



**National Organic Standards Board Meeting Agenda
October 20 & 22 (Comment Webinars), and October 27-29, 2026 (Meeting)**

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PLEASE NOTE:

Discussion documents, proposals, reports and/or other documents prepared by the National Organic Standards Board, including its subcommittees and task forces, represent the views of the National Organic Standards Board and do not necessarily represent the views and policies of the Department of Agriculture. Please see the [NOP website](#) for official NOP policy, regulations, guidance, and instructions.

National Organic Standards Board (NOSB)
Livestock Subcommittee (LS)
Integrating Livestock and Agroforestry Crops Discussion Document
Fall 2026

Summary of Issue:

The Livestock Subcommittee (LS) is currently exploring opportunities to promote and assist growers utilizing or interested in agroforestry (integrating grazing livestock into crop production systems). The Subcommittee aims to provide guidance to organic certifiers for assessing these operations, enabling producers to leverage this ecologically beneficial, integrative approach. Concurrently, this initiative seeks to maintain robust pathogen prevention measures that conform to both the Food Safety Modernization Act (FSMA) and organic regulatory standards.

Background:

In the winter of 2025, the Livestock Subcommittee (LS) requested a work agenda item to develop a proposal to revise and clarify requirements for the integration of livestock and agroforestry crops. The LS presented a [Discussion Document](#) for the Fall 2025 public meeting and accepted public comments. The full NOSB had a verbal presentation and discussion at the Spring 2026 meeting (Omaha, NE, May 2026). The LS is presenting an additional discussion document for the Fall 2026 and solicit feedback from stakeholders regarding this practice.

Integration of livestock and agroforestry crops is an increasingly popular practice in the US with potential to improve soil health (<https://www.fs.usda.gov/nac/practices/silvopasture.php>). Systems that include grazing in orchards, tree crops, and other cropping systems have been common for centuries in many parts of the world. They allow for management and utilization of orchard floor vegetation, increasing food production per unit of land. Integration of livestock and crops is a core principle of regenerative agriculture. Increasing biodiversity and cycling nutrients has exponential benefits to the health and productivity of an ecosystem. Agroforestry crops can include woody perennials that provide shade or forage for livestock, and also fruit or nut species for human consumption. There are financial as well ecological benefits for producers. Agroforestry systems are inherently aligned with organic principles and should be encouraged and supported by the NOP; however harvest rules after livestock have grazed in integrated systems are limiting the ability for producers to either be certified, or do this practice at all.

A conflict arises with organic certification due to the Federal Regulation at [7 CFR 205.203](#), which requires 90- or 120-days between application of animal manures and harvest of organic crops for human consumption. It appears as though Congress' intent of pre-harvest restrictions is to protect human health, as the Organic Foods Production Act (OFPA) describes in 7. U.S.C. 6513(b)(2)(B)(iv) that organic plans can provide for the application of raw manure on crops for human consumption if a preharvest interval is applied "to ensure the safety of such crop." The Food and Drug Administration (FDA), in its 2015 final [Produce Safety Rule](#), describes conditions when the presence of grazing animals may contribute to contamination of produce and may require producers to take steps to

minimize these risks, but FDA does not prohibit grazing animals on produce farms, nor does it apply any minimum preharvest interval in such cases. The NOSB is interested in exploring ways to work with producers, certifiers, and consumers to support these important ecological systems while also creating clarity on rules for certification that work for all stakeholders.

Current Regulations:

The relevant sections of the organic regulations applicable to grazing livestock in organic cropping systems are included at 7 CFR 205.203 (c) which stipulates that organic producers *“must manage plant and animal materials to maintain or improve soil organic matter content in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, pathogenic organisms, heavy metals, or residues of prohibited substances.”* This section also lays out the requirements for preharvest intervals of either 90 or 120 days when producers apply uncomposted manure to their organic production sites. Due to a lack of clear guidance related to grazing livestock, certifiers have tended to require a 90 or 120 day preharvest interval following any livestock grazing. This poses a barrier to operations integrating livestock into their cropping systems, as most operations’ growing seasons do not allow for both a timely grazing of forage and a lengthy preharvest interval prior to the harvest of the organic crop. These producers tend to forgo organic certification, choose not to integrate livestock at all, or must manage grazing in a way that is not ideal for the livestock or the forage.

The passage of the Food Safety Modernization Act, and the subsequent promulgation of the [Produce Safety Rule](#) at FDA, required the federal government to scientifically evaluate various risks to food safety as it relates to farm practices and produce commonly consumed raw. In the 2015 Produce Safety Final Rule ([80 FR 74354](#)), FDA acknowledges that “currently available science does not allow us to identify a specific minimum time period between grazing and harvesting that is generally applicable across various commodities and farming practices.” Instead, FDA suggests producers consider implementing a preharvest interval based on site specific conditions if there is reason to believe the grazing activities may cause contamination of produce. FDA also acknowledges that post-harvest processing can adequately reduce pathogen risks posed during the growing of produce, so when produce is typically cooked or further processed (e.g., fermented, heat treated, etc.) after harvest, these types of commodities are exempt from the Produce Safety Rule.

Also in the 2015 Produce Safety Rule, FDA recognizes that grazing livestock pose a significantly lower risk of contaminating crops with pathogenic organisms than does the application of raw manure, and their science-based food safety rules reflect that difference in risk. Organic regulations do not specifically provide for a more nuanced approach to this issue when grazing livestock is considered the same as when a farmer applies raw manure despite the fact that these two activities pose very different risks to contaminating organic crops with pathogenic organisms. In this discussion document, the Livestock Subcommittee explores ways that organic certifiers could have the latitude to evaluate the two activities differently, as they pose different potential risks to contamination of organic crops. The LS is not proposing any revisions to the mandatory preharvest interval of 90 or 120 days following an uncomposted manure application. The LS is proposing an approach that views livestock grazing not as a

direct manure application, but, rather, as a practice that has a potential for contamination of organic crops with pathogenic organisms requiring site specific prevention strategies.

Proposed Guidance Revision:

The NOP Handbook includes [NOP 5025](#) which describes how certifiers should evaluate and approve contamination and commingling prevention plans for organic producers and handlers. This guidance document references two parts of the organic regulations: 7 CFR 205.201 (Organic production and handling system plan) and 7 CFR 205.272 (Commingling and contact with prohibited substance prevention practice standard). The first regulation applies to all certified operations, which are required to develop an organic system plan that prevents contamination and commingling regardless of its scope (crop producer, livestock producer, or handler). The second generally applies to organic handling operations, who must ensure their handling prevents commingling with nonorganic products or contamination with prohibited substances. The guidance document describes control points to address these concerns that would apply to certified crop and livestock producers as well as certified handlers. As such, we can assume the NOP's intention is that contamination and commingling prevention plans be developed by all certified operators including producers who raise both crops and livestock on the same certified sites. The guidance's inclusion of crop producers also suggests that it covers the requirements at 7 CFR 205.203 which require producers to prevent contamination from prohibited substances and pathogenic organisms.

The Livestock Subcommittee's proposed approach to addressing the barriers identified above is to add a new section to this guidance that provides a list of organic control points producers and certifiers could use to evaluate contamination risk by pathogenic organisms and adequacy of prevention strategies when livestock graze in organic crop fields.

New Sections:

4.1 General

Certifying agents can consider livestock grazing distinct from direct raw manure applications (requiring a 90 or 120 day preharvest interval) when a producer's plan adequately identifies the risks grazing may pose to contaminating organic crops with pathogenic organisms and implements risk prevention and avoidance measures.

4.2 Organic Control Points

3. Examples of organic control points for crop operations that graze livestock on land which also produces crops for human consumption can include, but are not limited to:

- a. Potential for livestock presence to contaminate organic crops with pathogenic organisms
- b. Physical separations between livestock and organic crops
- c. Implementation of site specific preharvest intervals

- d. Post-harvest processing of organic crops which reduces or eliminates risks from pathogenic organisms

The Livestock Subcommittee agrees with the scientific community and FDA that grazing livestock pose less risk to organic crops than does the application of raw manure. The LS also believes that the current organic regulations provide certifiers flexibility in whether the 90/120 preharvest interval should be applied following the grazing of livestock. Additional specificity in this guidance document would support certifiers in their evaluation of contamination risks on operations that integrate livestock into their cropping systems and provide a pathway for these types of operations to overcome unnecessary barriers to certification.

Questions to stakeholders:

Producers: please provide specific examples of livestock grazing in organic cropping systems and steps producers take to prevent contamination of crops with pathogenic organisms. Examples can include grazing density, types of animals, types of crops, benefits to livestock, benefits to crops, alignment with food safety regulations, contamination prevention steps.

Certifiers: please provide specific challenges you see in evaluating site specific contamination risks and prevention strategies as it relates to grazing livestock in organic cropping systems.

Please provide the LS with additional control points that should be considered for inclusion in a proposal to revise guidance document NOP 5025.

Subcommittee Vote

Motion to accept the discussion document on Integrating livestock and agroforestry crops

Motioned by: Nate Lewis

Seconded by: Cat McCluskey

Yes: 4 No: 0 Abstain: 0 Recuse: 0 Absent: 1

**National Organic Standards Board (NOSB)
Livestock Subcommittee (LS) Proposal
Ivermectin – Addition to National List for Treatment of New World Screwworm
Fall 2026**

Summary of Substance:

Ivermectin is a synthetic parasiticide previously allowed for use in organic livestock production. It was [removed](#) from the National List in 2019 after a [2016 NOSB recommendation](#) found that it failed the National List criteria because of its toxicity to the environment, the availability of alternative synthetic parasiticides, and its incompatibility with a system of sustainable agriculture. The toxicity of ivermectin has not changed, and LS continues to acknowledge its negative effects on soil biology. What has changed, which prompts a new view into its necessity, is the emergence of New World Screwworm (NWS) in livestock in the United States. On June 3, 2026, USDA confirmed the first US animal case in the current outbreak of NWS, and USDA Animal and Plant Health Inspection Service (APHIS) has identified a number of parasiticides allowed for use in the control of the parasite. It is confirmed that moxidectin (a parasiticide currently allowed in organic production) is allowed off-label for NWS control, but FDA bulletins suggest use of ivermectin for NWS control in cattle. This parasite outbreak has potentially made ivermectin necessary again.

LS received indications that the organic industry is preparing a petition to add ivermectin back to the National List for the treatment of NWS in response to the outbreak. The LS has heard from producers that maximum effectiveness is a priority in stopping the outbreak which is leading to a preference for ivermectin over moxidectin. Therefore, the LS is proposing addition of ivermectin to the National List for NWS control only with its previous withholding time of 90 days.

Subcommittee Review:

This proposal has two main areas for consideration: process and substance. The process of recommending a substance to be added to the National List without a petition is atypical. NOSB welcomes input on whether the need to address an emergency in the livestock sector outweighs the organic regulatory tradition of responding to industry driven petitions when adding synthetic substances to the National List. The material, ivermectin, is well known, and its use has significant drawbacks. NOSB also welcomes input on whether the need for its use in an NWS outbreak shifts the National List criteria (7 U.S.C. 6517(c)(1)) significantly enough to warrant a renewed allowance limited to its use for NWS.

Classification: Ivermectin was previously on the National List at § 205.603(a) and classified as synthetic.

National List Motion:

Motion to add ivermectin (CAS #70288-86-7) at § 205.603(a)(23)(iii) for the treatment of New World Screwworm (*Cochliomyia hominivorax*) only—milk or milk products from a treated animal cannot be labeled as approved for in subpart D of this part for 90 days following treatment

Motion by: Nate Lewis

Seconded by: Franklin Quarcoo

Yes: 4 No: 0 Abstain: 0 Absent: 1 Recuse: 0

Sunset 2028
Meeting 2 - Reviews
Livestock Substances § 205.603
Fall 2026

Introduction

As part of the [Sunset Process](#), the National Organic Program (NOP) announces substances on the National List of Allowed and Prohibited Substances (National List) that are coming up for sunset review by the National Organic Standard Board (NOSB). The following list announces substances that must be reviewed by the NOSB and renewed by the USDA before their sunset dates. This document provides the substance's current status on the National List, annotation, references to past technical reports, past NOSB actions, and regulatory history, as applicable. If a new technical report has been requested for a substance, it is noted in this list. Substances included in this document may also be viewed in the NOP's [Petitioned Substances Index](#).

Request for Comments

Written comments should be submitted via Regulations.gov at www.regulations.gov during the comment period as explained in the meeting notice published in the Federal Register.

Public comments are necessary to guide the NOSB's review of each substance against the criteria in the Organic Foods Production Act ([7 U.S.C. 6518\(m\)](#)) and the USDA organic regulations ([7 CFR 205.600](#)). The current substances on the National List were originally recommended by the NOSB based on evidence available to the NOSB at the time of their last review, which demonstrated that the substances were: (1) not harmful to human health or the environment, (2) necessary because of the unavailability of wholly nonsynthetic alternatives, and (3) consistent and compatible with organic practices.

Public comments should clearly indicate the commentor's position on the allowance or prohibition of substances on the National List and explain the reasons for the position. Public comments should focus on providing relevant new information about a substance since its last NOSB review. Such information could include research or data that may support a change in the NOSB's determination for a substance (e.g., scientific, environmental, manufacturing, industry impact information, etc.). Public comment should also address the continuing need for a substance or whether the substance is no longer needed or in demand.

For Comments that Support the Continued Use of §205.603 Substances in Organic Production:

If you provide comments supporting the allowance of a substance at §205.603, you should provide information demonstrating that the substance is:

1. not harmful to human health or the environment;
2. necessary to the production of the agricultural products because of the unavailability of wholly nonsynthetic substitute products; and
3. consistent with organic livestock production.

For Comments that Do Not Support the Continued Use of §205.603 Substances in Organic Production:

If you provide comments that do not support a substance at §205.603, you should provide reasons why the use of the substance should no longer be allowed in organic production. Specifically, comments that support the removal of a substance from the National List should provide new information since its last NOSB review to demonstrate that the substance is:

1. harmful to human health or the environment;

2. unnecessary because of the availability of alternatives; and/or
3. inconsistent with organic livestock production.

For Comments that Support the Continued Prohibition of §205.604 Substances in Organic Production:

If you provide comments supporting the prohibition of a substance on the §205.604 section of the National List, you should provide information demonstrating that the substance is:

1. harmful to human health or the environment;
2. unnecessary because of the availability of alternatives; and
3. inconsistent with organic livestock production.

For Comments that Do Not Support the Continued Prohibition of §205.604 Substances in Organic Production:

If you provide comments that do not support the prohibition of a substance at §205.604, you should provide reasons why the use of the substance should no longer be prohibited in organic production. Specifically, comments that support the removal of a substance from the §205.604 section of the National List should provide new information since its last NOSB review to demonstrate that the substance is:

1. not harmful to human health or the environment; and/or
2. consistent with organic livestock production.

For Comments Addressing the Availability of Alternatives:

Comments may include information about the viability of alternatives for a substance under sunset review. Viable alternatives include, but are not limited to:

- Alternative management practices that would eliminate the need for the specific substance;
- Other substances that are on the National List that are better alternatives, which could eliminate the need for this specific substance; and/or
- Other organic or nonorganic agricultural substances.

Your comments should address whether any alternatives have a function and effect equivalent to or better than the allowed substance, and whether you want the substance to be allowed or removed from the National List. Assertions about alternative substances, except for those alternatives that already appear on the National List, should, if possible, include the name and address of the manufacturer of the alternative. Further, your comments should include a copy or the specific source of any supportive literature, which could include: product or practice descriptions, performance and test data, reference standards, names and addresses of organic operations who have used the alternative under similar conditions and the date of use, and an itemized comparison of the function and effect of the proposed alternative(s) with substance under review.

Written public comments will be accepted via www.regulations.gov during the open comment period noted in the Federal Register. Comments received after that date may not be reviewed by the NOSB before the meeting.

§ 205.603 Sunsets: Synthetic substances allowed for use in organic livestock production:

- [Activated charcoal](#)
- [Calcium borogluconate](#)
- [Calcium propionate](#)
- Chlorine materials
 - [\(i\) Calcium hypochlorite](#)
 - [\(ii\) Chlorine dioxide](#)

- [\(iii\) Hypochlorous acid—generated from electrolyzed water](#)
 - [\(iv\) Sodium hypochlorite](#)
- [Kaolin pectin](#)
- [Mineral oil](#)
- [Nutritive supplements \(Injectable trace minerals, vitamins, and electrolytes\)](#)
- [Propylene glycol](#)
- [Sodium chlorite, acidified §205.603\(a\)\(28\); and Sodium chlorite, acidified §205.603\(b\)\(9\)](#)
- [Zinc sulfate](#)

§ 205.604 Sunsets: Nonsynthetic substances prohibited for use in organic livestock production:

- None

Activated charcoal

Reference: § 205.603 (a)(6) Activated charcoal (CAS # 7440-44-0) - must be from vegetative sources.

Technical Report: [2002 TAP](#); [2021 TR](#)

Petition(s): [2002](#)

Past NOSB Actions: [2002 recommendation/vote](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

The principal veterinary use for activated charcoal is as an antidote to toxic substances—and analogous medical applications include use as a detoxifier. According to the 2002 TAP Review, it is regarded as the poison antidote of choice and the universal antidote to toxic substances. There is no reported overdose or acute toxicity. Activated charcoal is highly effective against both natural and synthetic toxins. Studies show activated carbon to be effective in removing various mycotoxins, such as aflatoxin, fumonisins, ochratoxin A, trichothenes, and zearalenone. Natural toxins from plants are also removed or attenuated by activated charcoal treatment or supplementation.

Activated charcoal can also be used to remove synthetic pesticides from animals that might contaminate milk or meat. Treatment with activated carbon when using certain parasiticides can help reduce the residual levels in flesh and fatty tissue. However, it should be noted that use of such substances and withdrawal from milk or meat production is subject to the applicable USDA organic regulations.

Activated charcoal can be added to animal feeds to bind to any included toxins and is also reported to increase weight gain [2021 TR, lines 90-94]. It is used to treat animals for drug overdoses, with efficacy established on pigs, dogs, and rabbits.

Manufacture

Activated charcoal of vegetative origin can be made from a large variety of sources such as hardwoods, grain hulls, corn cobs, and nut shells. The material undergoes pyrolysis at a very high heat. The resulting charcoal may be chemically activated using a variety of acids, bases, and salts, usually under pressure and elevated temperature. Activation agents include acetic acid, hydrochloric acid, potassium hydroxide, sodium hydroxide, zinc chloride, and several others. According to the 2021 TR, these chemical activation agents are usually collected and reused. The charcoal may also be activated through exposure to oxygenated gas or steam. Activated charcoal can also be produced from animal by products or coal, but these sources are not allowed under this listing.

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- **Activated charcoal** shall be of plant origin (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).
- **Activated charcoal** shall be of plant origin. Prohibited for use in the production of maple syrup (Table 6.3 - Ingredients classified as food additives, CAN/CGSB-32.311-2020).
- **Activated charcoal** shall be of plant origin. Prohibited for use in the production of maple syrup (Table 6.5 - Processing aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- **Activated carbon** is permitted in products of plant and animal origin (Section A2 – Processing Aids and Other Products, EC No. 2021/1165).

[CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods \(CXG 32-1999\)](#)

- **Activated carbon** is permitted for plant products (Table 4 - Processing aids which may be used for the preparation of products of agricultural origin, CXG 32-1999).

[International Federation of Organic Agriculture Movements \(IFOAM\) Norms](#)

- **Activated carbon** is permitted as a processing and post-harvest handling aid (Appendix 4, Table 1: List of approved additives and processing/postharvest handling aids, IFOAM NORMS 2014).

[Japan Agricultural Standard \(JAS\) for Organic Production](#)

- **Activated carbon** is permitted (Table D.1 - Substances for preparation etc., JAS 1605 Organic Products of Plant Origin).

Ancillary Substances

The LS is not aware of any used with activated charcoal

Human Health and Environmental Issues

Activated charcoal has minimal impact on human health and the environment. It may cause respiratory problems for those who handle it, especially as the particle size decreases. Its use in processing doesn't generally have an effect or chemical interaction in the agroecosystem.

Because of concern regarding the use of certain acids in manufacture, during a sunset review for activated charcoal listed at § 205.605(b), some stakeholders commented that they would like to see use limited to sources derived solely from steam activation. The 2021 TR indicates that this concern is lessened by re-use of the activation agents.

Discussion

Comments on activated charcoal received for the Spring 2026 NOSB meeting were strongly in favor of its continued listing as an approved synthetic substance for use in livestock care. It is used infrequently in relatively small amounts and has little environmental impact. Furthermore, its use can reduce or prevent livestock distress and death.

Justification for Vote

The Subcommittee finds activated charcoal **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove activated charcoal from the National List

Motioned by: Cat McCluskey

Seconded by: Kathryn Deschenes

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 1

Calcium borogluconate

Reference: § 205.603 (a)(7) Calcium borogluconate (CAS # 5743-34-0) - for treatment of milk fever only.

Technical Report: [2000 TAP](#); [2015 TR \(electrolytes\)](#)

Petition(s): N/A

Past NOSB Actions: [2000 recommendation/vote](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Calcium borogluconate is used for the treatment of hypocalcemia (also called parturient paresis or milk fever) in cattle, sheep, and goats [2000 TAP, page 1].

Milk fever is the result of metabolic stress occurring only at or near parturition (giving birth). The mother mobilizes large amounts of calcium to produce milk to feed newborns, and blood calcium levels can drop below the point necessary for impulse transmission along the nerve tracts. There are three discernable stages of milk fever for cows: in stage one, cows are able to stand but show signs of hypersensitivity and excitability. In stage two, cows are unable to stand. In stage three, cows lose consciousness progressively to the point of coma [2000 TAP, page 1].

Manufacture

Calcium borogluconate is prepared by the reaction of five parts calcium gluconate to one-part boric acid in an aqueous solution [2000 TAP, page 1]. Boric acid esterifies the alcohol groups on the gluconate. Excess boric acid is removed by distillation with ethanol.

Calcium gluconate is prepared by a number of methods, including the reaction of gluconic acid with calcium hydroxide. Calcium hydroxide was also reviewed by the NOSB for processing and was voted synthetic and allowed. Gluconic acid is most commonly produced in the U.S. by fermentation [2000 TAP, page 1].

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- **Calcium borogluconate** is permitted for milk fever. No withdrawal period required (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).

[European Economic Community \(EEC\) Council Regulation, EC No. 2018/848 and 2021/1165](#)

- **Calcium borogluconate** is not explicitly mentioned in the regulations.

[CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods \(CXG 32-1999\)](#)

- **Calcium borogluconate** is not explicitly mentioned in the regulations.

[International Federation of Organic Agriculture Movements \(IFOAM\) Norms](#)

- **Calcium borogluconate** is not explicitly mentioned in the regulations.

[Japan Agricultural Standard \(JAS\) for Organic Production](#)

- **Calcium borogluconate** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

The TAP review did not discuss environmental issues related to the manufacture of calcium borogluconate. The review noted that the material is metabolized by the animal, with the calcium entering the blood stream and some being expressed as milk. The animal's urine and feces may contain higher levels of boron as a result, but none of the literature reviewed partitioned the fate. Some claim that introduction of boron and sugar is either unnecessary or causes complications, but these are not specified [2000 TAP, page 3].

Discussion

Calcium borogluconate was among 35 NOSB recommendations for amendments to the National List, made from November 2000 to November 2016, that were acted upon in a final rule published in December 2018.

Calcium borogluconate is also classified on the National List under electrolytes, which are currently listed at § 205.603 as synthetic substances allowed for organic livestock production when they do not contain antibiotics. Due to the listing of calcium borogluconate as a stand-alone substance and the inclusion of the substance under the listing for electrolytes, the Subcommittee sought feedback on the separate listings and clarity from the FDA on the status of the substance as a livestock treatment. As explained in the NOP Final Rule adding calcium borogluconate to the National List:

“The NOP conferred with the FDA on the proposed additions and amendments to § 205.603. During this conference, the FDA indicated that their process involves reviewing formulated products for medical treatment approval. FDA indicated they do not review for medical treatment approval of generic materials, as included in this rule. Therefore, individual substances cited in this rule would not be reviewed as medical treatments under the FDA process. Based upon this consultation, NOP believes these substances are not in conflict with FDA regulations.” ([83 FR 66569](#))

During the last sunset review, stakeholders reflected a general acceptance of calcium borogluconate under separate listings to facilitate consistency amongst certifiers. One comment noted that the majority of certifiers would allow calcium borogluconate as an injectable electrolyte but having the separate listing assures this is the case. Another certifier commented that the listing is redundant, while a different certifier added that having the separate listings does not cause differences in decision making.

During the last sunset review, producers supported the re-listing of calcium borogluconate, stating that it is a common, inexpensive, and a traditional treatment for ketosis in ruminates. A producer group noted that a variety of treatments for ketosis are necessary for organic producers as they perform and are administered in different ways. Two veterinarians commented that the substance is essential for livestock treatment.

Questions to our Stakeholders

Is the listing of calcium borogluconate (and calcium propionate) redundant with electrolytes or is it necessary to keep them listed separately to assure allowance as administered as an IV?

Justification for Vote

The Subcommittee finds calcium borogluconate **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove calcium borogluconate from the National List

Motioned by: Corie Pierce

Seconded by: Nate Lewis

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Calcium propionate

Reference: § 205.603 (a)(8) Calcium propionate (CAS # 4075-81-4) - for treatment of milk fever only.

Technical Report: [2002 TAP](#); [2015 TR \(Electrolytes\)](#)

Petition(s): [2002](#)

Past NOSB Actions: [2002 recommendation/vote](#); [2002 position paper](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Calcium propionate is an electrolyte that is used in organic livestock to treat metabolic conditions such as hypocalcemia, scours, dehydration, milk fever, erratic heartbeat, loss of muscle control, mastitis, ketosis, alkalosis, acidosis, and difficulty in labor and prostration. Lack of treatment often results in death [2015 TR, lines 85-87]. Although the FDA considers electrolyte formulations to be animal drugs, many of the formulations have not been formally approved by the FDA; often because they are non-proprietary, general use materials. No company has applied for a New Animal Drug Approval (NADA) for calcium propionate [2015 TR, lines 375-376].

Milk production is very closely related to the total glucose supply at the udder. Propionate is used by the liver to make the glucose used by the cow to make lactose, the sugar in milk. Propionate's second function involves the cow's fat metabolism. When the cow's energy demands for milk production exceed the amount of energy she is eating, she begins to break down some of her body fat. The fats are broken down into smaller pieces, called non-esterified fatty acids (NEFA's), and carried to the liver. At the liver, they are broken down to form acetate to generate energy. Acetate is broken down to carbon dioxide and water to yield more energy; however, this process requires propionate. If there is not enough propionate available (which is often the case when cows are making a lot of milk sugar), the excess acetate builds up in the liver, creating acetone, acetoacetate, and beta-hydroxybutyrate. These products are released from the liver into the cow's bloodstream, causing ketosis symptoms [2002 TAP, page 7].

When lactation starts, milk fever can be treated by intravenous administration of electrolytes containing calcium to the animal. Calcium can be added by oral boluses, pastes, or drenching if the animal is still standing, but when the animal is down, an intravenous injection is needed. Oral doses of calcium

chloride can be effective, but it is caustic, causing ulcerations and acidosis. Calcium propionate is less caustic, does not cause acidosis, and the propionate fatty acid is glucogenic. One dose of calcium propionate is given at calving, and another 24 hours later [2015 TR, lines 338-342].

Manufacture

Electrolytes are mostly synthetic materials produced by chemical processes. Since many are salts, they are often produced by acid-base reactions. Calcium propionate is produced by reacting propionic acid with an aqueous solution of calcium hydroxide. It is also produced by reacting calcium hydroxide with propionitrile [2015 TR, lines 708-710].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- **Calcium propionate** is not explicitly mentioned in the regulations.

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Calcium propionate** is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Calcium propionate** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Calcium propionate** is not explicitly mentioned in the regulations.

Japan Agricultural Standard (JAS) for Organic Production

- **Calcium propionate** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

Electrolytes are used in animal production situations. Since electrolytes are usually added to correct deficiencies, concentrations in the environment due to excretion would be no more than a normal untreated animal with normal electrolyte balances. Most of these materials are produced by acid-base reactions. Environmental contamination from production of calcium propionate is unlikely, as reactions are simple neutralizations, producing the needed salt and water. Any problems would come from excess stocking rates. Excess stocking rates could lead to an excess of metabolic by-products in the immediate environment, plus extra stress on the animals [2015 TR, lines 806-810].

Discussion

The 2015 TR on electrolytes, including calcium propionate, discussed whether there were alternative non-synthetic materials or alternative practices that would make the use of calcium propionate unnecessary. The TR concluded that the electrolytes are on the list of allowed synthetics, and non-synthetic sources of electrolyte formulations are typically not commercially available [2015 TR, lines 1006-1007].

Alternative practices that would make the use of calcium propionate less necessary for treatment of hypocalcemia and the prevention of milk fever are low calcium prepartum diets, Dietary Cation Anion Difference (DCAD) diets (prior to parturition), and administration of oral electrolytes. Sometimes combinations of these treatments are used. DCAD diets involve adding electrolytes to food to provide an excess of strong anions or choosing food that will have this effect [2015 TR, lines 1014-1018]. Body condition should be managed in late lactation to prevent cows from becoming too fat which adds to the risk of milk fever. Modifying diets of late lactation cows to increase the energy supply from

digestible fiber and reduce the energy supply from starch may aid in partitioning dietary energy toward milk and away from body fattening.

Public comments on calcium propionate received at the Spring 2021 NOSB meeting were generally in favor of continuing its listing on the National List as an approved synthetic substance for use in livestock care. A majority of livestock dairy producers, veterinarians, and the organic industry at large stated it was an essential treatment for milk fever. It was noted that calcium propionate products present little opportunity for environmental or human health issues, stating that the calcium propionate is metabolized by the livestock to achieve normal electrolyte balances. One commenter stated that they have not seen new, non-synthetic products available for the treatment of milk fever.

There were a few commenters who noted that the listing for calcium propionate is redundant, as the listings for electrolytes at § 205.603(a)(11) and nutritive supplements at § 205.603(a)(21) together allow for calcium propionate for the treatment of milk fever, but other commenters stated that having the separate listings does not cause differences in decision making. The LS is seeking comments for the Fall 2026 meeting regarding these previous comments.

Questions to our Stakeholders

1. Is this listing redundant with electrolytes and nutritive supplements?

Justification for Vote

The Subcommittee finds calcium propionate **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove calcium propionate from the National List

Motioned by: Corie Pierce

Seconded by: Nate Lewis

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Chlorine materials – Calcium hypochlorite, chlorine dioxide, Hypochlorous acid - generated from electrolyzed water, sodium hypochlorite

Reference: § 205.603 (a)(10) Chlorine materials—disinfecting and sanitizing facilities and equipment. Residual chlorine levels in the water shall not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act.

- (i) Calcium hypochlorite
- (ii) Chlorine dioxide
- (iii) Hypochlorous acid - generated from electrolyzed water
- (iv) Sodium hypochlorite

Petition(s): [2016 \(Hypochlorous Acid\)](#)

Technical Report: [2006 TR \(Chlorine materials\)](#); [2017 Limited Scope TR \(Hypochlorous Acid\)](#); 2025 TR (pending post)

Past NOSB Actions: [10/1995 NOSB minutes and vote](#); [05/2006 NOSB sunset recommendation](#); [10/2010 NOSB recommendation](#); [10/2015 sunset recommendation](#); [04/2016 Recommendation to add hypochlorous acid](#); [11/2017 sunset recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to National List 02/20/2001 ([65 FR 80547](#)); Sunset renewal notice 03/15/2017 ([82 FR 14420](#)); Hypochlorous acid added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 10/30/2019 ([84 FR 53577](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

The EPA approved the registration of sodium hypochlorite and calcium hypochlorite pesticides for use on crops, soil, and livestock to control bacteria, fungi, and slime-forming algae that can cause diseases in people and animals [Draft 2025 TR, lines 444-446]. These materials are chlorinated inorganic disinfectants which are also used in cleaning irrigation, drinking water, and other water and wastewater systems. Chlorine dioxide is an antimicrobial disinfectant and pesticide used to control harmful microorganisms including bacteria, viruses, and fungi on inanimate objects and surfaces primarily in indoor environments. The material is used as a disinfectant, sanitizer, and medical treatment [Draft 2025 TR, lines 81-82]. It is also used in cleaning water systems and disinfecting public drinking water supplies. Chlorine dioxide is also used as a bleaching agent in paper and textile manufacturing, as a food disinfectant (e.g., for fruit, vegetables, meat, and poultry), for disinfecting food processing equipment, and treating medical wastes [2006 TR, lines 60-71]. Chlorine materials are currently used for disinfection of livestock facilities ([NOP Guidance 5026](#)).

Hypochlorous acid, formulated via electrolyzed water, is effective as a sanitizer at a much lower chlorine concentration and is safer for health and the environment than the currently listed chlorine sanitizers. A couple of publications stated that hypochlorous acid is the most effective form of chlorine for killing microbial pathogens and parasites that pose food safety risks [Draft 2025 TR, lines 505-506].

Manufacture

Calcium hypochlorite, sodium hypochlorite, and chlorine dioxide are all synthetic materials that are manufactured by chemical processes. Calcium hypochlorite is produced by passing chlorine gas over hydrated (slaked) lime. It is then separated from the coproduct, calcium chloride, and air dried or vacuum dried. Generally, sodium hypochlorite is produced by reacting chlorine with a solution of sodium hydroxide (NaOH, also called lye or caustic soda). This method is used for most commercial productions of sodium hypochlorite. A more active, but less stable formulation of sodium hypochlorite can be produced by chlorinating a solution of soda ash (Na₂CO₃). Chlorine dioxide is formed by reacting sodium chlorate (NaClO₃) and sulfuric acid (H₂SO₄) with sulfur dioxide (SO₂), or chloric acid is reacted with methanol (CH₃OH). Alternatively, chlorine dioxide can be formed with chlorine (Cl₂) and sodium chlorite; sodium hypochlorite with hydrochloric acid; potassium chlorate with sulfuric acid; or by passing nitrogen dioxide through a column of sodium chlorate [2006 TR, lines 149-171].

Hypochlorous acid: Electrolyzed water (EW) is the product of the electrolysis of a dilute sodium chloride solution in an electrolysis cell containing a semi-permeable membrane that physically separates the anode and cathode but permits ions to pass through. In the process, hypochlorous acid, hypochlorite ion, and hydrochloric acid are formed at the anode, and sodium hydroxide is formed at the cathode. The solution formed on the anode side is acidic EW (pH 2 to 6), and the solution formed on the cathode side is basic EW (pH 7.5 to 13). Neutral EW, with a pH of 6 to 7.5 is produced by mixing the anodic solution with hydroxide, or by using a single-cell chamber for electrolysis.

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- The following chlorine compounds are permitted: **a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite**. Shall not exceed maximum levels for safe drinking water. Chlorine compounds may be used: a) for wash water in direct contact with crops or food; b) in flush water from cleaning irrigation systems, equipment, storage or transport units—application to crops or fields is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).
- The following chlorine compounds are permitted up to maximum label rates: **a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite** (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).
- Teat dips and udder wash are permitted. Substances, such as alcohol, iodine, hydrogen peroxide, chlorine dioxide and ozone, can be used as disinfectants for a pre- or post-teat dip or udder wash if they are registered for this use by Canada's Food and Drug Regulations. Chlorhexidine can be used as a post-milking teat dip if alternative germicidal agents and physical barriers have lost their effectiveness (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Calcium hypochlorite** is not explicitly mentioned in the regulations.
- **Chlorine dioxide** is not explicitly mentioned in the regulations.
- **Hypochlorous acid** is not explicitly mentioned in the regulations.
- **Sodium hypochlorite** is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Calcium hypochlorite** is not explicitly mentioned in the regulations.
- **Chlorine dioxide** is not explicitly mentioned in the regulations.
- **Hypochlorous acid** is not explicitly mentioned in the regulations.
- **Sodium hypochlorite** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Calcium hypochlorite** is permitted with the following limitation: an intervening event or action must occur to eliminate risks of contamination (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).
- **Chlorine dioxide** is permitted with the following limitation: an intervening event or action must occur to eliminate risks of contamination (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).
- **Hypochlorous acid** is not explicitly mentioned in the regulations.
- **Sodium hypochlorite** is permitted with the following limitation: an intervening event or action must occur to eliminate risks of contamination (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).
- **Sodium hypochlorite (e.g., as liquid bleach)** is permitted (Appendix 5: Substances for pest and disease control and disinfection in livestock housing and equipment, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Calcium hypochlorite** is not explicitly mentioned in the regulations.
- **Chlorine dioxide** is not explicitly mentioned in the regulations.
- Any substances other than **hypochlorous acid water** and sodium hypochlorite, both of which are specified in Table D.1, should not be used for the seeds specified in 5.6.1 (Seeds used in cultivation facilities of sprout, JAS 1605 Organic Products of Plant Origin).
- Sodium hypochlorite is permitted with the following criteria: limited to the use in processed products of plant origin (limited to the use of **hypochlorous acid water** produced by electrolyzing salt water (limited to the use of salt containing 99% or more sodium chloride)), or the use for disinfecting the intestines of livestock animals for processed meat products, or cleaning of eggs (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- **Hypochlorous acid water** is permitted with the following criteria: limited to the use only for the purpose of disinfecting meat in the process of dismantling or cleaning eggs (Table K.1 - Substances for preparation or other purposes, JAS 1608 Organic Livestock Products).
- Any substances other than hypochlorous acid water and **sodium hypochlorite**, both of which are specified in Table D.1, should not be used for the seeds specified in 5.6.1 (Seeds used in cultivation facilities of sprout, JAS 1605 Organic Products of Plant Origin).
- **Sodium hypochlorite sodium chloride** is permitted with the following criteria: limited to those obtained by electrolyzing the salt solution (limited to those using salt containing no less than 99% sodium chloride) (Table D.1 - Substances for preparation etc., JAS 1605 Organic Products of Plant Origin).
- **Sodium hypochlorite** is permitted with the following criteria: limited to the use in processed products of plant origin (limited to the use of hypochlorous acid water produced by electrolyzing salt water (limited to the use of salt containing 99% or more sodium chloride)), or the use for disinfecting the intestines of livestock animals for processed meat products, or cleaning of eggs (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- **Sodium hypochlorite** is permitted with the following criteria: limited to the use only for the purpose of disinfecting meat in the process of dismantling or cleaning eggs (Table K.1 - Substances for preparation or other purposes, JAS 1608 Organic Livestock Products).

Human Health and Environmental Issues

The last sunset review document on chlorine materials stated that information available from EPA and FDA on chlorine dioxide, sodium, and calcium hypochlorite, and hypochlorous acid indicated that there was no environmental contamination resulting from proper manufacture, use, or disposal. A Technical Report in 2025, however, provided information on adverse environmental impacts of two of the three methods used in producing chlorine needed for manufacturing chlorine materials.

Chlorine and its disinfection byproducts (DBPs) can contaminate milk in equipment and bulk milk tanks that have been sanitized with chlorinated water [Draft 2025 TR, lines 666-676]. Halogenated teat dips, such as ASC and iodophors, are another potential source of Trihalomethanes (THMs) and other DBP contaminants in the milk supply chain. Various researchers reported that DBPs found in the milk supply include THMs, chlorites, chlorates, and perchlorates [Draft 2025 TR, lines 669-671]. Free chlorine residues cause taste and odor sensory defects in milk. Residual chlorine will inhibit organisms responsible for making fermented and cultured dairy products, such as cheese [Draft 2025 TR, lines 671-672]. Most importantly, chlorine DBPs pose a public health risk by exposing people to probable carcinogens and other oncogenic substances [Draft 2025 TR, lines 673-674]. Some DBPs in milk and dairy products are endocrine disruptors [Draft 2025 TR, lines 674-675].

Chlorate enters the food supply almost exclusively as a DBP through the use of chlorine-based sanitizers in food production. DBPs found in the milk supply have been linked to the use of hypochlorous acid, hypochlorites, and chlorine dioxide (2025 TR, lines 678-680). The use of chlorine-based sanitizers throughout the cleaning process in Clean In Place (CIP) systems, that is not followed by a sufficient clean water or acid rinse, is one of the leading causes of milk contaminated with DBPs [Draft 2025 TR, lines 969-998]. Because of quality and food safety concerns, the Republic of Ireland prohibited the use of chlorine disinfectants in CIP systems starting in 2021 [Draft 2025 TR, lines 680-684].

Discussion

Protecting food from contamination by human pathogens is essential to safeguard organic integrity. Despite the potential for significant risks to human health and the environment, chlorine compounds have been judged essential to ensure food safety and to comply with food safety regulations. The Livestock Subcommittee (LS) in its most recent sunset review generally supported continued listing of these materials but encourages ongoing discussion about the listing of sanitizers and disinfectants for livestock handling and processing. The LS declared its support for research priorities that investigate alternatives to chlorine compounds and encouraged the use of alternative, less toxic materials, when their use can meet strict food safety standards. During the previous sunset review, the LS concluded that chlorine materials were an essential part for maintaining hygiene in livestock facilities.

Public comments during the last sunset review were consistently in favor of relisting chlorine materials including (i) Calcium hypochlorite, (ii) Chlorine dioxide, and (iv) Sodium hypochlorite. Due to its efficacy as a sanitizer and the overall lack of suitable alternatives at the time, livestock producers and other stakeholders in the livestock product supply chain cited chlorine materials as a critical tool to maintain hygiene.

Various subsequent studies have revealed that alternatives to chlorine are also of interest to livestock producers and handlers of animal products [Draft 2025 TR, lines 1330-1331]. Generation of chlorine gas poses a worker safety hazard. Chlorination reduces the biodiversity of raw milk and lowers counts of beneficial bacteria—like *Lactobacillus* spp.—that are used to make cheese and other fermented dairy products [Draft 2025 TR, lines 1331-1333].

Alternatives to chlorine materials in livestock production include hydrogen peroxide as a livestock management tool and production aid [Draft 2025 TR, lines 1348-1349]. Alternative products for livestock health care include botanicals, essential oils, herbal preparations, and cleaning agents. Alternative processing sanitizers and cleaners include bacteriophages, post-harvest fruit and vegetable wash, citric acid, peracetic acid/ peroxyacetic acid, and post-harvest use of peracetic acid/ peroxyacetic acid [Draft 2025 TR, lines 1348-1360]. It is important to note that this is not an exhaustive list of alternatives and some of the listed materials require additional research or regulatory action prior to substitution for chlorine [Draft 2025 TR, lines 1336-1341].

In its Spring 2026 public comment submitted to the NOSB, a human and environmental health advocacy organization asked the board to commission a Technical Report that (a) determines what disinfectants/sanitizer uses are required by law and (b) comprehensively examines more organically-compatible methods and materials to determine whether chlorine-based materials are actually needed for any uses. The commenting organization stated that if there are uses for which chlorine is necessary, then the NOSB should include them in the National List and limit the use to those particular uses.

Questions to our Stakeholders

1. Is there any additional information/research data on the performance and cost-effectiveness of alternatives to chlorine materials?

Justification for Vote

The Subcommittee finds chlorine materials at § 205.603 (a)(10) (i) calcium hypochlorite, (ii) chlorine dioxide, (iii) hypochlorous acid - generated from electrolyzed water, and (iv) sodium hypochlorite **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Votes

Motion to remove calcium hypochlorite at § 205.603(a)(10)(i)

Motioned by: Franklin Quarcoo

Seconded by: Kathryn Deschenes

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Motion to remove chlorine dioxide at § 205.603(a)(10)(ii)

Motioned by: Franklin Quarcoo

Seconded by: Corie Pierce

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Motion to remove hypochlorous acid at § 205.603(a)(10)(iii)

Motioned by: Franklin Quarcoo

Seconded by: Cat McCluskey

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Motion to remove sodium hypochlorite at § 205.603(a)(10)(iv)

Motioned by: Franklin Quarcoo

Seconded by: Kathryn Deschenes

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Kaolin pectin

Reference: § 205.603 (a)(17) Kaolin pectin - for use as an adsorbent, antidiarrheal, and gut protectant.

Technical Report: [2002 TAP](#); [2021 TR](#)

Petition(s): [2002](#)

Past NOSB Actions: [2002 recommendation/vote](#); [2002 Position Paper](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Kaolin pectin is used in livestock for the same reasons that it is administered to humans: as an adsorbent, anti-diarrheal, and gut protectant. It may also be combined with vitamin A to treat bacterial diarrhea in calves [2021 TR, lines 164-166, 207-208].

Kaolin pectin, as a combination, is not listed by the FDA as generally recognized as safe (GRAS). However, kaolin and pectin are individually considered as GRAS [2021 TR, lines 168-169].

In addition to kaolin pectin having been placed on the National List as an allowed synthetic substance, kaolin and pectin are also separately allowed for use in organic systems.

Manufacture

Kaolin pectin is a formulated mixture of kaolin and pectin, produced through standardization and buffering steps to create a consistent oral livestock medication. Kaolin is a naturally occurring aluminum silicate clay, and pectin is derived from citrus peel or apple pomace through extraction and purification. Because the commercial product undergoes processing such as buffering, standardization, and blending with carriers, kaolin pectin meets the definition of a synthetic substance under 7 CFR 205.2.

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- **Kaolin pectin** is not explicitly mentioned in the regulations.

[European Economic Community \(EEC\) Council Regulation, EC No. 2018/848 and 2021/1165](#)

- **Kaolin pectin** is not explicitly mentioned in the regulations.

[CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods \(CXG 32-1999\)](#)

- **Kaolin pectin** is not explicitly mentioned in the regulations.

[International Federation of Organic Agriculture Movements \(IFOAM\) Norms](#)

- **Kaolin pectin** is not explicitly mentioned in the regulations.

[Japan Agricultural Standard \(JAS\) for Organic Production](#)

- **Kaolin pectin** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

According to the 2002 TAP and the 2021 TR:

- There is no evidence that kaolin and pectin will contaminate the environment.
- In the manner in which kaolin is to be used, in kaolin pectin, there is an unlikely chance of environmental contamination. However, if workers are to be exposed to kaolin dust during manufacture, they must take appropriate precautions.
- Extensive safety and toxicological data exist on the impact of kaolin and pectin on human health and the environment. Reviews by JEFCA (the Joint FAO/WHO Expert Committee on Food Additives) and the U.S. FDA suggest that the petitioned substance is not harmful to human health or the environment [2021 TR, lines 442-443].

There is no evidence that kaolin pectin for use as medicine in livestock would cause harmful interactions in organic crop, livestock production, or livestock handling. Because kaolin is made up of natural components, the fecal excretion of kaolin will not cause harm. Most of the pectin consumed in the intestine is degraded [2021 TR, lines 481-484].

Discussion

Public comments concerning the 2028 sunset review of kaolin pectin were generally favorable toward its continued availability in organic livestock production. Certification agencies reported relatively limited

use, and their comments demonstrate that approved products are currently used by organic livestock operations in several certification programs. Supporters for relisting note that kaolin pectin is an effective, mild, affordable, and readily available treatment that can play an important role in maintaining animal health and welfare. Several comments emphasized its value as an as-needed treatment rather than a routinely administered livestock input.

Several comments compared kaolin pectin with activated charcoal, another material available for certain livestock-health situations. The comments indicate that the two materials should not necessarily be regarded as interchangeable. Kaolin pectin was described as helping protect the gastrointestinal lining and manage excess fluid, whereas activated charcoal was described as binding or adsorbing toxins so that they can pass through the digestive tract without being absorbed by the animal. On that basis, the availability of activated charcoal does not, by itself, demonstrate that kaolin pectin is unnecessary. The products may address different clinical circumstances or perform complementary functions.

Although the comments broadly support continued access, they identify an important regulatory question concerning the classification of pectin. Pectin may exist in amidated and non-amidated forms, and the production method may affect whether a particular form is classified as synthetic or nonsynthetic. A health and environmental non-profit organization argued that non-amidated pectin is nonsynthetic and therefore may already be permitted without a specific listing under § 205.603. It recommended that the NOSB reconsider the listing and specifically determine whether kaolin pectin containing amidated pectin should be allowed. The organization also referred to an earlier NOSB conclusion suggesting that a listing might not be necessary when a natural form is used.

The comments support continued access to kaolin pectin as an as-needed gastrointestinal treatment for organic livestock, particularly calves. Its reported effectiveness, mild action, affordability, familiarity, and availability support a finding that it remains compatible with organic livestock healthcare. The evidence of actual use across several certification programs further demonstrates that the material continues to serve a practical function.

Questions to our Stakeholders

1. What types of pectin are used in currently available kaolin pectin products?
2. How do certifiers distinguish amidated from non-amidated kaolin pectin?

Justification for Vote

The Subcommittee finds kaolin pectin **compliant** with the Organic Foods Production Act (OFPA) (7 U.S.C. 6518(m) and 6517) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove kaolin pectin from the National List

Motioned by: Kathryn Deschenes

Seconded by: Corie Pierce

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 1

Mineral oil

Reference: § 205.603(a)(20) Mineral oil—for treatment of intestinal compaction, prohibited for use as a dust suppressant.

Technical Report: [2002 TAP](#); [2015 TR](#); [2021 Limited Scope TR](#)

Petition(s): [2002 Petition](#)

Past NOSB Actions: [11/1995 NOSB minutes and vote](#); [2002 recommendation/vote](#); [05/2003 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL at § 205.603(b) effective 04/21/2001 ([65 FR 80548](#), [66 FR 15619](#)); Added to NL § 205.603(a) effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 5/29/2028

Subcommittee Review

Use

The scope of this sunset review is for mineral oil, listed at § 205.603(a)(20) for administering internally to lubricate the intestinal tract and dislodge intestinal obstructions in cattle and other ruminants. The National Organic Program (NOP) regulations at § 205.603(a)(20) currently permit the use of mineral oil in organic livestock production for treatment of intestinal compaction, prohibited for use as a dust suppressant.

Mineral oil is used as an internal lubricant in livestock production. In the case of “omasal impaction,” the ruminant’s third stomach (omasum) becomes tightly bound and compacted, resulting in severe pain for the affected animal. Omasal impaction is related to failure of omasal transport, which develops because of a condition that prevents ingested material from passing through the omasal canal into the abomasum, the fourth and final stomach compartment in the ruminants’ stomachs. In general, impactions in various segments of the gastrointestinal tract may develop in pregnant beef cows during cold winter months when cattle consume less water and are fed lower-quality roughage. Mineral oil may be applied as an oral drench until the viscous mineral oil treatment lubricates the impaction [2021 TR, lines 111-120].

Mineral oil is also commonly used to control bloat. Bloat generally occurs in animals after grazing young, lush pasture, particularly if the pasture contains significant amounts of legume species (clover, medics, or lucerne). Ruminants such as cattle produce large volumes of gas during the digestive process, and natural foaming agents in legumes and some rapidly growing grasses cause stable foam to form in the rumen. The animal is therefore unable to pass the gas trapped as small bubbles in the foam. Severe cases may require insertion of a wide-bore trocar and cannula into the rumen to relieve the pressure followed by direct addition of an anti-bloat preparation (e.g., mineral oil, vegetable oils, or dioctyl sodium sulfosuccinate) into the rumen through the cannula. Sudden death is commonly observed in cattle that are not closely observed. As a preventative measure, veterinary specialists suggest that cattle producers drench each animal twice daily with an anti-bloat preparation when the pasture is considered risky [2021 TR, lines 136-147].

Manufacture

The industrial production of highly refined, food-grade mineral oils involves chemical processing and refinement using various chemical reagents and/or catalysts. To produce mineral oil, the chemical

composition of natural crude oil is altered through physical separation (distillation) followed by reactions/combination with synthetic substances and reagents (aromatic solvents, strong acids, and/or catalysts). Crude oil is desalted, distilled, and subjected to solvent extraction, de-aromatization with fuming sulfuric acid or sulfur trioxide, and/or catalytic hydrocracking treatments to reduce the concentration of polar constituents containing heteroatoms (nitrogen, oxygen, and sulfur atoms) as well as polynuclear aromatic hydrocarbons (PAHs) and other aromatic compounds [2021 TR, lines 136-147].

Because of the complexity of the mineral oil mixtures, refined mineral oils are identified using several CAS numbers depending on the treatment processes utilized and the intended use pattern of the mineral oil product. Mineral oils used in organic livestock production are hydrocarbon molecules containing 34 carbon atoms. These untreated mineral oils may also contain small amounts of nitrogen- and sulfur containing compounds. As such, the NOSB classified mineral oil as “synthetic” since initially recommending addition of the substance to the National List.

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- **Mineral oil** is permitted for external use (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Mineral oil** is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Mineral oils** are permitted in traps with the following condition for use: need recognized by the certification body or authority (Table 2 - Substances for plant pest and disease control, CXG 32-1999).

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Light mineral oils (paraffin)** of mineral origin are permitted (Appendix 3: Crop protectants and growth regulators, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Mineral oil** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

Because of their complexity, it is not possible to separate mineral oil mixtures into individual components for quantification. Indeed, an enormous number of individual components are constituents of crude and refined mineral oil mixtures. Mineral oils may be classified as highly refined or mildly treated/untreated [2021 TR, lines 43-46].

Testing in laboratory animals has demonstrated that mineral oils are slightly to practically non-toxic to mammals on an acute exposure basis. Mineral oils are mild irritants, classified as Toxicity Category IV (lowest toxicity) for skin irritation and Category III for eye irritation. Highly refined “white” mineral oils produced no sensitization reactions in guinea pigs repeatedly exposed to the substance [2021 TR, lines 486-490].

The carcinogenicity and genotoxicity potential for mineral oils is generally dependent upon the degree of refinement and presence of PAHs in the mixture. White mineral oils, which have undergone the most

severe acid, solvent, or hydrocracking treatment, showed no activity in a series of skin-tumor bioassays [2021 TR, lines 518-520]. Much like the mammalian studies, the results of avian and honeybee studies suggest that refined mineral oils are practically non-toxic to birds and honeybees via acute oral and contact exposure, respectively. Refined mineral oils are generally characterized as minimally toxic to aquatic organisms on an acute exposure basis [2021 TR, lines 534-535, 548-549].

The white mineral oils that are likely to be used for lubrication and external parasite control in organic livestock production are highly refined oils that contain negligible quantities of toxic contaminants compared to untreated and mildly treated oils [2021 TR, lines 481-484].

Discussion

Public comments on mineral oil were overwhelmingly supportive of continued listing for livestock use at § 205.603(a)(20) for the treatment of intestinal compaction, while maintaining the existing prohibition on its use as a dust suppressant. Commenters generally described mineral oil as a longstanding and narrowly used animal health tool with a well-established role in organic livestock management.

Several commenters emphasized that mineral oil is used infrequently but remains an important option when digestive disturbances occur. Stakeholders noted that mineral oil serves as a practical treatment for intestinal compaction and may also be used by veterinarians to address digestive upsets and frothy bloat.

Comments also indicated that mineral oil remains a familiar material within organic livestock systems. Producers reported that the substance is commonly included on Organic System Plans and available for use when needed. Several commenters suggested that the substance has a history of successful use in organic production with few reported concerns related to animal health, efficacy, or compliance.

A recurring theme was the lack of readily available substitutes that provide the same combination of effectiveness, availability, and producer familiarity. Commenters characterized mineral oil as a useful component of the veterinary and livestock health toolbox, particularly for emergency or acute digestive conditions where prompt intervention is important.

Few substantive concerns were raised regarding continued listing. The comments reviewed did not identify significant adverse impacts associated with current livestock uses, nor did they recommend additional restrictions beyond the existing annotation prohibiting use as a dust suppressant. Instead, commenters generally concluded that the material continues to meet an essential livestock health need and should remain available to organic producers.

The comments received were largely supportive of relisting mineral oil for the treatment of intestinal compaction in livestock. Commenters described the substance as an established, effective, and infrequently used therapeutic tool that provides important animal health benefits and remains necessary in certain livestock management situations. Stakeholders generally favored maintaining the current annotation and did not identify significant concerns that would warrant removal from the National List at this time.

Questions to our Stakeholders

None

Justification for Vote

The Subcommittee finds mineral oil **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove mineral oil from the National List

Motioned by: Kathryn Deschenes

Seconded by: Nate Lewis

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 1

Nutritive supplements – injectable trace minerals, vitamins, and electrolytes

Reference: § 205.603 (a)(21) Nutritive supplements - injectable supplements of trace minerals per paragraph (d)(2) of this section, vitamins per paragraph (d)(3), and electrolytes per paragraph (a)(11), with excipients per paragraph (f), in accordance with FDA and restricted to use by or on the order of a licensed veterinarian.

Technical Report: [1995 TAP \(electrolytes\)](#); [2015 TR \(vitamins\)](#); [2015 TR \(electrolytes\)](#); [2019 TR \(trace minerals\)](#); [2026 Limited Scope TR](#)

Petition(s): [2009](#)

Past NOSB Actions: [05/2009 recommendation to add to NL](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Nutritive supplements (Injectable trace minerals, vitamins, and electrolytes) are allowed to treat livestock ailments when administered or ordered by a licensed veterinarian.

Manufacture

Trace minerals used as feed additives are produced by chemical reactions resulting in inorganic forms of the mineral. Organic compounds are used for some of the trace minerals [2019 TR, lines 71-73].

Vitamins can be extracted from foods or synthesized by chemical or fermentation processes. Regarding the former, certain vitamins can be obtained from natural dietary sources in varying quantities. For example, Vitamin C (ascorbic acid) is a major nutritional component of citrus fruits and Vitamin D is a natural constituent nutrient of cold-water fish [2015 TR, lines 46-49].

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- **Minerals, trace minerals,** and elements are permitted with the following origin/usage conditions: unprocessed rock dusts; ground animal or plant material (other than blood or bone meal); and seawater are preferred sources. Chelated and sulphated forms are permitted. If none of the aforementioned sources are commercially available, other versions are permitted except

for forms containing or produced with EDTA or EDDHA (Table 5.2 - Feed, feed additives and feed supplements, CAN/CGSB-32.311-2020).

- **Electrolytes** are permitted including, but not limited to: CMPK (calcium, magnesium, phosphorus, potassium). Orally or **by injection** (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).
- **Minerals, trace minerals**, and elements are permitted with the following origin/usage conditions: non-synthetic chelated or sulphated minerals. Examples include oyster shell, calcium chloride and magnesium oxide. Synthetic nutrient minerals may be used if non-synthetic sources are not commercially available. Minerals from any source are permitted for medical use (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).
- **Vitamin** formulants that comply with Canadian regulations are accepted. Vitamins not compliant to 5.1.2 of this standard are permitted. Orally, topically or **by injection** (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- Feed of **mineral origin, trace elements, vitamins** or provitamins are of natural origin, except in cases where products or substances from such sources are not available in sufficient quantities or qualities or where alternatives are not available (Authorisation of products and substances for use in organic production, EC No. 2018/848).
- When despite preventive measures to ensure animal health referred to in point 3.1.4.1 a health problem arises, veterinary treatments may be used in the following order of preference: (i) substances from plants, animals or **minerals** in a homeopathic dilution; (ii) plants and their extracts not having anaesthetic effects; and (iii) substances such as **trace elements**, metals, natural immunostimulants or authorised probiotics (Veterinary treatments, EC No. 2018/848).
- Compounds of **trace elements** permitted include: iron (II) carbonate (siderite); iron (II) sulphate monohydrate; iron (II) sulphate heptahydrate; potassium iodide; calcium iodate, anhydrous; coated granulated calcium iodate anhydrous; cobalt (II) acetate tetrahydrate; cobalt (II) carbonate; cobalt (II) carbonate hydroxide (2:3) monohydrate; coated granulated cobalt (II) carbonate; cobalt (II) sulphate heptahydrate; copper (II) carbonate dihydroxy monohydrate; copper (II) oxide; copper (II) sulphate pentahydrate; dicopper chloride trihydroxide; manganese (II) oxide; manganous sulfate, monohydrate; zinc oxide; zinc sulphate heptahydrate; zinc sulphate monohydrate; zinc chloride hydroxide monohydrate; sodium molybdate dihydrate; sodium selenite; coated granulated sodium selenite; sodium selenate; selenised yeast, *Saccharomyces cerevisiae*, inactivated (Nutritional Additives, EC No. 2021/1165).
- Non-organic feed materials of plant, algal, animal or yeast origin, feed materials of microbial or of **mineral origin**, feed additives and processing aids may be used only if they have been authorised pursuant to Article 24 for use in organic production (General nutrition requirements, EC No. 2018/848).
- Feed materials of **mineral origin** authorised pursuant to Article 24 for use in organic production, nutritional additives authorised pursuant to Article 24 for use in organic production, and phytotherapeutic and homeopathic products shall be used in preference to treatment with chemically synthesised allopathic veterinary medicinal products, including antibiotics, provided that their therapeutic effect is effective for the species of animal and for the condition for which the treatment is intended (Disease prevention, EC No. 2018/848).
- For the purposes of point (c) of Article 24(1) of Regulation (EU) 2018/848, only the products and substances listed in Part A of Annex III to this Regulation may be used in organic production as non-organic feed material of plant, algal, animal or yeast origin or as feed material of microbial or **mineral origin**, provided that their use is in accordance with the relevant provisions of Union

law, in particular Regulation (EC) No 767/2009 of the European Parliament and of the Council and, where applicable, in accordance with national provisions based on Union law (Non-organic feed material of plant, algal, animal or yeast origin or feed material of microbial or mineral origin, EC No. 2021/1165).

- Feed materials of mineral origin are permitted and include: calcium carbonate; calcareous marine shells; maerl; lithothamn; calcium gluconate; magnesium oxide; magnesium sulphate anhydrous; magnesium chloride; magnesium carbonate; dicalcium phosphate; monocalcium phosphate; calcium-magnesium phosphate; magnesium phosphate; monosodium phosphate; calcium sodium phosphate; monoammonium phosphate (ammonium dihydrogen orthophosphate); sodium chloride; sodium bicarbonate; sodium carbonate; sodium sulphate; potassium chloride (Annex III: Authorised products and substances for use as feed or in feed production, EC No. 2021/1165).
- **Vitamins**, pro-vitamins and chemically well-defined substances having similar effects are permitted if they are derived from agricultural products. If not available from agricultural products: derived synthetically, only those identical to **vitamins** derived from agricultural products may be used for monogastric animals and aquaculture animals; derived synthetically, only **vitamins A, D and E** identical to vitamins derived from agricultural products may be used for ruminants; the use is subject to prior authorisation of the Member States based on the assessment of the possibility for organic ruminants to obtain the necessary quantities of the said vitamins through their feed rations (Nutritional Additives, EC No. 2021/1165).

[CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods \(CXG 32-1999\)](#)

- Specific criteria for feedstuffs and nutritional elements: b) feedstuffs of **mineral origin, trace elements, vitamins**, or provitamins can only be used if they are of natural origin. In case of shortage of these substances, or in exceptional circumstances, chemically well-defined analogic substances may be used (Livestock and livestock products: Nutrition, CXG 32-1999).
- The use of veterinary medicinal products in organic farming shall comply with the following principles: a) where specific disease or health problems occur, or may occur, and no alternative permitted treatment or management practice exists, or, in cases required by law, vaccination of livestock, the use of parasiticides, or therapeutic use of veterinary drugs are permitted; b) phytotherapeutic (excluding antibiotics), homeopathic or ayurvedic products and **trace elements** shall be used in preference to chemical allopathic veterinary drugs or antibiotics, provided that their therapeutic effect is effective for the species of animal and the condition for which the treatment is intended; c) if the use of the above products is unlikely to be effective in combating illness or injury, chemical allopathic veterinary drugs or antibiotics may be used under the responsibility of a veterinarian; withholding periods should be the double of that required by legislation with, in any case, a minimum of 48 hours; d) the use of chemical allopathic veterinary drugs or antibiotics for preventative treatments is prohibited (Livestock and livestock products: Health care, CXG 32-1999).

[International Federation of Organic Agriculture Movements \(IFOAM\) Norms](#)

- Organic animal management provides animals with **vitamins, trace elements** and **supplements** only from natural sources unless they are not available in sufficient quantity and/or quality (Main objectives and detailed requirements of the COROS, IFOAM NORMS 2014).

[Japan Agricultural Standard \(JAS\) for Organic Production](#)

- Feed additives (excluding antibiotics and those produced by using recombinant DNA technology), which are natural substances or substances derived from natural sources that have

not undergone any chemical treatment. In the cases where it is difficult to obtain such feed additives, similar feed additives (similar to the relevant feed additives) may be used only for the purpose of **supplementing the nutrients** and other active ingredients of feed (Production Methods, JAS 1607 Organic Feed).

- Such natural substances or feeds derived from natural substances (that have not undergone chemical treatment), which are intended for **vitamin or mineral supplementation**. In case it's difficult to obtain such feed, feed additives intended for **mineral supplementation** may be fed (Feeding, JAS 1608 Organic Livestock Products).
- **Vitamins, minerals**, veterinary biological drugs, or any veterinary medicinal products other than parasiticides, should be used only for the therapeutic treatment of livestock or poultry (Health management, JAS 1608 Organic Livestock Products).

Human Health and Environmental Issues

The potential exists for environmental contamination resulting from the industrial production of several vitamin compounds. In particular, materials safety data sheets (MSDS) for several feedstock chemicals and other chemical reagents used in the synthesis of calcium pantothenate (vitamin B5) and biotin (vitamin B7) indicate the potential for ecological damage if accidentally released into the environment. Isobutyraldehyde and cyanide salts used in the synthesis of calcium pantothenate as well as ethylene oxide used for choline chloride generation have shown toxicity toward fish and aquatic invertebrates. Further, hydrogen sulfide, which is used in the synthesis of biotin, is toxic to fish at low doses, and is therefore listed as very toxic to aquatic life. Strong acids (e.g., nitric acid, hydrochloric acid) used in the syntheses of numerous vitamins may alter the pH of aquatic systems if accidentally released to the environment. Strong acids and bases are also utilized in the extraction of tocopherols from vegetable oils and may lead to environmental impairment if accidentally released or improperly handled. Many of the vitamins synthesized for supplements and feed fortification are derived from petroleum products or genetically modified crop materials [2015 TR, lines 897-909]. Despite the potential for some vitamin compounds to pose some environmental harm during manufacture, their use in livestock agriculture is targeted and minimal. In the case of injectable nutritive supplements, the potential for these products to cause environmental harm is negligible.

Discussion

There can be times of stress when certain individual animals need high amounts of vitamins and minerals delivered to target tissues in a rapid manner. If for whatever reason animals are not eating, then they are not taking in the oral forms of vitamins and minerals, and they may need nutritive supplementation best delivered by injection. Additionally, with the prohibition of the use of antibiotics in certified organic livestock, farmers and veterinarians need as many of the remaining tools as possible to prioritize animal health. Injectable forms of vitamins and minerals, allowed strictly on an as-needed basis, provide valuable support to an animal's immune system and work to assist livestock health, well-being, and animal welfare.

The Livestock Subcommittee commissioned a limited scope TR in 2026 to support the 2028 sunset review of this substance. In this TR the LS requested information about formulations unique to the injectable supplements, acknowledging that many of the same compounds are allowed to be consumed orally by livestock as either “electrolytes” or “nutritive vitamins and minerals.” The biggest distinction drawn between injectable forms of these substances versus the orally consumed ones is oversight. When formulated into an injectable, FDA provides oversight, and these substances must be used in accordance with laws governing livestock drugs. Similarly, as these injectables are considered livestock drugs, excipients allowed at 7 CFR 205.603(f) may be used as part of the formulations. Despite these

differences with electrolytes and nutritive vitamins and minerals, the TR revealed no new information warranting removal from the national list or further restriction on use.

NOSB heard and read comments from stakeholders regarding the continued need to have the injectable nutritive supplements listing on the National List. While there appears to be some redundancy with other listings (e.g., electrolytes, calcium borogluconate, calcium propionate), producers and producer groups expressed that clarity around allowance for these substances outweighs any potential downfall from redundancy, as these substances are used in high consequence situations when animals health is in jeopardy. The fact that this group of substances undergoes more regulatory scrutiny as an injectable than the orally administered versions of the same substances gives more confidence in the need to renew this listing.

Questions to our Stakeholders

Do the current restrictions on injectable nutritive supplements pose any challenges to producers in accessing the therapies they need to treat their livestock?

Justification for Vote

The Subcommittee finds nutritive supplements **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove nutritive supplements from the National List

Motioned by: Nate Lewis

Seconded by: Corie Pierce

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Propylene glycol

Reference: § 205.603 (a)(27) Propylene glycol (CAS #57-55-6) - only for treatment of ketosis in ruminants.

Technical Report: [2007 TAP](#); [2021 TR](#)

Petition(s): [2002](#)

Past NOSB Actions: [2002 Position Paper](#); [09/2002 recommendation to add to NL](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Propylene glycol is allowed for use in organic production only as a treatment for ketosis in ruminants [21 CFR 205.603(a)(27)]. Propylene glycol is typically administered in an oral drench to animals showing signs of clinical ketosis or to animals that a producer suspects of having subclinical ketosis. Propylene glycol is generally recognized as safe (GRAS) by the U.S. FDA (21 CFR 184.1666) [2021 TR, lines 71-73, 92].

Ketosis is a metabolic disease that can result from energy imbalance in early lactation. According to the most recent technical report, the majority of a dose of propylene glycol is not fermented in the rumen. Instead, it is directly absorbed and metabolized by the liver to form glucose [2021 TR, lines 82-84].

Manufacture

Propylene glycol is commercially produced through the hydrolysis of propylene oxide. The original source of the propylene oxide is typically propylene, generated either through the steam cracking of hydrocarbons or through the dehydrogenation of propane, both of which are non-renewable sources [2021 TR, lines 41-44].

The 2021 technical report notes that researchers and manufacturers are improving methods to produce propylene glycol on a commercially viable scale via two additional routes:

- Catalytic hydrogenolysis of glycerol, a method that is becoming more economically feasible with the increased production of glycerol through biomass-produced ethanol.
- Microbial fermentation through a number of different microorganisms.

Many of the fermentation methods in development rely on genetically modified microorganisms for the efficient production of propylene glycol [2021 TR, lines 46-52, 358-359].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- Botanical preparations, such as atropine, butorphanol and other medicines from herbaceous plants shall be used according to label specifications. Substances containing petroleum-derived formulants, such as **propylene glycol**, shall not be fed to livestock (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).
- **Propylene glycol** may only be used as an ingredient in foot baths (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Propylene glycol** is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Propylene glycol** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Propylene glycol** is not explicitly mentioned in the regulations.

Japan Agricultural Standard (JAS) for Organic Production

- **Propylene glycol** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

The technical report on propylene glycol notes that the substance is widely used throughout many U.S. and global economic sectors, with most of the production capacity through propane as part of the petrochemical reduction process. Production of propane can lead to significant environmental impacts, including greenhouse gas emissions, pollution of waterways, water use issues, and petrochemical spills [2021 TR, lines 507-511].

In the treatment of ketosis, propylene glycol is used in small volumes and is virtually non-toxic to vertebrates and invertebrates (with the exception of cats). Its use on organic dairy farms presents a very low risk for environmental contamination. Beyond mishandling or leakage from packages, less than 1 percent of the propylene glycol used in a dose is excreted in milk, manure, or urine when used to treat ketosis. Contamination resulting from on-farm use is likely to be minimal [2021 TR, lines 519-524].

Based on currently available information, propylene glycol is:

- Not acutely toxic and it has a high lethal concentration in both mammals and aquatic species.
- Readily decomposed into carbon dioxide and water by microorganisms in water and soil, and breaks down in air through reaction with hydroxyl radicals.
- Able to move rapidly through the environment with water and shows little to no bioaccumulation.
- Efficiently retained and consumed as energy for animals so that it will not be applied to soils through manure incorporation [2021 TR, lines 612-618].

Discussion

Propylene glycol was added to the National List following NOSB recommendations made between 2000–2016, with final rulemaking completed in 2018.

The 2021 NOSB review included comments from stakeholders who were largely supportive of continued listing. Commenters noted that propylene glycol is a practical and safer alternative to intravenous dextrose for treating ketosis, especially since ketotic cows can be difficult to handle. Dairy producers acknowledged natural options such as apple cider vinegar and molasses but emphasized that propylene glycol remains the most effective and widely available treatment. A large-animal veterinarian described it as the “gold standard” for ketosis therapy. Additionally, one stakeholder noted that prior to the allowance of propylene glycol, farmers commonly used intravenous dextrose to treat ketosis—an approach that is both less effective and dangerous for cows and farmers. IV dextrose can cause extreme blood sugar spikes, lead to abscesses if not administered correctly, and is difficult to give because ketotic cows may become aggressive. In contrast, propylene glycol provides a far safer and easier method for rehabilitating ruminants suffering from ketosis.

Use of propylene glycol is restricted by 7 CFR 205.238(c)(2), which prohibits administering drugs in the absence of illness, thereby limiting use to animals showing ketosis symptoms.

The 2021 TR noted that while emerging fermentation methods could reduce reliance on petrochemical sources, many rely on genetically modified microorganisms and are not yet commercially viable. Despite concerns about manufacturing impacts and potential future use of excluded methods, the Subcommittee determined that propylene glycol provides necessary, limited-use medical treatment for ketosis and recommends relisting.

The Board heard widespread support for the renewal of propylene glycol on the National List. No new information was received regarding the potential for excluded methods to be used in its manufacture.

Questions to our Stakeholders

1. Do stakeholders have concerns about excluded methods in the manufacture of propylene glycol, or should additional clarification or annotation be considered to ensure continued compliance with organic standards?

Justification for Vote

The Subcommittee finds propylene glycol **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove propylene glycol from the National List

Motioned by: Nate Lewis

Seconded by: Corie Pierce

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Sodium chlorite, acidified

Reference: § 205.603 (a)(28) Sodium chlorite, acidified – allowed for use on organic livestock as a teat dip treatment only; and

§ 205.603 (b)(9) Sodium chlorite, acidified – allowed for use on organic livestock as a teat dip treatment only.

Technical Report: [2013 TR](#); 2025 TR (Chlorine Materials - pending post)

Petition(s): [2012](#); [2014 Addendum #1](#); [2014 Addendum #2](#)

Past NOSB Actions: [04/2015 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Acidified sodium chlorite is used as a disinfecting teat dip for organic livestock producers both as a pre- and post-milking application/treatment [2025 TR, lines 347-348]. Acidified sodium chlorite breaks down in the environment to water and salt and is more benign than other teat dip materials currently listed on the National List.

Manufacture

Acidified sodium chlorite solutions are made by mixing an aqueous solution of sodium chlorite with a food-grade acid, such as citric acid. Several industrial synthetic procedures are utilized in the production of sodium chlorite. As examples, the treatment of chlorine dioxide, sodium hydroxide, and a reducing agent (e.g., sodium sulfite) or reaction of chlorine dioxide with sodium peroxide (i.e., Na₂O₂ or an alkaline solution of hydrogen peroxide, H₂O₂) are commercially utilized methods for the synthesis of sodium chlorite. Generally recognized as safe (GRAS) acids, such as citric and lactic acids, are typically produced through fermentative means; however, these naturally occurring compounds may also be extracted from plant-based sources or generated using chemical synthetic methods [2013 TR, lines 47-54].

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- **Acidified sodium chlorite** is not explicitly mentioned in the regulations.

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- **Acidified sodium chlorite** is not explicitly mentioned in the regulations.

[CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods \(CXG 32-1999\)](#)

- **Acidified sodium chlorite** is not explicitly mentioned in the regulations.

[International Federation of Organic Agriculture Movements \(IFOAM\) Norms](#)

- **Acidified sodium chlorite** is not explicitly mentioned in the regulations.

[Japan Agricultural Standard \(JAS\) for Organic Production](#)

- **Acidified sodium chlorite** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

While the manufacture and use of acidified sodium chlorite solutions have resulted in releases to the environment, the risk of environmental contamination from released acidified sodium chlorite is minimal. Certain manufacturing facilities have reported releases of chlorine dioxide, a portion of which was generated through reaction of chlorite with a strong acid, to air, water, and soil. Strong acids (e.g., hydrochloric acid) and bases (sodium hydroxide) are used in the commercial production of sodium chlorite, and their release due to improper handling/disposal could lead to serious environmental impairments. Likewise, the release of strong oxidizing agents in large quantities may lead to ecotoxicity in both terrestrial and aquatic environments. This is true of both the chemical feedstocks (e.g., hydrogen peroxide) used in the manufacture of acidified sodium chlorite precursors and the chemicals in acidified sodium chlorite solutions (i.e., chlorous acid, chlorine dioxide, chlorite). Regarding the former, several lower reactivity sulfur-containing and carbonaceous substances have been evaluated for the conversion of chlorine dioxide to sodium chlorite [2013 TR, lines 359-369].

Discussion

Acidified sodium chlorite was among 35 NOSB recommendations on amendments to the National List made between November 2000 and November 2016 that were acted upon in a final rule published in December 2018.

Preventive health care is an essential part of organic farming, and mastitis prevention through clean milking parlors and clean animals is always of paramount importance on a dairy farm. Organic farmers cannot use antibiotics and thus the use of pre-milking and post-milking teat dips is a normal practice and may be the most critical factor in preventing mastitis. Acidified sodium chlorite satisfies the criteria related to impact on humans and the environment and is compatible with organic agriculture. Iodine is widely used in teat dips. The previous sunset review of acidified sodium chlorite relied on a technical report (TR) on iodine, received on January 7, 2015. This technical report provided the most up to date research information and comparative data on iodine-based teat dips and on teat dips whose primary ingredient is acidified sodium chlorite. The following is excerpted from the iodine TR in its discussion of alternatives to iodine in teat dips: “Information regarding the availability of natural, non-synthetic agricultural commodities or products that could substitute for iodine and iodophor disinfectants is limited.” Acidified sodium chlorite thus appears to be a potentially important ingredient in teat dips. Iodine’s efficacy as a post-milking teat disinfectant is comparable to acidified sodium chlorite [2025 TR, lines 1666-1667].

Public comments during the 2021 spring meeting were supportive of relisting sodium chlorite, acidified (ASC) as an approved teat dip for livestock. It was stated a few times that it is not used frequently but

key when necessary to prevent mastitis. During the NOSB Review, there was discussion about the two listings at § 205.603(a) and § 205.603(b), and whether they were redundant. The listings are not redundant. At § 205.603(a) sodium chlorite is allowed as a pre-milking sanitizer while at § 205.603(b) it is used for post-milking as a preventative topical treatment.

A 2012 study compared treatments of beef infected with fecal slurry pathogen cocktail containing *E. coli* O157:H7, *Salmonella typhimurium*, *Campylobacter coli*, and *Campylobacter jejuni* with a number of productions including: acidified sodium chlorite, sodium hypochlorite, chlorine dioxide, peroxyacetic acid, ozone gas, acetic acid, citric acid, lactic acid and a control experiment consisting of plain water rinse [2025 TR, lines 1580-1593]. The organic acid rinses effectively reduced bacterial loads in beef comparable to treatment with chlorine compounds. Lactic acid applied with hand-held equipment at a 2% solution was the most effective treatment as a carcass rinse for beef. The 2025 technical report on chlorine materials cites other studies that cover the relative performance of chlorine materials and alternative materials as disinfectants.

In its Spring 2026 public comment submitted to the NOSB, a human and environmental health advocacy organization asked the board to commission a Technical Report that (a) determines what disinfectants/sanitizer uses are required by law and (b) comprehensively examines more organically-compatible methods and materials to determine whether chlorine-based materials are actually needed for any uses. The commenting organization stated that if there are uses for which chlorine is necessary, then the NOSB should include them in the National List and limit the use to those particular uses.

Questions to our Stakeholders

1. Is there any additional information/research data on the performance and cost-effectiveness of alternatives to chlorine materials?

Justification for Vote

The Subcommittee finds sodium chlorite, acidified **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove sodium chlorite, acidified from the National List

Motioned by: Franklin Quarcoo

Seconded by: Kathryn Deschenes

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Zinc sulfate

Reference: § 205.603 (b)(11) Zinc sulfate - for use in hoof and foot treatments only.

Technical Report: [2015 TR](#)

Petition(s): [2014](#)

Past NOSB Actions: [04/2015 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Zinc sulfate is allowed for use in organic livestock as a footbath for control of foot rot in livestock-- primarily dairy cattle, sheep, and goats.

Manufacture

Zinc sulfate is produced synthetically by combining zinc ash with aqueous sulfuric acid [2015 TR, line 53]. Zinc ash is produced from zinc ore mined from underground or open pit mines [2015 TR, line 60].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- **Zinc sulfate** is not explicitly mentioned in the regulations.

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Zinc sulphate** is not explicitly mentioned in the regulations; zinc sulphate heptahydrate and zinc sulphate monohydrate are permitted (Nutritional Additives, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Zinc sulfate** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Trace elements (e.g., boric acid; sodium borate; calcium borate; borethanolamin; cobalt-acetate; cobalt-sulphate; copper oxide; copper sulfate; copper hydroxide; copper silicate; copper carbonate; copper citrate; ferric oxide; ferric sulfate; ferrous sulfate; iron citrate; iron sulfate; iron tartrate; manganous oxide; manganese sulfate; manganese carbonate; selenic acid; selenous acid; sodium molybdate; molybdic oxide; zinc carbonate; zinc oxide; zinc silicate; and **zinc sulfate**) are permitted as calcareous and magnesium amendments of mineral origin with the following conditions for use: use restricted to cases where soil/plant nutrient deficiency is documented by soil or tissue testing or diagnosed by an independent expert. Micronutrients in either chloride or nitrate forms are prohibited. Micronutrients may not be used as a defoliant, herbicide, or desiccant (Appendix 2: Fertilizers and soil conditioners, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Zinc sulfate** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

Production of zinc sulfate results in significant local production of tailings in large volumes and lesser amounts of particulates, heavy metals, and gases, which can be filtered out or captured, but may not be depending on where the zinc is mined and processed. The amount of zinc sulfate used for foot rot control is a small proportion of its total use. However, its disposal on farm fields with manure can result in soil zinc buildups beyond desirable levels.

It should also be noted that the use of zinc sulfate should decrease the use of copper sulfate in treating foot diseases. The buildup of persistent copper in agricultural soils is a serious issue. While zinc sulfate can accumulate in soils, its persistence is less certain due to its weaker mode of attachment to soil particles. Zinc sulfate is therefore considered a more benign material compared to copper sulfate.

Excess applications of zinc sulfate could disrupt essential nutrient balances in soils and in extremes could become toxic to plants or animals. Zinc sulfate is toxic to fish and aquatic invertebrates. Direct application to water where these exist should be avoided.

Discussion

Copper sulfate and zinc sulfate are two of the most accepted treatments for foot rot and are comparable in efficacy. According to the 2015 TR:

“Peracetic acid and hydrogen peroxide foams are also used in the treatment and control of footrot, although the efficacy of these treatments is controversial (Bergstein et al., 2006). It is important to note that antibiotics are increasingly used in treatment of pododermatitis, due to the bacterial nature of its etiology. However, good evidence is available for increased microbial antibiotic resistance in *Dichelobacter nodosus* and other bacteria present during infection (Lorenzo, et al., 2012). Antibiotics are prohibited in organic livestock production (7CFR § 205.237, § 205.238). These same bacteria have not demonstrated resistance to zinc sulfate treatment.” [2015 TR lines 699-705]

“Some vaccines have been shown to be effective in treating footrot. Because several bacteria are involved in the infection and these are represented by multiple serogroups, the effectiveness of using a monovalent vaccine in treating another serogroup is likely to be limited. Programs are ongoing to address vaccination, but a complete vaccine has not yet been described for footrot in cattle or sheep (Bennett and Hickford, 2010).” [2015 TR lines 709-713]

Formalin can also be used for this purpose but is not approved for use on organic farms. Zinc sulfate has proven particularly effective at controlling the bacteria associated with foot rot, and is sometimes used in combination with other materials, including copper sulfate. The combination of zinc sulfate with sodium lauryl sulfate (as an excipient) has proven to be more effective than zinc sulfate with copper sulfate.

Copper compounds are toxic to sheep and goats, so the presence of zinc sulfate on the National List allows for its use for these species as an alternative to copper sulfate.

Comments from stakeholders during the last sunset review were strongly in favor of retaining zinc sulfate on the national list as an approved synthetic material. Some proposed adding an annotation specifying that its use be curtailed if soil zinc levels become excessive. Zinc sulfate is considered less environmentally damaging than copper sulfate, which is on the National List for the same use. Since zinc sulfate has only been on the National List for a short time, it is not clear whether its presence there has reduced the use of copper sulfate for hoof disease.

NOSB heard comments indicating that producers are rotating between zinc sulfate and copper sulfate to treat hoof conditions in organic livestock. There were no quantitative comments suggesting that zinc sulfate’s allowance is directly leading to a reduction in copper sulfate use, however, it does remain clear that this substance is an effective alternative to copper sulfate as a hoof treatment and it should remain allowed in organic livestock production.

Questions for stakeholders

1. Are livestock producers using less copper sulfate by substituting zinc sulfate for foot rot management?

Justification for Vote

The Subcommittee finds zinc sulfate **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove zinc sulfate from the National List

Motioned by: Nate Lewis

Seconded by: Cat McCluskey

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

National Organic Standards Board (NOSB)
Handling Subcommittee (HS)
Agar-Agar Reclassification Discussion Document
Fall 2026

Summary of Issue

Agar-agar is currently listed at 7 CFR 205.605(a) as an allowed nonsynthetic substance for use in organic handling. However, the 2025 TR concluded that the most widely used form of agar-agar is synthetic because it is alkali extracted. To resolve confusion and ensure consistency in use of this material, the Handling Subcommittee is considering adding synthetic agar-agar at § 205.605(b). This change would align the regulations with current practice.

Background

In 2011, the Handling Subcommittee voted unanimously to add agar-agar to the list of allowed synthetics at § 205.605(b), while retaining the nonsynthetic listing at § 205.605(a). However, based on public comments, the Subcommittee ultimately determined that the classification determination should be made after the NOP Guidance 5033-1, Decision Tree for Classification of Materials as Synthetic or Nonsynthetic, was finalized. That Guidance has been completed, and the 2025 TR concludes that the most widely used form of agar-agar – alkali-extracted – is synthetic [2025 TR, line 472].

Agar-agar is a mixture of polysaccharides derived from the cell walls of red algae (seaweed) that live in marine environments, mainly from the cultivated genus *Gracilaria*. The amount and composition of agar-agar produced is highly variable within and across individuals, species, locations, and time of year [2025 TR, lines 169-170]. Specific manufacturing processes are generally confidential.

Algae are cultivated on floating rafts, bottom cultivation or in tanks or ponds. Algae that washes ashore may also be gathered. Algae are harvested, washed, and dried by sun or in ovens.

Prior to extraction, the *Gracilaria* species are usually subjected to alkaline pretreatment (heated in a sodium hydroxide solution); others may receive mild acidic pretreatments. Alkaline pretreatment is used to bring about a chemical change in the polysaccharides that produce agar-agar with increased gel strength. Without this pretreatment, the gels extracted from *Gracilaria* species would be too weak for most commercial production [2025 TR, lines 138-142]. Other algal species (*Gelidium* and *Pterocladia*) have a more active natural process that results in higher gel strength and lower gelling temperatures, but these species are much more difficult to cultivate; demand for the agar-agar from these species is high for use in pharmacology and microbiology applications, and shortages have occurred [2025 TR, lines 146-151].

After pretreatment, the agar-agar is extracted with boiling or hot water, followed by filtration. Water is removed from the gel through a freeze-thaw process or by mechanical pressure. The gel is then dried with hot air and may be shredded or milled, resulting in a finished product of flakes, strips, or powder.

Discussion

There appears to be general consensus that the agar-agar currently in use by many organic processors is classified as “synthetic.” In the sunset review process for agar-agar, the NOSB has repeatedly determined that agar-agar produced from *Gracilaria* through the alkaline process meets the criteria in 7 USC 6517(c)(1). In addition, this material meets the criteria for synthetic processing aids and adjuvants in 7 CFR 205.600(b). For accuracy, if its use should continue, it should be listed at § 205.605(b). Comments that informed the Spring 2026 NOSB meeting indicated that agar-agar is in use, is necessary, and there does not appear to be

adequate supply of the nonsynthetic version to meet the needs of organic producers. Accordingly, based on current practice and need, it appears appropriate to add agar-agar to § 205.605(b), while retaining the current listing at § 205.605(a).

Questions for Stakeholders

None

Subcommittee Vote:

Motion to accept the discussion document on 1) classifying agar-agar produced using a synthetic pretreatment that brings about a chemical change in the polysaccharides as synthetic, and 2) adding agar-agar to 7 CFR 205.605(b).

Motioned by: Allison Johnson

Seconded by: Amanda Felder

Yes: 4 No: 0 Abstain: 0 Recuse: 0 Absent: 0

Sunset 2028
Meeting 2 - Review
Handling Substances § 205.605(a), § 205.605(b)
Fall 2026

Introduction

As part of the [Sunset Process](#), the National Organic Program (NOP) announces substances on the National List of Allowed and Prohibited Substances (National List) that are coming up for sunset review by the National Organic Standard Board (NOSB). The following list announces substances that must be reviewed by the NOSB and renewed by the USDA before their sunset dates. This document provides the substance's current status on the National List, annotation, references to past technical reports, past NOSB actions, and regulatory history, as applicable. If a new technical report has been requested for a substance, it is noted in this list. Substances included in this document may also be viewed in the NOP's [Petitioned Substances Index](#).

Request for Comments

Written comments should be submitted via Regulations.gov at www.regulations.gov during the comment period as explained in the meeting notice published in the Federal Register.

Public comments are necessary to guide the NOSB's review of each substance against the criteria in the Organic Foods Production Act ([7 U.S.C. 6518\(m\)](#)) and the USDA organic regulations ([7 CFR 205.600](#)). The current substances on the National List were originally recommended by the NOSB based on evidence available to the NOSB at the time of their last review, which demonstrated that the substances were: (1) not harmful to human health or the environment, (2) necessary because of the unavailability of wholly nonsynthetic alternatives, and (3) consistent and compatible with organic practices.

Public comments should clearly indicate the commentor's position on the allowance or prohibition of substances on the National List and explain the reasons for the position. Public comments should focus on providing relevant new information about a substance since its last NOSB review. Such information could include research or data that may support a change in the NOSB's determination for a substance (e.g., scientific, environmental, manufacturing, industry impact information, etc.). Public comment should also address the continuing need for a substance or whether the substance is no longer needed or in demand.

For Comments that Support the Continued Use of §205.605(a), §205.605(b), and/or §205.606 Substances in Organic Production:

If you provide comments supporting the allowance of a substance at §205.605(a), §205.605(b), and/or §205.606, you should provide information demonstrating that the substance is:

1. not harmful to human health or the environment;
2. necessary to the production of the agricultural products because of the unavailability of wholly nonsynthetic substitute products; and
3. consistent with organic handling.

For Comments that Do Not Support the Continued Use of §205.605(a), §205.605(b), and/or §205.606 Substances in Organic Production:

If you provide comments that do not support a substance on §205.605(a), §205.605(b), and/or §205.606, you should provide reasons why the use of the substance should no longer be allowed in organic production. Specifically, comments that support the removal of a substance from the National List should provide new information since its last NOSB review to demonstrate that the substance is:

1. harmful to human health or the environment;

2. unnecessary because of the availability of alternatives; and
3. inconsistent with organic handling.

For Comments Addressing the Availability of Alternatives:

Comments may include information about the viability of alternatives for a substance under sunset review. Viable alternatives include, but are not limited to:

- Alternative management practices that would eliminate the need for the specific substance;
- Other currently exempted substances that are on the National List, which could eliminate the need for this specific substance; and
- Other organic or nonorganic agricultural substances.

For Comments on Nonorganic Agricultural Substances at Section §205.606:

For nonorganic agricultural substances on section §205.606, the NOSB Handling Subcommittee requests current industry information regarding availability of and history of unavailability of an organic form of the substance in the appropriate form, quality, or quantity of the substance. The NOSB Handling Subcommittee would like to know if there is a change in supply of organic forms of the substance or demand for the substance (i.e. is an allowance for the nonorganic form still needed), as well as any new information about alternative substances that the NOSB did not previously consider.

Your comments should address whether any alternatives have a function and effect equivalent to or better than the allowed substance, and whether you want the substance to be allowed or removed from the National List. Assertions about alternative substances, except for those alternatives that already appear on the National List, should, if possible, include the name and address of the manufacturer of the alternative. Further, your comments should include a copy or the specific source of any supportive literature, which could include: product or practice descriptions, performance and test data, reference standards, names and addresses of organic operations who have used the alternative under similar conditions and the date of use, and an itemized comparison of the function and effect of the proposed alternative(s) with substance under review.

Written public comments will be accepted via www.regulations.gov during the open comment period noted in the Federal Register. Comments received after that date may not be reviewed by the NOSB before the meeting.

§ 205.605(a) Sunsets: Nonagricultural (Nonorganic) substances allowed as ingredients in or on processed products labeled as “organic” or “made with organic (specified ingredients or food group(s)).”:

- [Agar-agar](#)
- [Animal enzymes](#)
- [Calcium sulfate-mined](#)
- [Carrageenan](#)
- [Glucono delta-lactone](#)
- [Tartaric acid](#)

§ 205.605(b) Sunsets: Nonagricultural (Nonorganic) substances allowed as ingredients in or on processed products labeled as “organic” or “made with organic (specified ingredients or food group(s)).”:

[Cellulose](#)

- Chlorine materials

- [\(i\) Calcium hypochlorite](#)
 - [\(ii\) Chlorine dioxide](#)
 - [\(iii\) Hypochlorous acid—generated from electrolyzed water](#)
 - [\(iv\) Sodium hypochlorite](#)
- [Potassium hydroxide](#)
- [Potassium lactate](#)
- [Silicon dioxide](#)
- [Sodium lactate](#)

§ 205.606 Nonorganically produced agricultural products allowed as ingredients in or on processed products labeled as “organic.”

- None

Agar-agar

Reference: § 205.605(a)(2)

Technical Report: [1995 TAP](#); [2011 TR](#); [2025 TR](#)

Petition(s): N/A

Past NOSB Actions: [04/1995 NOSB minutes and vote](#); [11/2007 recommendation](#); [05/2012 recommendation](#); [11/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: National List amended 10/31/2003 ([68 FR 61987](#)); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Agar-agar has been used as a food additive for over 350 years. Current uses in food include stabilizer, thickener, gelling agent, texturizer, moisturizer, emulsifier, flavor enhancer, and absorbent. Agar-agar can be found in bakery products, confections, jellies and jams, dairy products, canned meat and fish products, and vegetarian meat substitutes. A useful characteristic of agar-agar is its ability to withstand high temperatures. Since agar-agar is practically tasteless and does not require the addition of cations to form gels, it doesn't interfere with taste profiles. Agar-agar can be used in foods in combination with other thickening or gelling agents. Agar-agar is classified as generally recognized as safe (GRAS) by the FDA.

Manufacture

Agar-agar is a mixture of polysaccharides derived from the cell walls of red algae (seaweed) that live in marine environments, mainly from the cultivated genus *Gracilaria*. The amount and composition of agar-agar produced is highly variable within and across individuals, species, locations, and time of year [2025 TR, lines 169-170]. Specific manufacturing processes are generally confidential.

Algae are cultivated on floating rafts, bottom cultivation or in tanks or ponds. Algae that washes ashore may also be gathered. Algae are harvested, washed, and dried by sun or in ovens.

Prior to extraction, the *Gracilaria* species are usually subjected to alkaline pretreatment (heated in a sodium hydroxide solution); others may receive mild acidic pretreatments. Alkaline pretreatment is used to bring about a chemical change in the polysaccharides that produce agar-agar with increased gel strength. Without this pretreatment, the gels extracted from *Gracilaria* species would be too weak for most commercial production [2025 TR, lines 138-142]. Other algal species (*Gelidium* and *Pterocladia*) have a more active natural process that results in higher gel strength and lower gelling temperatures, but these species are much more difficult to cultivate; demand for the agar-agar from these species is high for use in pharmacology and microbiology applications, and shortages have occurred [2025 TR, lines 146-151].

After pretreatment, the agar-agar is extracted with boiling or hot water, followed by filtration. Water is removed from the gel through a freeze-thaw process or by mechanical pressure. The gel is then dried with hot air and may be shredded or milled, resulting in a finished product of flakes, strips, or powder.

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- **Agar** is permitted as a soil amendment for use in initial mushroom spawn production (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- **Agar** is permitted. See Table 6.3 Extraction solvents and precipitation aids (Table 6.3 - Ingredients classified as food additives, CAN/CGSB-32.311-2020).
- Microorganisms are permitted. Microbial preparations may contain substrates derived from agricultural or biological substances such as milk, lactose, soy, **agar**, etc. May also contain permitted carriers (see Table 6.3 & 6.4 Carriers). Includes starter and dairy cultures and other preparations of microorganisms normally used in product processing (Table 6.4 - Ingredients not classified as food additives, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Agar** is permitted in products of plant origin, milk-based products, and meat products (Section A1 – Food Additives including carriers, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Agar** is permitted in food of plant origin, although exclusions of the GSFA still apply. **Agar** is permitted in food of animal origin, although exclusions of the GSFA still apply (Table 3 - Ingredients of Non-Agricultural Origin, CXG 32-1999).

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Agar** is permitted as an additive (Appendix 4, Table 1: List of approved additives and processing/postharvest handling aids, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Agar-agar** is not explicitly mentioned in the regulations.

Ancillary Substances

According to EU regulations, gel strength may be standardized by the addition of dextrose and maltodextrin or sucrose. Various materials may be used in the production process, but these steps are all followed by washing [2025 TR, 485-488]. After filtering of the crude gel, researchers mention the possible use of bleach or amylase, or precipitation with isopropanol, to remove algal residue [2025 TR, lines 490-491].

Human Health and Environmental Issues

Industrial agar-agar production requires large quantities of both alkali materials for pretreatment and energy to sustain high temperatures for several hours [2025 TR, lines 295-296]. The typical process takes 2-4 hours for extraction, consumes energy and water (15-20 times the weight of dry algae used, not including washing or freeze-thawing), and generates waste [2025 TR, lines 296-300]. These materials are costly in terms of waste disposal and exposure to employees and the environment.

Discussion

In 2011, the Handling Subcommittee voted unanimously to add agar-agar at § 205.605(b) of the National List of allowed synthetics, while retaining the nonsynthetic listing at § 205.605(a). However, based on public comments, the Subcommittee ultimately determined that the classification determination should be made after the Guidance document NOP 5033-1, Decision Tree for Classification of Materials as

Synthetic or Nonsynthetic, was finalized. That Guidance has been completed, and the 2025 TR concludes that the most widely used form of agar-agar – alkali-extracted – is synthetic [2025 TR, line 472].

Given that current uses likely include synthetic agar-agar, the Handling Subcommittee is considering recommending the addition of synthetic agar-agar to the National List, while retaining the nonsynthetic listing as well, to align the regulation with practice. In preparation for the Spring 2026 NOSB meeting, the Subcommittee asked stakeholders what form(s) of agar-agar are currently in use (synthetic v. nonsynthetic) and whether the material is commonly used in organic production.

Commenters noted that there are flaws in the Guidance NOP 5033-1 Decision Tree used to determine synthetic/nonsynthetic status and highlighted that there is a nonsynthetic process available. Commenters raised concerns about the environmental harms of seaweed production on aquatic environments, and one commenter stated that the version made from *Gracilaria* is synthetic and should be removed because of ecological impacts.

Commenters recommended aligning this listing with the [2020 NOSB recommendation](#) on protecting marine ecosystems from harvest damage, which proposed adding the following annotation to the crop input marine microalgae listing:

Prohibited harvest areas: established conservation areas under federal, state, or local ownership, public or private, including parks, preserves, sanctuaries, refuges, or areas identified as important or high value habitats at the state or federal level. Prohibited harvest methods: bottom trawling and harvest practices that prevent reproduction and diminish the regeneration of natural populations. Harvest practices should ensure that sufficient propagules, holdfasts, and reproductive structures are available to maintain the abundance and size structure of the population and its ecosystem functions. Harvest timing: repeat harvest is prohibited until biomass and architecture (density and height) of the targeted species approaches the biomass and architecture of undisturbed natural stands of the targeted species in that area. Bycatch: must be monitored and prevented, or eliminated in the case of special status species protected by U.S. Fish and Wildlife Service or National Marine Fisheries Service.

The National Organic Program has previously stated that it does not plan to act on that recommendation.

Several certifiers stated that they certify operations that use agar-agar, and several others do not. One certifier noted that although they do not currently have clients using this substance, they have in the past and support keeping it available. One certifier noted that the Accredited Certifiers Association best practices advise that agar-agar as low risk and does not require active verification of nonsynthetic status.

Commenters noted that there are alternatives to agar-agar, including pectin and gums. However, a trade association noted that agar-agar has several unique qualities, including being less temperature sensitive than other alternatives, so it is useful for gels that remain firm at room temperature, and that being from seaweed allows for its use in foods that are halal, kosher, and vegan. That commenter also stated that there are not sufficient quantities of the nonsynthetic version available.

Questions to our Stakeholders

None

Justification for Vote

The Subcommittee finds agar-agar **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove agar-agar from the National List

Motioned by: Allison Johnson

Seconded by: Andrea Hatziyannis

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Animal enzymes

Reference: § 205.605(a)(3) Animal enzymes - (Rennet - animals derived; Catalase - bovine liver; Animal lipase; Pancreatin; Pepsin; and Trypsin).

Technical Report: [2000 TAP](#); [2011 TR](#); [2015 Limited Scope TR \(ancillary substances in enzymes\)](#)

Petition(s): N/A

Past NOSB Actions: [11/2000 meeting minutes and vote](#); [11/2007 recommendation](#); [12/2011 recommendation](#); [11/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: National List amended 11/03/2003 ([68 FR 62215](#)); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Enzymes are naturally occurring proteins that act as highly efficient catalysts in biochemical reactions. They are used to carry out naturally occurring biological processes that are useful in the processing of food products or ingredients [2011 TR, lines 140-142]. Animal enzymes, such as rennet, are used as a coagulant to curdle milk to be made into cheese or sour cream. Enzymes are used in very small amounts to achieve the desired effect.

Manufacture

Traditionally, the fourth stomach of calves or goat kids is dried, cleaned, and then sliced into pieces, before being stored in either whey or saltwater. Vinegar or wine can be added to lower the pH. After allowing the solution to sit for a few days, it is filtered repeatedly. A small amount of boric acid is added to the filtrate. In industrial production, the stomach is minced, and the pH adjusted by adding hydrochloric acid and sodium phosphate [2011 TR, lines 444-458].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- Enzymes are permitted as soil amendments and as production aids. Derived from plants, **animals** or microorganisms through the action of microorganisms are permitted (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- Enzymes are permitted. Derived from plants, **animals** or microorganisms. Examples include, but are not limited to, bromelain, **bovine liver catalase**, ficin, **animal lipase**, malt, **pancreatin**, **pepsin**, **trypsin**, proteases and carbohydrases. **Animal-derived enzymes** shall be free of Specified Risk Material (SRM). This annotation will be reviewed at the next revision of the standard (Table 5.2 - Feed, feed additives and feed supplements, CAN/CGSB-32.311-2020).

- The following sources of enzymes are permitted: a) any preparations of enzymes normally used in food processing derived from edible, non-toxic plants, non-pathogenic fungi or non-pathogenic bacteria; b) **derived from animals**—shall be organic if commercially available: **rennet; catalase from bovine liver; animal lipase; pancreatin; pepsin; and trypsin**. Animal-derived enzymes shall be free of Specified Risk Material (SRM); and c) egg white lysozyme (Table 6.3 - Ingredients classified as food additives, CAN/CGSB-32.311-2020).
- The following sources of enzymes are permitted: a) any preparations of enzymes normally used in food processing derived from edible, non-toxic plants, non-pathogenic fungi or non-pathogenic bacteria; b) **animal-derived**—shall be organic if commercially available: **rennet; catalase from bovine liver; animal lipase; pancreatin; pepsin; and trypsin**. **Animal-derived enzymes** shall be free of Specified Risk Material (SRM); c) egg white lysozyme (Table 6.5 - Processing aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- In the processing of food, the following products and substances may be used: (a) preparations of micro-organisms and **food enzymes** normally used in food processing, provided that food enzymes to be used as food additives have been authorised pursuant to Article 24 for use in organic production (Processed food production rules, EC No. 2018/848).
- For the purposes of point (a) of Article 24(2) of Regulation (EU) 2018/848, only the products and substances listed in Part A of Annex V to this Regulation may be used as food additives, including **food enzymes** to be used as food additives, and processing aids in the production of processed organic food, provided that their use is in accordance with the relevant provisions of Union law, in particular Regulation (EC) No 1333/2008 of the European Parliament and of the Council and, where applicable, in accordance with national provisions based on Union law (Food additives and processing aids, EC No. 2021/1165).
- **Enzymes** and micro-organisms are permitted silage additives, only authorised to ensure adequate fermentation (Authorised feed additives and processing aids used in animal nutrition, EC No. 2021/1165).
- **Enzymes** and micro-organisms are permitted zootechnical additives (Authorised feed additives and processing aids used in animal nutrition, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- Specific criteria for additives and processing aids: a) binders, anti-caking agents, emulsifiers, stabilizers, thickeners, surfactants, coagulants: only natural sources are allowed; b) antioxidants: only natural sources are allowed; c) preservatives: only natural acids are allowed; d) colouring agents (including pigments), flavours and appetite stimulants: only natural sources are allowed; e) probiotics, **enzymes** and micro-organisms are allowed; f) antibiotics, coccidiostats, medicinal substances, growth promoters or any other substance intended to stimulate growth or production shall not be used in animal feeding (Livestock and livestock products: Nutrition, CXG 32-1999).
- Silage additives and processing aids may not be derived from genetically engineered/modified organisms or products thereof, and may be comprised of only: sea salt; coarse rock salt; yeasts; **enzymes**; whey; sugar; or sugar products such as molasses; honey; lactic, acetic, formic and propionic bacteria, or their natural acid product when the weather conditions do not allow for adequate fermentation, and with approval of the competent authority (Livestock and livestock products: Nutrition, CXG 32-1999).

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Fodder preservatives such as the following may be used: a. bacteria, fungi and **enzymes**; b. natural products of food industry; c. plant based products; d. vitamins and minerals subject to 5.5.6. (Animal Nutrition, IFOAM NORMS 2014).
- Preparations of micro-organisms and **enzymes** commonly used in food processing may be used, with the exception of genetically engineered microorganisms and their products. Cultures that are prepared or multiplied in-house shall comply with the requirements for the organic production of microorganisms (Ingredients, IFOAM NORMS 2014).
- Additives and processing aids from biological sources, such as fermentation cultures, **enzymes**, flavors, and gums must be derived from naturally occurring organisms by the use of biological, mechanical, and physical methods. Nonorganic forms are allowed in organic products only if there are no organic sources (Source and Manufacturing Process, IFOAM NORMS 2014).
- These may be used as ingredient or processing aids with approval from the control body: organic certified micro-organisms; preparations of micro-organisms; **enzymes and enzyme preparations** (Preparations of Micro-organisms and Enzymes for use in food processing, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Enzymes** are permitted (Table D.1 - Substances for preparation etc., JAS 1605 Organic Products of Plant Origin).
- **Enzymes** are permitted (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- **Enzymes** are permitted (Table B.1 - Additives for alcohol beverages, JAS 1606 Organic Processed Foods).
- **Enzymes** are permitted (Table A.1 - Substances used in the preparation etc., JAS 1607 Organic Feed).
- Any feeds other than those (feeds) listed below must not be given **enzymes** or microorganisms (excluding those that have been produced using recombinant DNA technology) (Feeding, JAS 1608 Organic Livestock Products).

Ancillary Substances

Enzyme products used in food processing may be single ingredient, stand-alone preparations of the enzyme, or formulated with other ingredients. In many cases the enzyme product which results from a fermentation process is not effective in food applications without further formulation. Enzyme preparations therefore commonly contain other substances, not only as incidental secondary metabolites and residual growth media from the enzyme production, but also intentionally added ingredients, which function as diluents, preservatives, stabilizers, antioxidants, etc. These additives must be generally recognized as safe (GRAS) or be FDA approved food additives for this use [2015 TR, lines 34-40].

To prevent the loss of enzyme activity, ancillary substances, such as stabilizers, are added. This is especially true for liquid enzyme preparations due to the destabilizing effect of water. Stabilizers are also used to combat the degradation of enzyme structures due to autolysis or proteolysis. To control microbial contamination of enzyme preparations, preservatives are added [2015 TR, lines 54-59]. The development of alternatives to preservatives (plant extracts, peptides, compounds from herbs and spices) is increasing but there are microbial resistance challenges and the need for continued research. Currently it is unknown if natural preservatives are being used in any enzyme formulations [2015 TR, lines 72-81].

Ancillary Substances by Food Additive Functional Class

Anti-caking & anti-stick agents	Magnesium stearate, calcium silicate, silicon dioxide, calcium stearate, magnesium silicate/talc, magnesium sulfate.
Carriers and fillers	Lactose, maltodextrins, sucrose, dextrose, potato starch, non-GMO soy oil, rice protein, grain (rice, wheat, corn, barley) flour, milk, autolyzed yeast, inulin, cornstarch, sucrose, glycerol, potassium chloride, ammonium sulfate, calcium phosphate, calcium acetate, calcium carbonate, calcium chloride, calcium sulfate, dextrin, dried glucose syrup, ethyl alcohol, glucose, glycol, lactic acid, maltose, mannitol, mineral oil, palm oil, purity gum (starch), saccharose, sorbitol, soy flour, sunflower oil, trehalose, vegetable oil, microcrystalline cellulose, propylene glycol, stearic acid, dicalcium phosphate.
Preservatives	Sodium benzoate, potassium sorbate, ascorbic acid, alpha (hops) extract, benzoic acids and their salts, calcium propionate, citric acid, potassium chloride, potassium phosphate, sodium acetate, sodium chloride, sodium propionate, sodium sulfate, sorbic acid and its salts, stearic acid, tannic acid, trisodium citrate, zinc sulfate.
Stabilizers	Maltodextrin, betaine (trimethylglycine), glucose, glycerol, sodium chloride, sodium phytate, sorbitol, sucrose.
pH control, buffers	Acetic acid, citric acid anhydrous, sodium citrate, sodium phosphate, trisodium citrate.

Human Health and Environmental Issues

Producing or using animal enzymes does not negatively impact biodiversity or the environment. Since only small quantities are used, and the enzymes break down naturally, their release poses no environmental threat.

Discussion

There are no direct substitutes for animal-derived enzymes; an enzyme must be replaced with another that performs the same function. For example, one replacement for animal-sourced rennet in cheese production is genetically engineered chymosin, though its use is not compatible with organic food standards because of the excluded methods involved in its creation [2011 TR, lines 809-812]. The 2000 TAP report indicated that animal enzymes could potentially be sourced from organic livestock. During the comment period for the 2021 Spring meeting, most participants supported keeping animal enzymes on the National List, highlighting the lack of organic animal enzymes, difficulties in establishing a consistent organic source, and cost concerns, with many noting that alternatives are insufficient for making certain varieties of cheese. Only one opposing comment called for further research into the necessity of catalase, animal lipase, pancreatin, pepsin, and trypsin.

Public comment received at the Spring 2026 meeting reflected broad support for continued listing. The input came primarily from accredited certifying agents reporting the extent of use among their certified operations and responding to the Subcommittee's questions, together with an organic policy coalition addressing sourcing. Reported use is modest and uneven across certifiers, and is purported to be obscured by the fact that many certifiers track "enzymes" generically and cannot readily separate animal-derived enzymes from microbial, fungal, or plant-derived ones. Where use was identifiable, rennet and animal lipase were clearly in active organic use—one certifier reported a single rennet product and four lipase inputs among its clients—while catalase, pancreatin, pepsin, and trypsin were not specifically identified in use this cycle, though generic tracking prevents a definitive per-enzyme conclusion. Consistent with prior reviews, the record indicates no available organic source and no direct organic-

compliant substitute; the policy coalition encouraged the Board to continue the search for organic animal enzymes and, if a source is not available, to identify the barriers and how to overcome them.

On the feasibility of producing animal enzymes from organic livestock, direct comment was limited, and no commenter identified a currently available organic source. Barriers identified across the comments and prior record include the absence of a consistent commercial organic source, cost, and the structural point that the finished enzyme is itself a non-certified processing input, which complicates any requirement that its source material be organic. On concerns regarding nonorganic source materials, a certifier observed that nonorganic sources may be used in producing various § 205.605 nonsynthetic materials and cautioned that requiring only organic source materials would create significant challenges—since the final product is not itself certified—and would raise an unresolved question of whether ancillary ingredients would also need to be organic; notably, the Canadian standard requires that animal-derived enzymes be free of certain materials, which the Board may wish to note as a sourcing-integrity consideration.

Regarding verification, certifiers who addressed the question found it manageable and dependent on documentation rather than on any difficulty unique to animal enzymes. One certifier noted that the burden of collecting documentation typically falls on the operator, but that reviewing that documentation for compliance has not posed a challenge; another reported no challenges determining origin and compliance, verifying origin by email where it is not indicated on the spec sheet and requiring a Verification of Ingredient (VOI) form, absent which the input is deemed prohibited due to insufficient information. On the environmental impact of animal-derived enzymes versus microbial or fermentation-based alternatives, there was little direct comment and no comparative analysis. Finally, on whether all listed enzymes remain necessary and in use, the data confirm that rennet and animal lipase are actively used, while catalase, pancreatin, pepsin, and trypsin were not specifically reported this cycle—an inconclusive result given generic "enzyme" tracking—and, consistent with 2021, no commenter argued that any listed enzyme is unnecessary.

In sum, the comment record supports continued listing: no commenter sought removal, rennet and lipase remain in active use, no organic-compliant substitute exists, and certifiers report that origin and compliance can be verified through standard documentation. The open items are candidates for follow-up rather than obstacles to relisting—improving source-specific tracking so per-enzyme use can be confirmed, affirming SRM-free sourcing as a sourcing-integrity expectation, and determining whether the full list remains in active organic use—while the feasibility of an organic source and a formal environmental comparison remain unestablished and are best pursued through the work agenda or a limited-scope technical review.

Questions to our Stakeholders

1. Are all of the animal enzymes listed necessary and being used in organic production?

Justification for Vote

The Subcommittee finds animal enzymes **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove animal enzymes from the National List

Motioned by: Kathryn Deschenes

Seconded by: Andrea Hatziyannis

Yes: 0 No: 3 Abstain: 0 Recuse: 0 Absent: 1

Calcium sulfate-mined

Reference: § 205.605(a)(8)

Technical Report: [1996 TAP](#); [2001 TAP](#)

Petition(s): [2000](#)

Past NOSB Actions: [09/1996 meeting minutes and vote](#); [11/2007 recommendation](#); [05/2012 recommendation](#); [11/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: National List amended 11/03/2003 ([68 FR 62215](#)); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

- Coagulate in tofu manufacturing. Calcium sulfate is essential for traditional, soy-based tofu.
- Yeast food and dough conditioner, water conditioner.
- Firming agent (in canned foods).
- Jelling ingredient.
- Baking powder.
- Anticaking agent.

Manufacture

Calcium sulfate is produced either by mining naturally occurring mineral deposits or as a byproduct of industrial processes. The listing restricts calcium sulfate to mined sources, and mined gypsum is the primary source. After crude gypsum is mined in open-cast quarrying or via deep mining, it is ground and separated. It is normally sold in pure form but may contain impurities of calcium carbonate and natural occurring silica. These impurities are typically present at low levels and are reduced through physical processing such as crushing, screening, washing, or drying, but the material is not chemically synthesized or purified. Synthetic calcium sulfate can form as a by-product from many different processes, including from emissions from fossil fuel power stations. The material is generally recognized as safe (GRAS) by the FDA.

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- Calcium is permitted with the following origin/usage conditions: calcium carbonate (calcitic limestone), calcium magnesium carbonate (dolomitic limestone), calcium silicate, and **calcium sulphate (gypsum), all from mined sources**. Other biological or mineral sources, such as shells from aquatic animals (for example, oyster shell flour), aragonite, eggshell meal and lime from sugar processing. Calcium chloride derived from naturally occurring brines and not chemically treated. Prohibited forms include slaked limestone (calcium hydroxide); quicklime (calcium oxide); **calcium sulphate produced using sulphuric acid and calcium products that have been used in controlled atmosphere storage** (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- **Calcium sulphate (gypsum)** is permitted as a soil amendment with the following origin/usage conditions: **from mined sources** are allowed; **calcium sulphate produced using sulphuric acid is prohibited**. To correct calcium and sulphur deficiencies and soil salinity problems (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).

- **Calcium sulphate (gypsum) from mined sources** is permitted; **calcium sulphate produced using sulphuric acid is prohibited** (Table 6.3 - Ingredients classified as food additives, CAN/CGSB-32.311-2020).
- **Calcium sulphate (gypsum)** is permitted. Sulphates produced using sulphuric acid are prohibited. May be used: a) as a carrier for cakes and biscuits; b) for soybean products; and c) for bakers' yeast (Table 6.5 - Processing aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Calcium sulphate (gypsum)** is permitted in products of natural origin containing calcium sulphate at various degrees of hydration. Minimum content of nutrients (percentage per weight): 25% CaO; 35% SO₃. Calcium and sulphur expressed as total CaO + SO₃. Fineness of grind: at least 80% to pass through a sieve with a 2 mm mesh width; at least 99% to pass through a sieve with a 10 mm mesh width. From 16 July 2022, the relevant limits for contaminants set in Regulation (EU) 2019/1009 apply (Annex II: Authorised fertilisers, soil conditioners and nutrients, EC No. 2021/1165).
- **Calcium sulphate** is permitted in products of plant origin as a carrier (Annex V: Authorised products and substances for use in the production of processed organic food and of yeast used as food or feed, EC No. 2021/1165).
- **Calcium sulphate** is permitted (Authorised products and substances for the production and conservation of organic grapevine products of the wine sector, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Gypsum (calcium sulphate)** is permitted, only from natural sources/origin (Table 1 - Substances for use in soil fertilizing and conditioning, CXG 32-1999).
- **Calcium sulphate** is permitted in food of plant origin: soybean products (excluding soybean products of food category 12.9 and fermented soybean products of food category 12.10); cakes, cookies and pies (e.g. fruit-filled or custard type); yeast and like products; soybean protein products; fermented soybean products. **Calcium sulphate** is not permitted in food of animal origin (Table 3 - Ingredients of non-agricultural origin, CXG 32-1999).
- **Calcium sulphate** is permitted for plant products as a coagulation agent (Table 4 - Processing aids which may be used for the preparation of products of agricultural origin, CXG 32-1999).

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Calcium sulfate** is permitted as an additive for soybean products, confectionery, and in bakers' yeast (Appendix 4, Table 1: List of approved additives and processing/postharvest handling aids, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- In the cases where it is difficult to obtain the spawns specified in (a)-(c), spawns [can be] cultured by using the following cultivation substances: 1) yeast extract, 2) malt extract, 3) sugar, 4) glucose, 5) calcium carbonate, 6) **calcium sulfate** (Spawns, JAS 1605 Organic Products of Plant Origin).
- Gypsum (calcium sulfate) is permitted with the following criteria: natural substances or substances derived from natural sources which have not undergone any chemical treatment (Table A.1 - Fertilizers and soil improvement substances, JAS 1605 Organic Products of Plant Origin).

- **Calcium sulfate** is permitted with the following criteria: limited to the use as a coagulant, or in confectionery, prepared legumes/beans, or baker's yeast (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- **Calcium sulfate** is permitted (Table B.1 - Additives for alcohol beverages, JAS 1606 Organic Processed Foods).

Ancillary Substances

None reported in the 2001 TAP.

Human Health and Environmental Issues

Calcium sulfate may be obtained from natural sources, with mined gypsum being the primary natural source. Gypsum is one of the most widely used minerals worldwide, and the United States is the largest producer. Gypsum is mined across many regions of the United States and Canada, with a significant share of production concentrated in a small group of leading states. Most deposits occur as gypsum in the dihydrate form, although anhydrite also occurs naturally. The mining of calcium sulfate involves quarrying or blasting and the use of heavy equipment, generating gypsum dust in the process. This dust can affect air quality and can be a potential exposure hazard to humans and other animals. There are no other known negative effects of toxicity and/or persistence in the environment caused by production of calcium sulfate from these methods, if standard regulations for proper mining activities are followed.

Discussion

In organic handling and processing, calcium sulfate is utilized because it is naturally derived and minimally processed with a long history of safe use. Its necessity is limited to specific applications, such as traditional tofu production, where few alternatives provide equivalent functionality without compromising product quality or organic principles. In past sunset reviews, manufacturers and trade associations have emphasized its use in tofu production. It was also noted that calcium sulfate was used in the brewing industry to adjust the mineral content of water. One interest group asked that its use be limited to coagulation of bean curd, noting evidence was not available for its use in other food applications. During the 2021 sunset review, the Board agreed that this material satisfies the OFPA evaluation criteria and unanimously supported the relisting of calcium sulfate.

During the Spring 2026 NOSB meeting, one public commentor recommended that an annotation be in place to restrict the use of calcium sulfate only for use in making tofu. One commentor stated this material is essential in tapioca-based syrups and powders in snack bars to provide cohesive structure and balanced structure. No public commenters objected to the relisting of calcium sulfate.

Questions to our Stakeholders

1. How is calcium sulfate currently used in organic production outside of the manufacturing of tofu?
2. How would limiting or restricting its use impact your production processes or product offerings?

Justification for Vote

The Subcommittee finds calcium sulfate **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove calcium sulfate from the National List

Motioned by: Amanda Felder

Seconded by: Kathryn Deschenes

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Carrageenan

Reference: § 205.605(a)(9)

Technical Report: [1995 TAP](#); [2011 TR](#); [2016 Limited Scope TR](#); [2026 Limited Scope TR](#)

Petition(s): N/A

Past NOSB Actions: [04/1995 NOSB minutes and vote](#); [11/2007 recommendation](#); [05/2012 recommendation](#); [11/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: National List amended 10/31/2003 ([68 FR 61987](#) – misspelled as ‘carrageenan’); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Carrageenan is a food additive used as an emulsifier, thickener, and gelling compound primarily in meat and dairy products. It is often used as a vegan alternative to animal-sourced gelatin. Carrageenan provides a ‘mouthfeel’ similar to that of fatty foods and thus may be used in low fat or dairy replacement products (Zhang et al., 2024a). Carrageenan is listed as an FDA-approved food additive at [21 CFR 172.620](#), and is allowed for use as an emulsifier, stabilizer or thickener in foods in the amount necessary to have the intended effect. In Europe, carrageenan is not allowed in infant formula, while China restricts the amount allowed in baby formula (Zhang et al. 2024a).

Manufacture

Carrageenan is made through three common methods of production: alcohol process, gel process, and semi-refined process. In all processing methods, the finished carrageenan is produced through a fairly simple process of heating edible red algae in a hot alkali solution, typically using potassium hydroxide. The cellulose from the plant is then removed through centrifugation and the remaining gel-like solution is the carrageenan, which can be evaporated and dried into a powder for addition to foods.

The three main kinds of carrageenan (kappa, iota, and lambda carrageenan) are extracted from different seaweed species (or are extracted from seaweed at different life stages) and are distinguished chemically by the number and position of ester sulphates on the carbohydrate units in the molecules. This information is relevant, as the different types have different properties and uses in the food industry, but are not distinguished in food labelling:

- Kappa-carrageenan – forms strong gels in combination with potassium ions and is used primarily in dairy products.
- Iota-carrageenan – forms soft gels in the presence of calcium ions.
- Lambda-carrageenan – does not gel and is used to thicken dairy products.

Historically, the seaweed used to make carrageenan grew in small patches along the coastline and required a large amount of labor to harvest (Langford, 2024a). Larger scale farming of seaweed was unsuccessful until 1974, when a location in the South Philippines had all the necessary components to allow for seaweed farms to thrive. About a decade later seaweed farming also became viable in Indonesia (Langford, 2024a). An innovation in processing reduced the cost of processing carrageenan in the 1990s (Langford, 2024a). This allowed seaweed farming to emerge in other tropical regions, but 92 percent of the supply still comes from the Philippines and Indonesia (Langford, 2024b). In 2021, Indonesian seaweed

(carrageenan) production totalled 7.1 metric tons (Langford, 2024b). Processing plants are located in China, Philippines, and Indonesia (Zhang et al., 2024a). China is the top country in terms of carrageenan processing, both domestically and through heavy investment in processing facilities in Indonesia (Zhang et al., 2024b).

In 2018, the carrageenan industry was valued at \$500 million, with production equal to 60,000 metric tons in China, Indonesia, and Philippines (Taylor, 2019). The volume of carrageenan used in dairy products and processed meats remained relatively stable between 2009 and 2019, while the amount used for bakery, confectionary, and beverages increased by a sizeable amount (Zhang et al., 2024a). The market for carrageenan is expected to increase 3.8 percent in volume and 5.4 percent in value between 2023 and 2030 (Zhang et al., 2024a).

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

Shall be derived using substances listed in Table 6.3 Extraction solvents and precipitation aids. By exception, isopropyl alcohol may be used to derive carrageenan.

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

The EEC allows carrageenan as an additive to organic dairy foods, and its use is prohibited in all baby formula.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

Permitted, although exclusions and limitations as specified by the GSFA still apply.

International Federation of Organic Agriculture Movements (IFOAM) Norms

IFOAM allows carrageenan as a food additive with no annotations.

Japan Agricultural Standard (JAS) for Organic Production

Limited to use in dairy products.

Ancillary Substances

The 2026 limited-scope TR indicates that manufacturers may include the following ancillary materials in food-grade carrageenan [2026 TR lines 578-595]:

- sugars for standardization purposes (e.g., dextrose or maltodextrin)
- sodium, potassium, or calcium salts to obtain specific gelling or thickening characteristics
- emulsifiers carried over from drum-drying processes (e.g., xanthan gum)

Food-grade refined carrageenan produced by alcohol precipitation contains approximately 90% anhydrous carrageenan, 8% moisture, and 2% inorganic salts (mainly chlorides). Food-grade refined carrageenan manufactured by the gel-press method contains about 77% anhydrous carrageenan, 8% moisture, and up to 15% inorganic salts (mainly chlorides). Additionally, both food-grade refined and semi-refined carrageenan may not contain more than 0.1% of methanol, ethanol, or propane-2-ol, singly or in combination.

Environmental Issues and Human Health Concerns

Seaweed farming, specifically for the seaweed raised for carrageenan, has several environmental issues. Seaweed farms can be a lucrative business for small scale aquaculture as the overhead is low, requiring at

the most basic level nylon strings or netting in shallow coastal waters. The turnover to harvest is quite short, at only 6 weeks. The harvested product is shelf-stable and can be stored for a relatively long period of time (Langford, 2024b). However, increased demand for seaweed has resulted in the establishment of some farms that involve first destroying important nearshore habitats like mangrove swamps or eelgrass beds to provide growing environments. Drifting mats from the established farms can also smother other nearby habitats, such as coral reefs. For example, when seaweed farming was introduced to India, to promote aquaculture for carrageenan, the seaweed rapidly invaded and smothered coral reefs in a nearby marine reserve (Baglar, 2008). Some coastal communities have improved their economic condition, but for some the economic gains were short lived due to environmental collapse (Langford, 2024b).

Research into the ecological effects of seaweed farming indicates that the diversity of fish is reduced in and around the seaweed farms. Proximity to seaweed farming reduces the size and growth rates of sea grass beds. A proposed environmental mitigation strategy is to move seaweed farming to deeper, sandy-bottomed areas and ensure that the farms are a safe distance from vulnerable habitats like coral reefs (Kelly et al., 2020).

The impacts of seaweed aquaculture can be positive. It has been hypothesized that carefully placed seaweed aquaculture can help increase oxygenation in near-shore waters, remove impurities from the water, buffer against wave action, help stabilize marine pH and otherwise help mitigate against some effects of climate change (Duart et al., 2017). In addition, it is a food source that requires no freshwater or chemical inputs, making it an attractive alternative to terrestrial-based crops. Lastly, seaweed farming can provide a viable alternative to fishing in areas where overfishing has depleted fish populations.

Current scientific evidence on the human health impacts of food-grade carrageenan remains mixed and, in several areas, limited. Research continues to differentiate food-grade carrageenan from *degraded carrageenan* (including poligeenan), which is not used in food and is known to cause gastrointestinal ulceration and cancer in animal models. Although some low-molecular-weight fractions can arise during extraction or through microbial fermentation, the extent and relevance of in-vivo degradation of food-grade carrageenan remain uncertain.

Digestive Fate. Studies using simulated digestive systems indicate that carrageenan largely resists digestion in the stomach and small intestine but may undergo microbial fermentation in the colon. Recent work suggests that gut bacteria—particularly species within *Bacteroides*—may degrade carrageenan and produce metabolites capable of influencing inflammatory responses. However, the physiological significance of these interactions in humans has not been fully established.

Toxicology. Available toxicological data do not identify safety concerns for carrageenan consumed at typical levels found in food. Carrageenan shows low acute toxicity in mammals, and only two isolated human allergic reactions have been reported. Reviews, including by McKim et al. (2019), have found no evidence that food-grade carrageenan is carcinogenic, genotoxic, or tumor-promoting. Intake estimates vary widely among populations, and the ADI for carrageenan remains “not specified” due to limited data on exposure and long-term effects.

Impurities. Food-grade carrageenan may contain low levels of naturally occurring or process-related impurities such as formaldehyde or semi-carbazide. Regulatory evaluations, including the European Food Safety Authority (EFSA’s), conclude that these impurities occur at levels far below those associated with health risks and do not pose a concern for consumers.

Inflammation and Ulceration. Evidence regarding carrageenan's role in intestinal inflammation is conflicting. In vitro studies suggest that carrageenan can contribute to inflammatory signaling under certain conditions, especially when inflammation is already present. Limited human data—including a small trial in ulcerative colitis patients—suggest that individuals with pre-existing inflammatory bowel disease may be more susceptible to adverse effects. Additional research indicates that inflammatory outcomes may depend on interactions between carrageenan, gut microbiota, and the integrity of the epithelial barrier.

Metabolic Effects. Findings related to metabolic outcomes are inconsistent. Some studies in animals and humans suggest that carrageenan may negatively affect glucose tolerance or insulin signaling, while others show potential lipid-lowering benefits or no adverse metabolic effect. Large-scale epidemiological data from France indicate a statistical association between carrageenan intake and increased risk of type 2 diabetes, though causal pathways remain unclear and limitations of self-reported dietary data apply.

Antiviral and Antibacterial Properties. Several studies demonstrate that specific forms of carrageenan—particularly iota-carrageenan—exhibit antiviral and antibacterial activity. Iota-carrageenan nasal sprays have shown clinical benefit in reducing common cold symptoms, and in vitro studies indicate potential inhibition of pathogens such as herpes simplex virus and *Chlamydia* species. These therapeutic findings remain separate from food uses.

Discussion

Carrageenan's status has shifted over time as scientific evidence, regulatory guidance, and organic-market expectations have evolved.

- In 1995, the NOSB classified carrageenan as nonsynthetic based on a TAP report, before NOP 5033-1 provided formal classification guidance. Because carrageenan remains listed at 7 CFR 205.605(a), certifiers generally continue to treat it as nonsynthetic.
- In 2012, the Handling Subcommittee recommended moving carrageenan to § 205.605(b) in light of updated manufacturing information, but the full Board later recommended relisting it at § 205.605(a), with specific CAS numbers and a prohibition on use in infant formula. That recommendation was not implemented.
- In 2016, the NOSB recommended removing carrageenan from § 205.605(a), but NOP retained it after comments indicated it remained necessary because fully natural substitutes were not available for all uses.
- In 2021, the NOSB again voted against removal, reaffirming its necessity.

The Board should also revisit whether carrageenan is properly classified as nonsynthetic under NOP 5033-1 [2026 TR lines 486–562]. Available information suggests that all or nearly all commercial carrageenan is produced through alkaline extraction, raising questions about whether it should instead be classified as synthetic. Stakeholder input on solvent-free extraction alternatives would help inform this determination. Finally, the Board may wish to reassess whether carrageenan remains necessary in organic processed foods. While some manufacturers consider it functionally useful, the record does not clearly show that feasible organic-compliant alternatives are unavailable for all current uses.

Public Comment from Spring 2026:

The written comments received on carrageenan reflect a community that cares deeply about the same thing—the integrity of the organic label—yet arrives at different conclusions from that shared commitment. Below, the perspectives are grouped by the nature of the concern rather than by author, so the Board can consider the underlying reasoning, evidence, and real-world experience that each brings. All commenters, whether they favor removal or continued listing, engaged thoughtfully and in good faith, and each deserves to be heard on those terms.

- **Shared ground.** Nearly every commenter—on all sides—acknowledged that virtually all commercial carrageenan is produced by alkaline extraction, and many explicitly agreed the Board should revisit whether it is correctly classified as non-synthetic under NOP 5033-1. This is a point of genuine common cause.
- **Point of divergence.** Commenters part ways on two questions: (1) whether the current human-health evidence warrants precaution strong enough to remove carrageenan, and (2) whether feasible alternatives truly exist for every remaining organic application.

A number of commenters asked the Board to remove carrageenan from the National List. Their comments are heartfelt and grounded in a protective instinct toward the people who rely on the organic label, particularly vulnerable eaters. Their principal arguments:

- **Human health and the precautionary principle.** These commenters point to a growing body of independent, peer-reviewed research—several studies published in 2024 and 2025—linking food-grade carrageenan to intestinal inflammation, impaired glucose tolerance and insulin resistance, and associations with type 2 diabetes and certain cancers, with people who have inflammatory bowel disease (Crohn’s, ulcerative colitis) identified as most susceptible. They urge the Board to “err on the side of caution” where the health of the public may be affected, framing organic as a refuge for those seeking to avoid uncertain additives.
- **Concern about the evidence base.** Several commenters noted a perceived pattern in which studies suggesting safety were industry-funded while independent research raised concerns, and asked the Board to weigh author affiliations and funding sources transparently.
- **Necessity / availability of alternatives.** These commenters observe that many major brands reformulated away from carrageenan years ago—including products once said to be impossible without it, such as aseptic chocolate milk—and that gums such as gellan, guar, and xanthan, “shake-well” labeling, or simply omitting the additive can serve the same functions. From their vantage point, a widely available ingredient is not necessarily an essential one.
- **Environmental footprint.** Commenters cite overharvesting of cold-water species, bio-invasive risk from cultivated warm-water species, smothering of coral ecosystems, and alkaline wastewater from processing, connecting these to organic’s duty to conserve biodiversity from “farm to fork.”
- **Classification and OFPA.** Citing the 2026 TR, commenters argue carrageenan should be reclassified as synthetic under NOP 5033-1 and, once synthetic, could not simply be relisted at § 205.605(a); they also recall the Board’s 2016 removal recommendation that was not implemented, and ask that the Board’s advisory role be respected.

One commenter went further, asking that carrageenan be listed as a “prohibited natural” at § 205.604 in addition to removal, so that the material could not return through a future reclassification. Whether or not the Board agrees, the underlying worry—protecting sensitive consumers—is sincere and deserves acknowledgment.

Commenters recommended aligning this listing with the [2020 recommendation](#) on protecting marine ecosystems from harvest damage, which proposed adding the following annotation to the crop input marine microalgae listing:

- Prohibited harvest areas: established conservation areas under federal, state, or local ownership, public or private, including parks, preserves, sanctuaries, refuges, or areas identified as important or high value habitats at the state or federal level. Prohibited harvest methods: bottom trawling and harvest practices that prevent reproduction and diminish the regeneration of natural populations. Harvest practices should ensure that sufficient propagules, holdfasts, and reproductive structures are available to maintain the abundance and size structure of the population and its ecosystem functions.
- Harvest timing: repeat harvest is prohibited until biomass and architecture (density and height) of the targeted species approaches the biomass and architecture of undisturbed natural stands of the targeted species in that area. Bycatch: must be monitored and prevented, or eliminated in the case of special status species protected by U.S. Fish and Wildlife Service or National Marine Fisheries Service.

The National Organic Program has previously stated that it does not plan to act on that recommendation.

A trade association representing food-additive manufacturers, a national organic trade association, an organic-industry consultancy, and several accredited certifying agents supported keeping carrageenan on the National List. Their comments come from close, practical familiarity with how organic products are actually formulated and certified, and they, too, speak for real people—formulators, small processors, and consumers who value particular products. Their principal arguments:

- **Functional necessity without a full replacement.** They describe carrageenan’s distinctive protein interaction, its performance at very low usage levels, its thermo-reversible and versatile gelling across pH and temperature ranges, and its synergy within multi-hydrocolloid systems. In their experience these properties are not fully matched by any single alternative—especially for plant-based dairy and meat alternatives, neutral protein and cocoa beverages, and sliceable deli products where it controls syneresis and locks particulates in suspension. They caution that delisting could constrain vegan and vegetarian product innovation.
- **Safety as affirmed by regulators worldwide.** They note that carrageenan is permitted by major regulatory and standard-setting bodies globally (FDA, EFSA, Codex, Health Canada, and others), and that its long history of food use supports continued allowance.
- **Continued market presence via equivalency.** A certifier observed that, because of international organic-equivalency arrangements, carrageenan-containing organic products would remain

available to U.S. consumers regardless of National List status, a practical consideration for the Board to weigh.

Carrageenan continues to be used in the organic sector, though reliance varies widely among accredited certifiers. One certifier reported 17 operations using 23 distinct carrageenan ingredients in more than 45 products, while others identified only a few operations or clients, and several reported no current handling clients using carrageenan. When used, carrageenan appears in dairy products, plant-based dairy alternatives, animal-protein and meat products, beer, and other beverages, where it functions as an emulsifier, thickener, gelling agent, or stabilizer, often as a vegan alternative to gelatin. Processors that still rely on carrageenan report that no workable substitute exists for some applications, particularly those requiring specific mouthfeel, texture, or syneresis control. Removal advocates, however, note that many major brands have already reformulated without it. Because most certifiers treat carrageenan as a low-risk material for verification, they generally do not track the manufacturing method used (refined or semi-refined) or the molecular form present (kappa-, iota-, or lambda-), leaving a significant information gap. Reported use figures therefore likely capture only a subset of actual use.

Questions to our Stakeholders

1. Are there products that would not be available as organic if carrageenan is not relisted?
2. If carrageenan were removed from the National List, how long would you need to reformulate affected products, and what technical challenges would you face?
3. For products you believe cannot be reformulated, have you tested alternatives such as gellan, guar, xanthan, agar, or gelatin substitutes?
4. What information can you provide about commercially available carrageenan made without alkaline extraction, including any hot-water, enzyme-assisted, or other alternative production methods and sources?

Justification for Vote

The Subcommittee finds carrageenan **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove carrageenan from the National List

Motioned by: Kathryn Deschenes

Seconded by: Allison Johnson

Yes: 1 No: 3 Abstain: 0 Recuse: 0 Absent: 0

References:

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Glucono delta-lactone

Reference: § 205.605(a)(14) Glucono delta-lactone—production by the oxidation of D-glucose with bromine water is prohibited.

Technical Report: [2002 TAP](#); [2016 TR](#)

Petition(s): [2002](#)

Past NOSB Actions: [09/2002 meeting minutes and vote](#); [11/2007 recommendation](#); [05/2012 recommendation](#); [11/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: National List amended 11/03/2003 ([68 FR 62215](#)); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Glucono delta-lactone (GDL) is primarily used in the production of tofu, particularly silken tofu, and is generally thought to be the only material that can produce the physical and sensory components favored in that product. In tofu production, GDL serves as a coagulant. GDL can also be used as a curing or pickling agent, leavening agent, pH control agent and sequestrant. It is also used in feta cheese in place of lactic acid bacteria to reduce pH. Less tangy than citric acid, GDL slowly undergoes hydrolysis in water and converts to gluconic acid to produce a tangy flavor in food applications. GDL is generally recognized as safe (GRAS) by the FDA [2016 TR, lines 587-590, 597-599].

Manufacture

GDL is produced by crystallization from an aqueous solution of gluconic acid. There are a variety of ways gluconic acid can be produced. The most common method to produce gluconic acid is called the Blom process, where gluconic acid is produced by fermentation of glucose syrups by *Aspergillus niger*. Sodium hydroxide or calcium carbonate is added to the fermentation process to produce gluconate salt. The gluconate salt is then isolated via evaporation, crystallization and then conversion to acid via ion-exchange. This process produces GDL via fermentation and acid-base reactions [2016 TR, lines 500-525]. Other processes to make GDL involve oxidation of D-glucose with bromine water (which is not allowed by the National List annotation) and the use of purified enzymes [2016 TR, lines 281-282].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- **Glucono delta lactone** is permitted with the following origin/usage conditions: production by the oxidation of D-glucose with bromine water is prohibited (Table 6.3 - Ingredients classified as food additives, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- **Glucono delta-lactone** is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Glucono delta-lactone** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Glucono delta-lactone** is not explicitly mentioned in the regulations.

Japan Agricultural Standard (JAS) for Organic Production

- **Glucono delta-lactone** is not explicitly mentioned in the regulations.

Ancillary Substances

GDL is >99% pure and has no ancillary substances present. GDL is often sold in formulation with other additives specifically designed for the application. These substances should be reviewed separately as they are not ancillary substances.

The 2016 technical report (TR) states that there are many chemical methods of gluconic acid synthesis other than bromine water. It also states that some enzymes used in the production of GDL may be genetically engineered. Standard of purity for GDL is listed in the Food Chemicals Codex. It must be >99% pure. It can contain up to 4mg/kg of lead. Standards for other heavy metals are not listed. Up to 0.5% glucose contaminant is allowed. No reports of GDL contamination were found on the Internet or in CAB or Pub Med databases as of September 29, 2015 [2016 TR, lines 283-284, 646-649].

Human Health and Environmental Issues

The Handling Subcommittee was unable to document any environmental or human health issues associated with the production or consumption of GDL. Some sources have indicated it may cause minor bladder discomfort and/or back pain.

The 2016 technical report examined human health and environmental impacts of GDL use and production but found low to no risk. The TR did raise the question of classification, given the substance is produced via fermentation and acid-base reactions similar to the production of citric acid, which is also listed as

nonsynthetic at § 205.605(a). The TR also raised concerns about the potential for genetically modified organism (GMO) enzymes used in the production of GDL via the oxidation with enzymes production method (not the most common form of production).

Discussion

The primary use of GDL is for the coagulation of tofu. Other coagulants for tofu include magnesium chloride, calcium chloride, calcium sulfate, and magnesium sulfate [2016 TR, lines 256-257]. Acids such as citric or lactic acid can be used as well. Each of these substances produces a different type of tofu texture and flavor making distinctly different products. Calcium salts produce firmer tofu; sulfate salts produce soft tofu and GDL produces silken tofu. Citric and lactic acids produce acidified tofu that is often undesirable. Precise control of temperature and processing environments may allow different coagulants to produce different types of tofu.

For the 2021 sunset review, the Handling Subcommittee requested public comments regarding the use of GDL in organic processed foods other than tofu production. One comment was received stating its use was necessary for a dairy product, and another noted its use in a cosmetic product. Further, the Handling Subcommittee asked if alternative tofu coagulants such as calcium or sulfate salt would be sufficient to produce all forms of tofu if GDL were removed from the National List. In response, companies commented that alternatives on the National List result in distinctly different and firmer tofu and that GDL is critical for silken, jelly-like tofu. Several tofu manufacturers commented in favor of retaining GDL. Lastly, the Subcommittee asked stakeholders whether GDL produced from enzymes should be prohibited or further restricted due to concerns about GMOs, an issue that is referenced in the 2002 TAP and noted as an issue for ongoing monitoring. Interest groups expressed concern that enzymatic GDL could possibly be produced via GMO substrates or enzymes and recommended the listing be annotated if renewed at all. As annotation changes are not possible during sunset review, this would require separate action from the Board. Another commenter questioned the necessity of GDL stating it could be produced via alternative means; however, no information was presented on the commercial viability of this approach.

At the Spring 2021 NOSB meeting, the Subcommittee received limited commentary from stakeholders about GDL. However, one commenter did indicate that the misalignment between the current annotation – which prohibits GDL made from bromine water and ensures only nonsynthetic GDL is used in organic – and the 2016 TR, which suggests GDL can be made from a variety of different chemical means, leaves the listing exposed to synthetic GDL production and some excluded methods. That comment suggests a clarification of the annotation may be needed.

The Handling Subcommittee heard from several certifiers about somewhat limited use of the substance among their members. Although use was limited, support for relisting was clear. One non-profit stakeholder shared a concern flagged by the Subcommittee about potential negative impacts from mining for the substance in sensitive areas. That group also asked that the material be annotated to limit its use as a coagulant only. Another stakeholder suggested GDL is nonessential, though several certifiers reported that a number of their members and clients are currently using GDL. Public comments at the last sunset review supported continued listing of GDL on the National List. Some public comments called for further review of the synthesis of gluconic acid to ensure only non-synthetic sources, potentially leading to further clarification of the annotation. The annotation was reviewed and discussed by the full Board at the Spring 2026 meeting. The Board is hesitant to add additional language to the annotation, and will ask questions of the stakeholders to understand which type of GDL is predominantly utilized in the industry, and if there would be any impact to availability if the annotation was changed. The goal is to ensure the listing is not too restrictive without understanding the alternative methods available.

Questions to our Stakeholders

1. How widespread is the use of GDL in organic applications?
2. Is there evidence that GDL being used in organic applications may derive from genetic modification of any kind?
3. Have alternatives to GDL emerged in recent years that deliver the same product quality and functionality?
4. What are the methods for production of gluconic acid synthesis other than bromine water?
5. Is there an organic integrity concern requiring an annotation change? What would the recommended changes be to the annotation?

Justification for Vote

The Subcommittee finds glucono delta-lactone (GDL) **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove glucono delta-lactone (GDL) from the National List

Motioned by: Andrea Hatziyannis

Seconded by: Amanda Felder

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Tartaric acid

Reference: § 205.605(a)(28) Tartaric acid - made from grape wine.

Technical Report: [2011 TR](#)

Petition(s): [2011 Petition to remove from § 205.605\(b\) - made from malic acid](#)

Past NOSB Actions: [NOSB meeting review 11/1995](#); [11/2005 recommendation](#); [12/2011 recommendation](#); [11/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: National List amended 10/31/2003 ([68 FR 61987](#)); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Tartaric acid naturally occurs in many plants, especially grapes, bananas, and tamarinds. It can also be produced synthetically from maleic acid, but the synthetic version was removed from the National List in 2013. Tartaric acid can be used to create several different salts, including tartar emetic (antimony potassium tartrate), cream of tartar (potassium hydrogen tartrate), and Rochelle salt (potassium sodium tartrate). The primary uses of tartaric acid are associated with its salts [2011 TR, lines 53-56].

Tartaric acid and its salts have a wide variety of uses. These include use as an acidulant, pH control agent, preservative, emulsifier, chelating agent, flavor enhancer and modifier, stabilizer, anti-caking agent, and firming agent. It has been used in the preparation of baked goods and confectionaries, dairy products, edible oils and fats, tinned fruits and vegetables, seafood products, meat and poultry products, juice

beverages and soft drinks, sugar preserves, chewing gum, cocoa powder, and alcoholic drinks [2011 TR, lines 58-63].

Tartaric acid and its immediate byproducts are particularly useful in baking. Due to its acidic properties, tartaric acid is used in baking powder in combination with baking soda (sodium bicarbonate). When tartaric acid reacts with sodium bicarbonate, carbon dioxide gas is produced, causing various baking products to rise without the use of active yeast cultures. This action alters the texture of many foods. Tartaric acid and its salts are used in pancake, cookie, and cake mixes because of these properties. Cream of tartar is used to make cake frosting and candies [2011 TR, lines 69-74].

Although tartaric acid is isolated from wines, it may also be used in winemaking to alter acidity. For non-grape wines, it may be added to increase acidity or to help prevent degradation of the flavor from unwanted microorganisms [2011 TR, lines 76-83].

Tartaric acid and its salts (i.e., potassium acid tartrate, sodium potassium tartrate acid) are classified by FDA as generally recognized as safe (GRAS).

Manufacture

The 2011 TR states that tartaric acid is an unwanted component present at the end of the winemaking process, and with the addition of calcium hydroxide and potassium hydroxide, it can be precipitated out as a calcium or potassium tartrate salt [2011 TR, lines 151-155]. The salts can then be purified to tartaric acid. The TR details the most prevalent processes for production of tartaric acid [2011 TR, lines 221-234]:

The nonsynthetic form of tartaric acid is isolated from the undesirable wastes created during the winemaking process. These unwanted materials include grape pomace, grape stalks, grape seeds, and vine, which naturally contain a significant amount of tartaric acid. An excess of tartaric acid is generally unwanted in winemaking because it creates a sour and undesirable taste. The available excess tartaric acid is precipitated using potassium hydroxide or calcium hydroxide in order to create a wine with the desired taste. Then the resulting waste mixture is evaporated. This process produces a powder containing calcium or potassium tartrate and additional substances including polyphenols and tannins. The powder is then sold to facilities that purify tartaric acid. The process for extracting tartaric acid from waste materials is similar to the processing of excess tartaric acid, in that potassium hydroxide is added to the waste mixture. Activated carbon is also added to remove unwanted pigmentation. The potassium tartrate is precipitated by adding saturated pure tartaric acid solution and then the precipitate is redissolved with acidic water at 70°C. Potassium and sulfate ions must be removed from the remaining solution, so cation exchanges are performed followed by evaporation. The solution is then crystallized at 4°C.

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- Tartaric acid from lees is permitted for beverages (Table 6.3 – Ingredients classified as food additives, CAN/CGSB-32.311-2020).
- Tartaric acid from lees is permitted for beverages (Table 6.5 – Processing aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- Tartaric acid (L(+)-) is permitted in products of plant origin and mead (Annex V: Authorised products and substances for use in the production of processed organic food and of yeast used as food or feed, EC No. 2021/1165).
- Tartaric acid (L(+)-) is permitted (Authorised products and substances for the production and conservation of organic grapevine products of the wine sector, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- Tartaric acid is permitted in food of plant origin, although exclusions of the GSFA still apply. Tartaric acid is not permitted in food of animal origin (Table 3 - Ingredients of Non-Agricultural Origin, CXG 32-1999).

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Tartaric acid is permitted as an additive and a processing and post-harvest handling aid only for wine (Table 1 - List of Approved Additives and Processing/Post-Harvest Handling Aids, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- L-Tartaric acid is limited to the use in processed products of plant origin (Table A.1 – Additives, JAS for Organic Processed Foods).
- L-Tartaric acid is permitted (Table B.1 – Additives for alcoholic beverages, JAS for Organic Processed Foods).

Ancillary Substances

None identified.

Human Health and Environmental Issues

If appropriate use patterns and disposal recommendations are followed, it is unlikely that tartaric acid would cause harm to the environment. The biodegradability of tartaric acid is 95% after 3 days and the substance is considered readily biodegradable. No bioaccumulation is to be expected [2011 TR, lines 390-391].

Discussion

Tartaric acid is a critical component in several areas of food handling. While baking powder can be replaced with baking soda, cream of tartar must be added to maintain the baking powder properties. Tartaric acid is made from grapes, but it is also an important component in winemaking and there are no organic alternatives. Other natural components of grapes, such as malic acid, can be used to alter the acidity of wine and possess preservative characteristics, but they often impart a different taste than tartaric acid [2011 TR, lines 438-440].

The Handling Subcommittee asked stakeholders whether organic tartaric acid is available in significant quantities, whether tartrate salts could be removed before the addition of sulfur dioxide in winemaking, and whether there are any other barriers to organic tartaric acid production that could be lowered.

Public comments submitted for the previous sunset review, and again in this sunset review raised the possibility of increasing the supply of organic tartaric acid, including by removing the nonorganic version from the National List. However, in order for tartaric acid to be labeled “organic,” sulfur dioxide could not be used in the winemaking process prior to extraction of the tartrate salts – i.e., it would have to be a

byproduct of wine that will be labeled “organic” or the relevant byproducts would need to be separated from the wine made from organic grapes prior to addition of sulfur dioxide. Production of wine labeled “organic” remains low, relative to wine labeled “made with organic grapes” that has sulfur dioxide added, and it is not clear whether removal of the tartrate salts prior to use of sulfur dioxide is a viable pathway for production. One certifier commented that tartrate salts are formed during wine storage, after fermentation is complete, and sulfur dioxide is typically added throughout the process, so it wouldn’t be possible to remove the tartrates prior to addition of sulfur dioxide. Accordingly, there does not appear to be capacity for significant production of organic tartaric acid, so long as the rules for wine made from organic grapes remain in their current form.

For pH adjustment, citric acid and malic acid can be used; however, they impart certain flavors to the product. If a grape flavor is needed, tartaric acid would be the first choice. Several certifiers certify operations that currently use tartaric acid, including one certifier reporting that 77 members use it.

Due to low impacts on human health and the environment and the advantageous qualities that tartaric acid lends to baked goods, wines, and other products, and widespread use among certified operations, tartaric acid is a good candidate for relisting. However, a commenter noted that numerous synthetic pesticides are used in nonorganic production of wine grapes, and the Handling Subcommittee encourages the industry to continue exploring ways to increase production of organic tartaric acid.

Questions to our Stakeholders

None

Justification for Vote

The Subcommittee finds tartaric acid **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove tartaric acid from the National List

Motioned by: Allison Johnson

Seconded by: Kathryn Deschenes

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Cellulose

Reference: § 205.605(b)(11) Cellulose (CAS #9004-34-6)—for use in regenerative casings, powdered cellulose as an anti-caking agent (non-chlorine bleached) and filtering aid. Microcrystalline cellulose is prohibited.

Technical Report: [2001 TAP](#); [2016 TR](#)

Petition(s): [2001](#)

Past NOSB Actions: [10/2001 meeting minutes and vote](#); [11/2007 recommendation](#); [05/2012 recommendation](#); [11/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: National List amended 11/03/2003 ([68 FR 62215](#)); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Annotation change effective 12/27/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

In the powdered form, cellulose is used as a processing aid for filtration of juices and an anti-caking agent ingredient for use in shredded cheese. Regenerated cellulose casings are used for peelable/non-edible hot dog and sausage casings. Some of these uses in organic handling have been around since before the enacting of OFPA, with cellulose allowed by certifiers in organic cheeses since 1994 and for use in organic meat products since 1999.

Manufacture

Cellulose is available in several different forms, each with varying functional qualities used for multiple purposes in organic handling. There are two specific forms of cellulose currently permitted for use in organic processing and handling: amorphous powdered cellulose and inedible cellulose casing.

Cellulose in its natural form is the main structural component of higher plant cell walls and one of the most abundant organic substances on earth [2016 TR, lines 55-56]. Most commercially available cellulose (powdered) is produced from wood pulp or other plant sources, e.g., corn cobs, soybean hulls, oat hulls, rice hulls, sugar beet pulp, etc. The plant material goes through a delignification process that results in a chemically changed synthetic substance. The original process for making regenerated cellulose casing, the viscose method, dates to the 1890's and converts cellulose fibers into regenerated fibers and films. With some minor changes to the process, it is still in use today. Cellulose is considered Generally Regarded as Safe GRAS under 21 CFR 121.101 [2016 TR, line 320].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- For collagen casings, collagen shall be derived from animal sources. If derived from cattle, collagen shall be guaranteed free of Specified Risk Material (SRM). Other ingredients (such as, but not limited to cellulose, calcium coatings, glycerin, etc.) added to collagen casings during their manufacture that remain in the collagen casing when it is used shall respect the requirement provided in 1.4 a) of CAN/CGSB-32.310. Permitted for poultry sausage (Table 6.4 – Ingredients not classified as food additives, CAN/CGSB-32.311-2020).
- Cellulose is permitted as a filtering aid (non-chlorine bleached) and for use in inedible regenerative sausage casings. The TCF (Totally Chlorine Free) method of bleaching is permitted (Table 6.5 – Processing aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- Cellulose is permitted in gelatine (Authorized food additives and processing aids, EC No. 2021/1165).
- Cellulose is permitted in products of plant origin and gelatine (Processing aids and other products, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- Cellulose is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Cellulose is permitted as a processing and post-harvest handling aid (Table 1 - List of Approved Additives and Processing/Post-Harvest Handling Aids, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- Powdered cellulose is limited to the use as a filter aid in processed products of plant origin (Table A.1 – Additives, JAS for Organic Processed Foods).

Ancillary Substances

The 2016 TR referenced three sources of commercially available cellulose that do not include any ancillary substances [2016 TR, line 133], yet suggested that the inclusion of ancillary substances potentially increased functional efficacy. The 2016 TR provided additional information about the use of ancillary substances [2016 TR, lines 131-154]. Some examples are polymers and co-polymers that improve absorption, increase or decrease viscosity, and increase yield. Food grade filtering systems composed mainly of cellulose may also include various polymers or substances like fiberglass for ease of handling, or to increase throughput. Enzymes may improve the shelf life of grated cheeses that use cellulose as an anti-caking agent, although cellulose without additives is commercially available and clearly identified. Sausage casings, including those made from regenerated cellulose, may be lubricated with vegetable, animal or mineral oil in the shirring process. Synthetic sausage casings may be formulated with mineral oil, propylene glycol and lecithin. Regenerated cellulose sausage casings are commercially available without additives.

Ancillary items were discussed at the 2016 meeting in St. Louis, where the NOSB decided that a proposal on ancillary items was needed. The subcommittee prepared a January 3, 2017 proposal titled [Ancillary Substances Permitted in Cellulose](#), which listed 6 functional classes of ancillary substances for cellulose: shirring aid, humectant, coating, coating with Ph control, peeling aid, and synthetic binder. The proposal states that any ancillary items in these classes would not need to be reviewed, while a new functional class of ancillary substances would need to be reviewed. At the 2017 Spring meeting, in Denver the proposal was sent back to subcommittee because it contained mistakes (e.g. vinyl chloride was listed as an ancillary substance). At the [Fall 2017 meeting](#), the Handling subcommittee chair reported that work would not continue on this topic, and that it would be better to work on ancillary substances in cellulose after the NOP finishes their review of ancillary substances. At the previous sunset review, ancillary substances were not discussed. The [2024 Research Priorities](#) of the NOSB included the following statement (page 157): *Research on the creation of an overarching ancillary ingredient review process for materials used in processing and handling vs reviewing ancillaries as part of the petition or sunset review process, including cost/benefit of each process.*

Human Health and Environmental Issues

During previous reviews, public comment, as well as the 2016 TR, raised concerns regarding the use of wood pulp as a source for cellulose and the environmental impact that logging of primary forests and replacement with monoculture plantations may have. Concerns were also raised about environmental problems caused by waste cellulose generated from food processing. The 2016 TR states that conversion of cellulosic food wastes, as well as cellulose waste from filtration aids and/or spent casings, into useful products is the subject of research. The research is based more on seeking to add value, but is also driven by environmental concerns, rising disposal costs, and governmental regulations [2016 TR, lines 396-401].

<https://uscode.house.gov/view.xhtml?path=/prelim@title7/chapter94&edition=prelimhttps://uscode.house.gov/view.xhtml?path=/prelim@title7/chapter94&edition=prelim>

Discussion

Most of the past discussions pertained to the text of the previous sunset review, where ancillary substances were listed in a table by functional class. A previous sunset review questioned whether cellulose manufacture requires ancillary substances, and it was not resolved.

During the Spring 2026 NOSB meeting, one certifier commented that for their clients using cellulose, the casings contain ancillary substances while the powders generally do not. Another commentator noted that the most common ancillary substances used in cellulose were dextrose and enzymes when used for an anti-caking agent. In regenerative casings, glycerin and mineral oil were commonly used as ancillary ingredients. Public comments overall supported the relisting of cellulose. One commenter opposed to the relisting stated that cellulose is generally derived from wood pulp, which involves the clearing of natural ecosystems, and should be delisted. Commenters noted the specific usage of cellulose essential for casings, as an anti-caking agent in shredded cheese, and as a filtering aid for maple syrup production. The Subcommittee reviewed the ancillary substances used in the manufacture of cellulose and concluded that they pose minimal concerns and do not affect the substance's compatibility with organic production and handling.

Questions to our Stakeholders

1. What alternatives to cellulose are currently available?

Justification for Vote

The Subcommittee finds cellulose **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove cellulose from the National List

Motioned by: Amanda Felder

Seconded by: Allison Johnson

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Chlorine materials – Calcium hypochlorite

Reference: § 205.605(b)(12) Chlorine materials - disinfecting and sanitizing food contact surfaces, equipment and facilities may be used up to maximum labeled rates. Chlorine materials in water used in direct crop or food contact are permitted at levels approved by the FDA or EPA for such purpose, provided the use is followed by a rinse with potable water at or below the maximum residual disinfectant limit for the chlorine material under the Safe Drinking Water Act. Chlorine in water used as an ingredient in organic food handling must not exceed the maximum residual disinfectant limit for the chlorine material under the Safe Drinking Water Act.

(i) Calcium hypochlorite

Technical Report: [2006 TR \(Chlorine materials- Handling\)](#); [2011 TR - Crops](#); 2025 TR (pending post)

Petition(s): N/A

Past NOSB Actions: [10/1995 NOSB minutes and vote](#); [04/2006 sunset recommendation](#); [10/2010 sunset recommendation](#); [10/2015 sunset review](#); [11/2017 sunset review](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to National List 02/20/2001 ([65 FR 80547](#)); Amendment to annotation effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 10/30/2019 ([84 FR 53577](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Calcium hypochlorite is an Environmental Protection Agency (EPA)-registered pesticide (OPP Nos. 014701). Calcium hypochlorite is an antimicrobial disinfectant and pesticide used to control harmful microorganisms including bacteria, viruses, and fungi on inanimate objects and surfaces primarily in indoor environments. It is allowed for disinfecting and sanitizing food contact surfaces. Residual chlorine levels for wash water in direct crop or food contact and in flush water from cleaning irrigation systems that is applied to crops or fields cannot exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (SDWA) (currently 4mg/L expressed as Cl₂) [2006 TR, lines 77-79].

Calcium hypochlorite is an "indirect" food additive approved by Food and Drug Administration ([FDA](#)). Calcium hypochlorite may be used as a final sanitizing rinse on food processing equipment (21 CFR 178.1010). Hypochlorites also can be used in postharvest, seed, or soil treatment on various fruit and vegetable crops [2006 TR, lines 93-99].

For organic food handling facilities and equipment, chlorine materials may be used up to maximum-labeled rates for disinfecting and sanitizing food contact surfaces. Rinsing is not required unless mandated by the label use directions. Water used in direct post-harvest crop or food contact (including flume water to transport fruits or vegetables, wash water in produce lines, egg or carcass washing) is permitted to contain chlorine materials at levels approved by the FDA or the EPA for such purposes. Rinsing with potable water that does not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA must immediately follow this permitted use. Certified operators should monitor the chlorine level of the final rinse water, the point at which the water last contacts the organic product. The level of chlorine in the final rinse water must meet limits as set forth by the SDWA. Water used as an ingredient in organic food handling should not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA, as required by the Organic Food Production Act (7 U.S.C. 6510(a)(7)).

In water, sodium and calcium hypochlorite separate into sodium, calcium, and hypochlorite ions and hypochlorous acid molecules. Hypochlorous acid molecules are neutral and small in size. As a result, when hypochlorous acid molecules exist in equilibrium with the hypochlorite ions, they easily diffuse through the cell walls of bacteria. This changes the oxidation-reduction potential of the cell and inactivates triphosphate dehydrogenase, an enzyme which is essential for the digestion of glucose. Inactivation of this enzyme effectively destroys the microorganism's ability to function [2006 TR, lines 117-122].

Manufacture

Calcium hypochlorite is produced by passing chlorine gas over slaked lime. It is then separated from the coproduct, calcium chloride, and air dried or vacuum dried [2006 TR, lines 151-152].

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- The following chlorine compounds are permitted: a) **calcium hypochlorite**; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite. Shall not exceed maximum levels for safe drinking water. Chlorine compounds may be used: a) for wash water in direct contact with crops or food; b) in flush water from cleaning irrigation systems, equipment, storage or transport units—application to crops or fields is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).

- The following chlorine compounds are permitted up to maximum label rates: a) **calcium hypochlorite**; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Calcium hypochlorite** is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Calcium hypochlorite** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Calcium hypochlorite** is permitted with the following limitation: an intervening event or action must occur to eliminate risks of contamination (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Calcium hypochlorite** is not explicitly mentioned in the regulations.

Ancillary Substances

Other substances are sometimes added to chlorine materials in order to stabilize the formula.

Human Health and Environmental Issues

Chlorine sanitizing compounds currently on the National List are strong oxidants and can pose serious risks to human health if acute high exposures occur or from chronic lower-level exposures – especially in occupational environments when these materials are used on a daily basis. These compounds are dermal, respiratory, ocular, and mucous membrane irritants. Sodium hypochlorite (bleach) can cause asthma, as classified by the Association of Occupational and Environmental Clinics. Given the similar chemistries and mechanisms of action, other chlorine-based oxidant sanitizers, already known to be respiratory irritants, also likely cause asthma. Chlorine compounds are toxic to fish and other aquatic organisms. Strict adherence to the label is required when used, including the use of personal protective equipment when appropriate. Use of chlorine compounds in organic processing and crop production have been reviewed in a 2006, 2011, and 2025 Technical Reports (TR) (referenced above).

Discussion

Calcium hypochlorite has historically been viewed by organic stakeholders as an important sanitation tool because of its ability to provide a reliable source of available chlorine for microbial control in agricultural water systems and food production environments. Technical reviews describe it as one of the most widely used chlorine-based disinfectants, with hundreds of EPA-registered products and long-standing use in water treatment, sanitation, and disinfection applications. Because it is relatively stable in dry form and can generate high levels of available chlorine when dissolved, it is commonly used where operators need a strong antimicrobial intervention.

Supportive comments generally emphasize that calcium hypochlorite plays a critical role in managing food safety hazards. Stakeholders from food production and handling sectors argue that the material is effective, familiar to operators, broadly accepted by regulators, and economically practical compared with some alternative technologies. Commenters supporting continued listing often note that microbial contamination events can have serious public health consequences and that chlorine materials—including

calcium hypochlorite—remain among the most validated and widely understood sanitation tools available to organic operations. These commenters typically support maintaining the current organic allowance, provided Safe Drinking Water Act residual limits continue to apply.

In contrast, some public comments question whether the continued listing of calcium hypochlorite should be assumed without a broader review of sanitizer needs. Several commenters, particularly environmental and organic advocacy groups, have argued that NOSB should examine whether reliance on chlorine chemistry remains necessary given the emergence of alternative sanitation systems. Their position is not necessarily that calcium hypochlorite is ineffective; rather, they contend that the organic program should periodically revisit whether less chemically intensive approaches could achieve similar outcomes. These commenters frequently call for a more comprehensive review of sanitizers and disinfectants as a class before reauthorizing chlorine materials for another sunset period.

Another recurring topic related to calcium hypochlorite is the distinction between sanitation of equipment and facilities versus direct contact with crops and foods. Historically, confusion arose because the National List annotations and subsequent regulatory language did not always clearly distinguish between these uses. NOP 5026 was developed specifically to address interpretation issues and clarify that chlorine-containing water may be used in certain direct-contact applications provided residual chlorine levels do not exceed the Safe Drinking Water Act maximum residual disinfectant limit. Nevertheless, subsequent petitions and comments indicate that questions persisted regarding how these provisions apply in practice. Since calcium hypochlorite is commonly used for water disinfection, it became indirectly implicated in many of these discussions.

Commenters also raised questions regarding the concept of essentiality, an OFPA review criterion. Some stakeholders asked whether all currently listed chlorine materials, including calcium hypochlorite, are necessary because other disinfectants may be available. However, the record does not reflect a consensus that alternatives can adequately replace calcium hypochlorite in every use pattern. In fact, supporters argue that having multiple chlorine materials available provides flexibility because different facilities, water chemistries, application systems, and operational conditions may favor one chlorine chemistry over another. Thus, many industry participants have viewed calcium hypochlorite not merely as interchangeable with other sanitizers but as part of an overall sanitation toolkit that allows operators to manage site-specific needs.

A further theme in the comments concerns regulatory consistency. Some commenters observed that municipal water supplies routinely contain disinfectant residuals generated from chlorine materials. As a result, stakeholders questioned whether it is logical to allow food operations to use water already treated with chlorine while restricting producers' ability to apply the same treatment directly under controlled conditions.

Key Issues Specifically Associated with Calcium Hypochlorite in Comments

Arguments supporting continued use

- Proven antimicrobial effectiveness in water treatment and sanitation.
- Long regulatory history and extensive industry familiarity.
- Important for irrigation systems, agricultural water, facilities, and equipment sanitation.
- Supports food safety objectives in organic production and handling.

Concerns raised by commenters

- Need for a broader assessment of alternatives prior to continued relisting.
- Questions regarding whether all chlorine materials remain essential under organic principles.
- Continued confusion regarding direct-contact versus non-food-contact uses.

- Desire for greater consistency among certifiers and reviewers interpreting NOP 5026 and National List annotations.

The public record does not reveal major controversy unique to calcium hypochlorite itself. Rather, comments portray calcium hypochlorite as a representative chlorine material caught within a broader policy debate. Stakeholders generally agree that it is an effective and important sanitizer. The disagreement centers on whether organic regulations clearly define its permissible uses, whether alternative sanitation approaches should receive greater consideration, and whether continued listing of chlorine materials is justified under organic essentiality criteria. The most consistent concern expressed across comments is not the performance of calcium hypochlorite, but the need for clearer regulatory language and a more comprehensive evaluation of chlorine sanitizers within the organic system.

Questions to our Stakeholders

1. Does calcium hypochlorite present unique worker safety, environmental, or handling concerns compared with other chlorine materials?
2. Have you experienced differences in how certifiers interpret or enforce the organic requirements for chlorine use? If so, please describe the specific issue(s) and how the interpretations differed.

Justification for Vote

The Subcommittee finds calcium hypochlorite **compliant** with the Organic Foods Production Act (OFPA) (7 U.S.C. 6518(m) and 6517) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove calcium hypochlorite from the National List

Motioned by: Kathryn Deschenes

Seconded by: Andrea Hatziyannis

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Chlorine materials – Chlorine dioxide

Reference: § 205.605(b)(12) Chlorine materials - disinfecting and sanitizing food contact surfaces, equipment and facilities may be used up to maximum labeled rates. Chlorine materials in water used in direct crop or food contact are permitted at levels approved by the FDA or EPA for such purpose, provided the use is followed by a rinse with potable water at or below the maximum residual disinfectant limit for the chlorine material under the Safe Drinking Water Act. Chlorine in water used as an ingredient in organic food handling must not exceed the maximum residual disinfectant limit for the chlorine material under the Safe Drinking Water Act.

(ii) Chlorine dioxide

Technical Report: [2006 TR \(Chlorine materials\)](#); [2011 TR - Crops](#); 2025 TR (pending post)

Petition(s): N/A

Past NOSB Actions: [10/1995 NOSB minutes and vote](#); [04/2006 sunset recommendation](#); [10/2010 sunset recommendation](#); [10/2015 sunset review](#); [11/2017 sunset review](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to National List 02/20/2001 ([65 FR 80547](#)); Amendment to annotation effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 10/30/2019 ([84 FR 53577](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Chlorine dioxide is an antimicrobial disinfectant and pesticide used to control harmful microorganisms including bacteria, viruses, and fungi on inanimate objects and surfaces primarily in indoor environments [2006 TR, lines 66-67]. It is allowed for disinfecting and sanitizing food contact surfaces. Residual chlorine levels for wash water in direct crop or food contact and in flush water from cleaning irrigation systems that is applied to crops or fields cannot exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (SDWA) (currently 4mg/L expressed as Cl_2).

For organic food handling facilities and equipment, chlorine materials may be used up to maximum-labeled rates for disinfecting and sanitizing food contact surfaces. Rinsing is not required unless mandated by the label use directions. Water used in direct post-harvest crop or food contact (including flume water to transport fruits or vegetables, wash water in produce lines, egg or carcass washing) is permitted to contain chlorine materials at levels approved by the Food and Drug Administration (FDA) or the Environmental Protection Agency (EPA) for such purposes. Rinsing with potable water that does not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA must immediately follow this permitted use. Certified operators should monitor the chlorine level of the final rinse water, the point at which the water last contacts the organic product. The level of chlorine in the final rinse water must meet limits as set forth by the SDWA. Water used as an ingredient in organic food handling should not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA, as required by the Organic Food Production Act (7 U.S.C. 6510(a)(7)).

Chlorine dioxide is a strong oxidant. It is likely a better bactericide than hypochlorous acid. In general, the disinfection efficiency of chlorine dioxide decreases as temperature decreases [2011 TR, lines 149-150].

Manufacture

To form chlorine dioxide, sodium chlorate (NaClO_3) and sulfuric acid (H_2SO_4) are reacted with sulfur dioxide (SO_2), or chloric acid is reacted with methanol (CH_3OH). Alternatively, chlorine dioxide can be formed with chlorine (Cl_2) and sodium chlorite; sodium hypochlorite with hydrochloric acid; potassium chlorate with sulfuric acid; or by passing nitrogen dioxide through a column of sodium chlorate [2011 TR, lines 206-210].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- Teat dips and udder wash are permitted. Substances, such as alcohol, iodine, hydrogen peroxide, **chlorine dioxide** and ozone, can be used as disinfectants for a pre- or post-teat dip or udder wash if they are registered for this use by Canada's Food and Drug Regulations. Chlorhexidine can be used as a post-milking teat dip if alternative germicidal agents and physical barriers have lost their effectiveness (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).
- The following chlorine compounds are permitted: a) calcium hypochlorite; b) **chlorine dioxide**; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite. Shall not exceed maximum levels for safe drinking water. Chlorine compounds may be used: a) for wash water in direct contact with crops or food; b) in flush water from cleaning irrigation systems, equipment, storage or transport units—application to crops or fields is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).
- The following chlorine compounds are permitted up to maximum label rates: a) calcium hypochlorite; b) **chlorine dioxide**; c) hypochlorous acid generated via electrolyzed water; d)

sodium hypochlorite (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- **Chlorine dioxide** is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Chlorine dioxide** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Chlorine dioxide** is permitted with the following limitation: an intervening event or action must occur to eliminate risks of contamination (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Chlorine dioxide** is not explicitly mentioned in the regulations.

Ancillary Substances

Other substances are sometimes added to chlorine materials in order to stabilize the formula.

Human Health and Environmental Issues

Chlorine sanitizing compounds currently on the National List are strong oxidants and can pose serious risks to human health if acute high exposures occur or from chronic lower-level exposures – especially in occupational environments when these materials are used on a daily basis. These compounds are dermal, respiratory, ocular, and mucous membrane irritants. Sodium hypochlorite (bleach) can cause asthma, as classified by the Association of Occupational and Environmental Clinics. Given the similar chemistries and mechanisms of action, other chlorine-based oxidant sanitizers, already known to be respiratory irritants, also likely cause asthma. Chlorine compounds are toxic to fish and other aquatic organisms. Strict adherence to the label is required when used, including the use of personal protective equipment when appropriate. Use of chlorine compounds in organic processing and crop production have been reviewed in the 2006, 2011, and 2025 Technical Reports (TR) (referenced above).

Discussion

Among the four chlorine materials listed under the National Organic Program (NOP), **chlorine dioxide** occupies a somewhat distinctive position because it is often viewed by stakeholders as a technologically different disinfectant than traditional hypochlorite chemistries, even though it is regulated within the same "chlorine materials" category. Technical reviews describe chlorine dioxide as a strong oxidizing antimicrobial used in water treatment, food processing, agricultural water systems, equipment sanitation, and facility disinfection. Unlike sodium hypochlorite and calcium hypochlorite, chlorine dioxide acts through a different oxidation mechanism and is often valued for its effectiveness across a broad pH range and its ability to control microbial contamination in challenging water conditions.

Public comments submitted during the Spring 2026 NOSB sunset reviews and chlorine-material discussions generally acknowledge chlorine dioxide as an effective sanitation tool with a long history of use in food safety applications. Stakeholders supporting continued listing frequently emphasize that organic operations exist within a broader food safety framework that requires robust pathogen controls. These commenters argue that chlorine dioxide remains an important option because it provides effective microbial reduction while allowing operations flexibility to select the most appropriate disinfectant technology for their specific process, facility design, water quality conditions, and regulatory obligations.

From this perspective, removal of chlorine dioxide could unnecessarily limit sanitation options available to certified organic operations.

A recurring theme in supportive comments is the belief that chlorine dioxide fills operational needs that may not always be met by other chlorine materials. Stakeholders note that water quality varies considerably among agricultural and food handling operations. Because chlorine dioxide performs differently from hypochlorite-based disinfectants, commenters argue that maintaining multiple chlorine chemistries provides useful flexibility for controlling microbial contamination under different production scenarios. Although the public record generally discusses chlorine materials collectively, supporters often point to the broader principle that maintaining several approved sanitizers helps organic operations tailor sanitation programs to site-specific risks rather than relying on a single chemistry.

At the same time, chlorine dioxide has been drawn into the broader policy debate surrounding the role of sanitizers in organic systems. Environmental organizations and some organic advocacy groups have repeatedly argued that NOSB should undertake a more comprehensive evaluation of disinfectants and sanitizers before continuing chlorine material listings. Their comments are generally not directed specifically at chlorine dioxide's efficacy. Rather, they question whether the organic program has fully examined whether alternative substances, non-chemical interventions, improved sanitation management systems, or preventive food safety practices could reduce dependence on chlorine-based disinfectants overall. In these comments, chlorine dioxide is evaluated alongside calcium hypochlorite, hypochlorous acid, and sodium hypochlorite as part of a larger discussion about the future role of sanitation chemicals within organic production and handling.

Some commenters have also raised questions regarding essentiality, one of the key considerations used during NOSB review. These stakeholders ask whether chlorine dioxide, together with other chlorine materials, remains indispensable to organic production and handling or whether equivalent outcomes could be achieved through other allowed materials. However, the public comments reviewed do not establish a consensus that substitutes can fully replace chlorine dioxide across all uses. Indeed, technical reviews continue to identify a variety of applications in which chlorine materials play important roles in water treatment and microbial control. As a result, NOSB discussions have generally focused more on clarifying conditions of use than on eliminating chlorine dioxide from the National List.

One of the most significant regulatory issues affecting chlorine dioxide has involved interpretation of allowed uses rather than concerns about the substance itself. NOP Guidance 5026 was developed because certifiers and industry participants expressed uncertainty regarding whether chlorine materials could be used solely for disinfecting food-contact surfaces or whether they could also be used in direct crop, food, or animal-contact applications. The guidance clarified that chlorine-containing water may be used in direct-contact situations, provided residual chlorine levels comply with Safe Drinking Water Act limits. As one of the chlorine materials listed under the National List, chlorine dioxide became part of these broader discussions concerning the scope of allowed direct-contact uses.

Another theme appearing in public comments is the relationship between chlorine dioxide and municipal water treatment systems. Stakeholders have pointed out that many organic operations routinely use water that has already been disinfected using chlorine-based technologies. Consequently, several commenters questioned whether it is reasonable to permit the use of municipally treated water while restricting an organic producer's ability to apply similar water treatment methods directly. This argument has often been used to support retention of chlorine materials, including chlorine dioxide, particularly when their use results in water that remains within established drinking-water safety standards.

Major Themes Emerging from Public Comments

Supportive comments emphasized:

- Strong antimicrobial efficacy and broad utility in sanitation and water treatment.
 - Operational flexibility for food processors, handlers, and agricultural producers.
 - Importance of maintaining multiple disinfectant tools to address varying water and facility conditions.
- Consistency with food safety objectives and existing public health standards.

Critical or cautionary comments emphasized:

- Need for broader review of sanitizer and disinfectant policies in organic production.
 - Evaluation of alternatives before concluding chlorine materials remain essential.
 - Continued confusion concerning direct-contact versus non-contact uses.
- Inconsistent interpretation among certifiers and industry stakeholders.

The public record suggests that chlorine dioxide itself has generated relatively little material-specific criticism. Instead, it is most often discussed as part of the larger chlorine-materials category. Most stakeholders appear to recognize its value as an effective disinfectant and water treatment technology. The primary policy questions raised in comments concern regulatory clarity, consistency of interpretation, the availability of alternatives, and whether the organic program has sufficiently evaluated the long-term necessity of chlorine-based sanitizers. Consequently, discussions of chlorine dioxide within NOSB and NOP proceedings have focused less on concerns about the chemical itself and more on defining where, when, and under what conditions chlorine materials should be allowed within organic production and handling systems.

Questions to our Stakeholders

1. Does calcium dioxide present unique worker safety, environmental, or handling concerns compared with other chlorine materials?
Have you experienced differences in how certifiers interpret or enforce the organic requirements for chlorine use or forms of chlorine dioxide? If so, please describe the specific issue(s) and how the interpretations differed.

Justification for Vote

The Subcommittee finds chlorine dioxide **compliant** with the Organic Foods Production Act (OFPA) (7 U.S.C. 6518(m) and 6517) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove chlorine dioxide from the National List

Motioned by: Kathryn Deschenes

Seconded by: Amanda Felder

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Chlorine materials – Hypochlorous acid – generated from electrolyzed water

Reference: § 205.605(b)(12) Chlorine materials - disinfecting and sanitizing food contact surfaces, equipment and facilities may be used up to maximum labeled rates. Chlorine materials in water used in direct crop or food contact are permitted at levels approved by the FDA or EPA for such purpose, provided the use is followed by a rinse with potable water at or below the maximum residual disinfectant limit for the chlorine material under the Safe Drinking Water Act. Chlorine in water used as an ingredient in organic food handling must not exceed the maximum residual disinfectant limit for the chlorine material under the Safe Drinking Water Act.

(iii) Hypochlorous acid - generated from electrolyzed water.

Technical Report: [2006 TR \(Chlorine materials - Handling\)](#); [2011 TR - Crops](#); [2015 TR](#); 2025 TR (pending post)

Petition(s): [2015](#)

Past NOSB Actions: [2016 NOSB Recommendation to add](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Hypochlorous acid is an antimicrobial disinfectant and pesticide used to control harmful microorganisms including bacteria, viruses, and fungi on inanimate objects and surfaces primarily in indoor environments. It is allowed for disinfecting and sanitizing food contact surfaces. Residual chlorine levels for wash water in direct crop or food contact and in flush water from cleaning irrigation systems that is applied to crops or fields cannot exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (SWDA) (currently 4mg/L expressed as Cl₂).

For organic food handling facilities and equipment, chlorine materials may be used up to maximum-labeled rates for disinfecting and sanitizing food contact surfaces. Rinsing is not required unless mandated by the label use directions. Water used in direct post-harvest crop or food contact (including flume water to transport fruits or vegetables, wash water in produce lines, egg or carcass washing) is permitted to contain chlorine materials at levels approved by the Food and Drug Administration (FDA) or the Environmental Protection Agency (EPA) for such purposes. Rinsing with potable water that does not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA must immediately follow this permitted use. Certified operators should monitor the chlorine level of the final rinse water, the point at which the water last contacts the organic product. The level of chlorine in the final rinse water must meet limits as set forth by the SDWA. Water used as an ingredient in organic food handling should not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA, as required by the Organic Food Production Act (7 U.S.C. 6510(a)(7)).

Hypochlorous acid molecules are neutral and small in size. As a result, when hypochlorous acid molecules exist in equilibrium with hypochlorite ions, they easily diffuse through the cell walls of bacteria. This changes the oxidation-reduction potential of the cell and inactivates triphosphate dehydrogenase, an enzyme which is essential for the digestion of glucose. Inactivation of this enzyme effectively destroys the microorganism's ability to function [2006 TR, lines 118-122].

Manufacture

Electrolyzed water (EW) is the product of the electrolysis of a dilute sodium chloride solution in an electrolysis cell containing a semi-permeable membrane that physically separates the anode and cathode but permits ions to pass through. In the process, hypochlorous acid, hypochlorite ion, and hypochlorite acid are formed at the anode, and sodium hydroxide is formed at the cathode. The solution formed on the anode side is acidic EW (pH 2 to 6), and the solution formed on the cathode side is basic EW (pH 7.5 to 13). Neutral EW, with a pH of 6 to 7.5 is produced by mixing the anodic solution with hydroxide, or by using a single-cell chamber for electrolysis. [2006 TR lines 48-68].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- The following chlorine compounds are permitted: a) calcium hypochlorite; b) chlorine dioxide; c) **hypochlorous acid generated via electrolyzed water**; d) sodium hypochlorite. Shall not exceed maximum levels for safe drinking water. Chlorine compounds may be used: a) for wash water in direct contact with crops or food; b) in flush water from cleaning irrigation systems, equipment, storage or transport units—application to crops or fields is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).
- The following chlorine compounds are permitted up to maximum label rates: a) calcium hypochlorite; b) chlorine dioxide; c) **hypochlorous acid generated via electrolyzed water**; d) sodium hypochlorite (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Hypochlorous acid** is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Hypochlorous acid** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Hypochlorous acid** is not explicitly mentioned in the regulations.

Japan Agricultural Standard (JAS) for Organic Production

- Any substances other than **hypochlorous acid water** and sodium hypochlorite, both of which are specified in Table D.1, should not be used for the seeds specified in 5.6.1 (Seeds used in cultivation facilities of sprout, JAS 1605 Organic Products of Plant Origin).
- Sodium hypochlorite is permitted with the following criteria: limited to the use in processed products of plant origin (limited to the use of **hypochlorous acid water** produced by electrolyzing salt water (limited to the use of salt containing 99% or more sodium chloride)), or the use for disinfecting the intestines of livestock animals for processed meat products, or cleaning of eggs (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- **Hypochlorous acid water** is permitted with the following criteria: limited to the use only for the purpose of disinfecting meat in the process of dismantling or cleaning eggs (Table K.1 - Substances for preparation or other purposes, JAS 1608 Organic Livestock Products).

Ancillary Substances

Other substances are sometimes added to chlorine materials in order to stabilize the formula.

Human Health and Environmental Issues

Hypochlorous acid, generated from electrolyzed water, is present in solutions of two chlorine sanitizers (sodium hypochlorite and calcium hypochlorite) currently allowed at § 205.601(a)(2)(i, ii). Like other chlorine compounds, hypochlorous acid is also an oxidant and can pose risks to human health. Strict adherence to the label is required when used, including the use of personal protective equipment when appropriate. Use of chlorine compounds in organic processing and crop production have been reviewed in the 2006, 2011, and 2025 Technical Reports (TR) (referenced above.).

As formulated via electrolyzed water, hypochlorous acid is effective as a sanitizer at a lower chlorine concentration and is likely safer for health and the environment than other currently listed chlorine sanitizers.

Discussion

Of the chlorine materials currently listed under the National Organic Program (NOP), hypochlorous acid (HOCl) occupies a somewhat unique position because it is both a specifically listed chlorine material and the primary antimicrobial species responsible for much of the sanitizing activity associated with chlorine-based disinfection systems. Technical reviews describe hypochlorous acid as an effective oxidizing antimicrobial used in food processing, produce washing, water treatment, and equipment sanitation. In recent years, it has gained increasing attention because it can be generated on-site and is often marketed as a more targeted sanitation technology than traditional bleach-based products.

Unlike calcium hypochlorite and sodium hypochlorite, which are often viewed simply as chlorine-releasing compounds, hypochlorous acid is frequently discussed by industry participants as a distinct sanitation technology. Stakeholders supporting its continued listing generally describe it as an effective tool that enables organic operators to achieve food safety objectives while minimizing operational challenges associated with other disinfectants. Public comments and technical reviews consistently recognize that food processors and produce handlers face increasing pressure to implement validated pathogen-control programs, and supporters argue that hypochlorous acid provides an important option within that broader food-safety framework.

A recurring argument from supporters is that hypochlorous acid contributes to operational flexibility. Organic operations vary considerably in size, water quality, product type, and sanitation needs. Commenters often emphasize that maintaining access to multiple chlorine materials allows operators to select technologies that best fit their facilities and processes. In this context, hypochlorous acid is viewed as one component of a broader sanitation toolkit rather than a stand-alone replacement for all other disinfectants. Technical reviews and stakeholder discussions suggest that many operators value having access to several chlorine-based antimicrobial approaches because microbial risks and treatment conditions differ substantially across production systems.

At the same time, hypochlorous acid has been included in broader public debates about whether chlorine materials, as a class, continue to satisfy organic principles of essentiality and compatibility. Some

commenters have argued that NOSB should conduct a more comprehensive review of sanitizers and disinfectants before routinely renewing chlorine materials. Their concern is generally not directed specifically at hypochlorous acid; rather, it reflects a larger policy question regarding the role of synthetic antimicrobial substances within organic systems. These stakeholders frequently encourage greater emphasis on preventive sanitation practices, improved facility management, and alternative antimicrobial technologies before concluding that chlorine-based materials remain indispensable.

An important element of the public discussion involves the perception that hypochlorous acid may differ from other chlorine materials in terms of its use profile and how it is viewed by operators. Some stakeholders describe it as a newer or more refined sanitation tool compared with traditional bleach-type chemistries. Nevertheless, regulatory treatment under the National List has generally grouped hypochlorous acid together with calcium hypochlorite, chlorine dioxide, and sodium hypochlorite. As a result, most NOSB discussions have evaluated hypochlorous acid under the broader category of "chlorine materials" rather than conducting a completely separate policy analysis for the substance.

A substantial portion of public discussion involving hypochlorous acid has focused on regulatory interpretation rather than technical performance. NOP Guidance 5026 was originally issued because confusion existed regarding where chlorine materials could be used and how residual chlorine restrictions should be applied. The guidance clarified that chlorine-containing water may be used in certain direct-contact applications—including food, crop, and animal-contact situations—provided that residual chlorine levels remain within Safe Drinking Water Act limits. Because hypochlorous acid is often used in water-based disinfection systems, questions concerning direct-contact applications have been particularly relevant to its use.

Another theme emerging from public comments is the relationship between hypochlorous acid and alternative sanitizing technologies. Stakeholders advocating continued listing frequently argue that the material remains highly useful because it supports microbial control in a variety of operational settings. Commenters questioning continued listing generally do not challenge its effectiveness; rather, they ask whether similar outcomes could be achieved through other approved substances or improved management systems. The public record does not demonstrate consensus that available alternatives can fully replace hypochlorous acid across all uses, and this uncertainty has contributed to support for maintaining access to multiple chlorine-based options.

A further issue relevant to hypochlorous acid is the broader discussion regarding consistency between organic regulations and public-water practices. Stakeholders have observed that many organic operations already rely on water that has undergone chlorine-based disinfection before reaching the farm or processing facility. Some commenters therefore argue that organic producers should retain the flexibility to use chlorine materials directly under controlled conditions, particularly when resulting residual levels remain within drinking-water standards. This reasoning has been cited as a justification for retaining chlorine materials generally, including hypochlorous acid, within organic production and handling systems.

Major Themes Emerging from Public Comments

Supportive comments emphasized:

- Strong antimicrobial effectiveness and utility in food safety and sanitation programs.
- Flexibility for handlers and processors.
- Value of maintaining multiple approved sanitation technologies.
- Consistency with Safe Drinking Water Act residual limits and established public-health practices.

Critical or cautionary comments emphasized:

- Need for broader review of sanitation materials and alternative approaches.
- Questions regarding whether chlorine materials as a group remain essential.
- Continued uncertainty regarding direct-contact uses.
- Desire for greater consistency among certifiers and organic reviewers implementing NOP policies.

The public record suggests that hypochlorous acid has generally been viewed favorably as an effective sanitation and antimicrobial tool, and relatively few commenters have raised concerns unique to the material itself. Most discussion instead places hypochlorous acid within the larger debate surrounding chlorine materials and organic sanitation policy. Stakeholders broadly recognize its usefulness for microbial control, while debate continues regarding regulatory clarity, essentiality, alternatives, and interpretation of direct-contact uses. Consequently, the most significant issues surrounding hypochlorous acid are not questions about efficacy, but rather ongoing efforts to clarify how chlorine materials should be reviewed, regulated, and applied within organic production and handling systems.

Questions to our Stakeholders

1. Does hypochlorous acid present unique worker safety, environmental, or handling concerns compared with other chlorine materials?
2. Have you experienced differences in how certifiers interpret or enforce the organic requirements for chlorine use? If so, please describe the specific issue(s) and how the interpretations differed.

Justification for Vote

The Subcommittee finds hypochlorous acid **compliant** with the Organic Foods Production Act (OFPA) (7 U.S.C. 6518(m) and 6517) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove hypochlorous acid from the National List

Motioned by: Kathryn Deschenes

Seconded by: Andrea Hatziyannis

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Chlorine materials – Sodium hypochlorite

Reference: § 205.605(b)(12) Chlorine materials - disinfecting and sanitizing food contact surfaces, equipment and facilities may be used up to maximum labeled rates. Chlorine materials in water used in direct crop or food contact are permitted at levels approved by the FDA or EPA for such purpose, provided the use is followed by a rinse with potable water at or below the maximum residual disinfectant limit for the chlorine material under the Safe Drinking Water Act. Chlorine in water used as an ingredient in organic food handling must not exceed the maximum residual disinfectant limit for the chlorine material under the Safe Drinking Water Act.

(iv) Sodium hypochlorite

Technical Report: [2006 TR \(Chlorine materials\)](#); [2011 TR - Crops](#); 2025 TR (pending post)

Petition(s): N/A

Past NOSB Actions: [10/1995 NOSB minutes and vote](#); [04/2006 sunset recommendation](#); [10/2010 sunset recommendation](#); [10/2015 sunset review](#); [11/2017 sunset review](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to National List 02/20/2001 ([65 FR 80547](#)); Amendment to annotation effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 10/30/2019 ([84 FR 53577](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Sodium hypochlorite is an EPA-registered pesticide (OPP No 014703). Sodium hypochlorite is an antimicrobial disinfectant and pesticide used to control harmful microorganisms including bacteria, viruses, and fungi on inanimate objects and surfaces primarily in indoor environments. It is allowed for disinfecting and sanitizing food contact surfaces. Residual chlorine levels for wash water in direct crop or food contact and in flush water from cleaning irrigation systems that is applied to crops or fields cannot exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (SDWA) (currently 4mg/L expressed as Cl₂).

Sodium hypochlorite is an "indirect" food additive approved by FDA. Sodium hypochlorite may be used as a final sanitizing rinse on food processing equipment (21 CFR 178.1010); sodium hypochlorite may be used in washing and lye peeling of fruits and vegetables (21 CFR 173.315). These hypochlorites also can be used in postharvest, seed, or soil treatment on various fruit and vegetable crops [2006 TR, lines 93-99].

For organic food handling facilities and equipment, chlorine materials may be used up to maximum-labeled rates for disinfecting and sanitizing food contact surfaces. Rinsing is not required unless mandated by the label use directions. Water used in direct post-harvest crop or food contact (including flume water to transport fruits or vegetables, wash water in produce lines, egg or carcass washing) is permitted to contain chlorine materials at levels approved by the FDA or the EPA for such purposes. Rinsing with potable water that does not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA must immediately follow this permitted use. Certified operators should monitor the chlorine level of the final rinse water, the point at which the water last contacts the organic product. The level of chlorine in the final rinse water must meet limits as set forth by the SDWA. Water used as an ingredient in organic food handling should not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA, as required by the Organic Food Production Act (7 U.S.C. 6510(a)(7)).

In water and soil, sodium and calcium hypochlorite separate into sodium, calcium, and hypochlorite ions and hydrochlorous acid molecules. Hypochlorous acid molecules are neutral and small in size. As a result, when hypochlorous acid molecules exist in equilibrium with the hypochlorite ions, they easily diffuse

through the cell walls of bacteria. This changes the oxidation-reduction potential of the cell and inactivates triphosphate dehydrogenase, an enzyme which is essential for the digestion of glucose. Inactivation of this enzyme effectively destroys the microorganism's ability to function [2006 TR, lines 117-122].

Manufacture

Generally, sodium hypochlorite is produced by reacting chlorine with a solution of sodium hydroxide (NaOH, also called lye or caustic soda). This method is used for most commercial productions of sodium hypochlorite. A more active, but less stable formulation of sodium hypochlorite can be produced by chlorinating a solution of soda ash (Na₂CO₃) [2006 TR, lines 156-159].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- The following chlorine compounds are permitted: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) **sodium hypochlorite**. Shall not exceed maximum levels for safe drinking water. Chlorine compounds may be used: a) for wash water in direct contact with crops or food; b) in flush water from cleaning irrigation systems, equipment, storage or transport units—application to crops or fields is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).
- The following chlorine compounds are permitted up to maximum label rates: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) **sodium hypochlorite** (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Sodium hypochlorite** is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Sodium hypochlorite** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Sodium hypochlorite** is permitted with the following limitation: an intervening event or action must occur to eliminate risks of contamination (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).
- **Sodium hypochlorite (e.g. as liquid bleach)** is permitted (Appendix 5: Substances for pest and disease control and disinfection in livestock housing and equipment, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- Any substances other than hypochlorous acid water and **sodium hypochlorite**, both of which are specified in Table D.1, should not be used for the seeds specified in 5.6.1 (Seeds used in cultivation facilities of sprout, JAS 1605 Organic Products of Plant Origin).
- **Sodium hypochlorite sodium chloride** is permitted with the following criteria: limited to those obtained by electrolyzing the salt solution (limited to those using salt containing no less than 99% sodium chloride) (Table D.1 - Substances for preparation etc., JAS 1605 Organic Products of Plant Origin).

- **Sodium hypochlorite** is permitted with the following criteria: limited to the use in processed products of plant origin (limited to the use of hypochlorous acid water produced by electrolyzing salt water (limited to the use of salt containing 99% or more sodium chloride)), or the use for disinfecting the intestines of livestock animals for processed meat products, or cleaning of eggs (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- **Sodium hypochlorite** is permitted with the following criteria: limited to the use only for the purpose of disinfecting meat in the process of dismantling or cleaning eggs (Table K.1 - Substances for preparation or other purposes, JAS 1608 Organic Livestock Products).

Ancillary Substances

Other substances are sometimes added to chlorine materials in order to stabilize the formula.

Human Health and Environmental Issues

Chlorine sanitizing compounds currently on the National List are strong oxidants and can pose serious risks to human health if acute high exposure occurs or from chronic lower-level exposures – especially in occupational environments when these materials are used on a daily basis. These compounds are dermal, respiratory, ocular, and mucous membrane irritants. Sodium hypochlorite (bleach) can cause asthma, as classified by the Association of Occupational and Environmental Clinics. Given the similar chemistries and mechanisms of action, other chlorine-based oxidant sanitizers, already known to be respiratory irritants, also likely cause asthma. Chlorine compounds are toxic to fish and other aquatic organisms. Strict adherence to the label is required when used, including the use of personal protective equipment when appropriate. Use of chlorine compounds in organic processing and crop production have been reviewed in the 2006, 2011, and 2025 Technical Reports (TR) (referenced above.).

Discussion

Among the chlorine materials listed under the National Organic Program (NOP), sodium hypochlorite is arguably the most familiar and widely recognized. Commonly referred to as liquid bleach, sodium hypochlorite has long been used throughout the food industry for sanitation, water disinfection, equipment cleaning, facility hygiene, and agricultural water treatment. As a result, discussions surrounding sodium hypochlorite often reflect broader debates about the role of chlorine-based sanitation in organic production and handling. While public comments rarely focus exclusively on sodium hypochlorite, the substance frequently serves as the reference point against which other chlorine materials are compared.

Supporters of continued listing consistently describe sodium hypochlorite as a cornerstone sanitation technology with a long history of effective pathogen control. Food processors, handlers, and agricultural operations note that it is widely understood, readily available, economical, and supported by extensive scientific and regulatory experience. Commenters frequently emphasize that sanitation failures can have significant food safety implications and argue that sodium hypochlorite remains one of the most practical tools available for controlling pathogenic bacteria, viruses, and other microorganisms in production environments. From this perspective, the material continues to meet an important need within organic systems despite its synthetic nature.

Many stakeholders also point to the operational versatility of sodium hypochlorite. Unlike some specialized sanitizers that may be used only under narrow conditions, sodium hypochlorite can be applied across a wide range of sanitation situations, including equipment cleaning, food-contact surface sanitation, water treatment, facility disinfection, and agricultural applications permitted under organic regulations. Public comments supporting relisting often note that operators value the ability to utilize a

familiar sanitation system that can be integrated into existing food safety plans without requiring extensive new infrastructure or specialized equipment. Because organic operations are subject to many of the same food safety expectations as conventional operations, commenters argue that sodium hypochlorite provides an important means of achieving those objectives.

Another recurring theme in supportive comments is the importance of regulatory consistency between organic production and broader public health practices. Stakeholders have noted that municipal water systems across the United States commonly employ chlorine-based disinfection technologies to ensure potable water quality. Consequently, many organic farms and processing facilities routinely receive water that contains residual disinfectants associated with chlorine treatment. Several commenters argue that it would be difficult to justify prohibiting or severely restricting sodium hypochlorite use within organic operations while simultaneously permitting the use of municipally disinfected water. This argument has been particularly influential in discussions concerning water treatment.

Despite broad recognition of its effectiveness, sodium hypochlorite has also been at the center of comments questioning the long-term role of chlorine materials in organic agriculture. Environmental organizations and some organic advocacy groups have repeatedly encouraged the NOSB to undertake a more comprehensive review of disinfectants and sanitizers rather than continuing to evaluate chlorine materials individually during periodic sunset reviews. These commenters generally acknowledge that sodium hypochlorite works as intended but question whether organic principles require greater emphasis on preventive approaches, alternative sanitizers, or management systems designed to reduce reliance on chlorine chemistry. Their concern typically focuses on policy considerations rather than challenges to the material's antimicrobial performance.

Questions regarding essentiality have also emerged repeatedly in public comments. Under organic review criteria, substances must continue to demonstrate a need within organic systems. Some stakeholders have therefore asked whether sodium hypochlorite remains essential given the availability of other disinfectants such as peracetic acid, hydrogen peroxide, ozone-based technologies, and other sanitation approaches. However, comments reviewed during recent NOSB proceedings do not provide a clear consensus that alternatives can completely replace sodium hypochlorite across all use patterns. Industry participants frequently argue that different sanitizers perform differently under varying operational conditions and that maintaining multiple approved options allows producers and handlers to select the most effective approach for their particular circumstances.

One of the most significant policy discussions involving sodium hypochlorite concerns the interpretation of allowed uses under the National List and NOP Guidance 5026. Historically, stakeholders disagreed about whether chlorine materials were limited to disinfecting facilities and food-contact surfaces or whether they could also be used in direct crop, food, or animal-contact applications. NOP 5026 was issued specifically to address these questions and clarify that chlorine-containing water may be used in direct-contact situations provided residual chlorine levels do not exceed Safe Drinking Water Act limits. Because sodium hypochlorite is one of the most commonly used chlorine materials in water-based sanitation systems, it became heavily implicated in these interpretation issues.

A further issue raised indirectly in comments concerns the distinction between the active ingredient and the formulated product. Sodium hypochlorite products can vary considerably in formulation, concentration, and manufacturing processes. While the National List specifically addresses the active chlorine material, stakeholders have occasionally expressed concern about ensuring that reviews adequately consider all components associated with commercial sanitizer products. This issue forms part of a broader discussion regarding how formulated sanitizers should be evaluated within organic systems

and whether NOP guidance clearly distinguishes between review of active ingredients and review of complete formulations. Public comments indicate that stakeholders continue to seek greater clarity on these matters.

Major Themes Emerging from Public Comments

Supportive comments emphasized:

- Extensive history of successful sanitation and pathogen control.
- Familiarity, affordability, and widespread availability.
- Compatibility with existing food safety and sanitation programs.
- Importance for water treatment, facility sanitation, and equipment disinfection.
- Consistency with municipal drinking-water disinfection practices.

Critical or cautionary comments emphasized:

- Need for broader evaluation of sanitizer alternatives and non-chemical interventions.
- Questions regarding whether all chlorine materials remain essential.
- Continued uncertainty regarding direct-contact uses.
- Desire for clearer distinctions between active ingredients, formulated products, and varying review approaches.
- Concerns about inconsistent interpretation among certifiers.

The public record indicates that sodium hypochlorite is generally recognized as one of the most established and operationally important chlorine materials available to organic producers and handlers. Few commenters dispute its effectiveness as a disinfectant. Instead, the debate largely centers on policy questions: whether chlorine materials remain essential under organic principles, how alternatives should be evaluated, and whether NOP rules and guidance clearly define where sodium hypochlorite may be used. As with the other chlorine materials, the most significant issues raised in public comments relate less to the chemistry itself and more to regulatory interpretation, consistency among certifiers, and the broader role of synthetic sanitizers within organic production and handling systems.

Questions to our Stakeholders

1. Does sodium hypochlorite present unique worker safety, environmental, or handling concerns compared with other chlorine materials?
2. Have you experienced differences in how certifiers interpret or enforce the organic requirements for chlorine use? If so, please describe the specific issue(s) and how the interpretations differed.

Justification for Vote

The Subcommittee finds sodium hypochlorite **compliant** with the Organic Foods Production Act (OFPA) (7 U.S.C. 6518(m) and 6517) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove sodium hypochlorite from the National List

Motioned by: Kathryn Deschenes

Seconded by: Amanda Felder

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Potassium hydroxide

Reference: § 205.605(b)(26) Potassium hydroxide - prohibited for use in lye peeling of fruits and vegetables except when used for peeling peaches.

Technical Report: [2001 TAP](#); [2016 TR](#)

Petition(s): [2001 petition](#); [2011 petition to amend annotation](#)

Past NOSB Actions: [10/1995 meeting minutes and vote](#); [11/2005 recommendation](#); [12/2011 recommendation](#); [11/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to the National list 12/21/2000 ([65 FR 80548](#)); National List amended 11/03/2003 ([68 FR 62215](#)); National List amended 05/28/2013 ([78 FR 31815](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Potassium hydroxide is a synthetic, inorganic compound produced by the electrolysis of potassium chloride. Also known as potash, it is a strong base, and alkaline in solution. Much of its utility in food processing is based on its function as a caustic strong base. Potassium hydroxide is widely used in food processing as a pH adjuster, cleaning agent, stabilizer, thickener, and poultry scald agent [2016 TR, lines 22-23].

Potassium hydroxide in poultry chill water increases the shelf life of broilers and other meat birds by killing various spoilage organisms, particularly when used in combination with lauric acid. To a limited extent, potassium hydroxide will also act as a preservative in the curing of certain foods, such as olives [2016 TR, lines 278-281].

Potassium hydroxide is also used in the lye peeling of fruits and vegetables. The annotation permits this use exclusively for peeling peaches. Peaches peeled for canning or pickling typically use a 1.5% solution of lye at a temperature slightly below 145°F (<62°C) for about 60 seconds, followed by a wash and dip into a solution of 0.5-3.0% citric acid. Because hot water cannot be used for freezing peaches, they require a higher solution - about 10% - and a treatment time of about 4 minutes to be peeled. Lye is removed by thorough washing, and citric acid is used to neutralize the pH of the fruit [2016 TR, lines 88-92].

For certain grains and legumes, potassium hydroxide is used to remove tannins that interfere with nutrient uptake. For example, it increases the solubility of proteins in soybeans. It can also be used as a solvent to determine protein quality and total soluble protein in assays. Potassium hydroxide can be used as a substitute for the traditional calcium hydroxide (lime water) used to remove the pericarp of corn, a process known as nixtamalization - part of the process to make masa from corn. Furthermore, the removal of the pericarp or bran from corn, sorghum, and other grains increases the nutritional quality and digestibility of those grains [2016 TR, lines 296-306].

Manufacture

The 2016 technical report (TR) notes that the FDA specifies that food grade potassium hydroxide (KOH) is made by the electrolysis of potassium chloride (KCl) and water in the presence of a porous diaphragm [21 CFR 184.1631(a)]. Potassium chloride, also known as muriate of potash, is a naturally occurring mineral, with the main global source being Canada. Most U.S. production occurs in New Mexico and Utah. Potassium chloride is put into aqueous solution and is electrolyzed by various processes. Diaphragm cells will produce a liquor that contains 10-15% by weight of KOH and about 10% KCl. Most of the KCl crystallizes by evaporation and subsequent cooling during concentration. The concentrated KOH is about

a 50% solution with about 0.6% KCl. Potassium hydroxide is regarded by the chemical industry as a by-product of the process for producing hydrochloric acid [2016 TR, lines 203-217].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- Aquatic plant products may be extracted by using the following substances in order of preference: a) substances in Table 4.2 Extractants; b) **potassium hydroxide**; c) sodium hydroxide provided the amount of solvent used does not exceed the amount necessary for extraction. The operator shall provide an affidavit from the manufacturer that proves the need to use sodium hydroxide. Sodium benzoate and potassium sorbate may be used as preservatives for water-extracted aquatic plant products. All other preservatives are prohibited unless listed in Table 4.2 (Column 1 or 2) with the exception that Formulants used in crop production aids are prohibited (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- Humates, humic acid and fulvic acid are permitted if mined; produced through microbial activity; extracted by physical processes; or with: a) Table 4.2 Extractants; or b) **potassium hydroxide**—**potassium hydroxide** levels used in the extraction process shall not exceed the amount required for extraction. Levels (mg/kg) of arsenic, cadmium, chromium, lead and mercury shall not exceed the limits (category C1) specified in Guidelines for the Beneficial Use of Fertilising Residuals. Shall not cause a build-up of heavy metals or micronutrients in soil (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- Plant extracts, oils and preparations are permitted as production aids with the following origin/usage conditions: permitted extractants include fats and oils (such as cocoa butter, lanolin and animal fats); alcohols; water; or substances listed on Table 4.2 (Column 2) other than Formulants used in crop production aids. Extraction with other solvents is prohibited except with, in order of preference: a) **potassium hydroxide**; or b) sodium hydroxide; provided the amount of solvent used does not exceed the amount necessary for extraction. The operator shall provide an affidavit from the manufacturer that proves the need to use sodium hydroxide. For control of pests (e.g., diseases, weeds and insects). Clove oil is permitted for sprout inhibition in potatoes (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- **Potassium hydroxide (caustic potash)** is permitted for pH adjustment. Prohibited for use in lye peeling of fruits and vegetables (Table 6.5 - Processing aids, CAN/CGSB-32.311-2020).
- **Potassium hydroxide (caustic potash)** is permitted (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- **Caustic potash** is permitted (Annex IV: Authorised products for cleaning and disinfection, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Potassium hydroxide** is permitted for pH adjustment for sugar processing (Table 4 - Processing aids which may be used for the preparation of products of agricultural origin, CXG 32-1999).

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Seaweed and seaweed products are permitted with the following conditions for use: as far as obtained by (i) physical processes including dehydration, freezing and grinding; (ii) extraction with water or **potassium hydroxide** solutions, provided that the minimum amount of solvent

necessary is used for extraction; (iii) fermentation (Appendix 2: Fertilizers and soil conditioners, IFOAM NORMS 2014).

- Algal preparations are permitted with the following conditions for use: as far as obtained by (i) physical processes including dehydration, freezing and grinding; (ii) extraction with water or **potassium hydroxide** solutions, provided that the minimum amount of solvent necessary is used for extraction; (iii) fermentation (Appendix 3: Crop protectants and growth regulators, IFOAM NORMS 2014).
- Caustic potash (**potassium hydroxide**) is permitted (Appendix 5: Substances for pest and disease control and disinfection in livestock housing and equipment, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Potassium hydroxide** is permitted with the following criteria: limited to the use as a pH control agent in the processing of sugar (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- Sodium hydroxide and **potassium hydroxide** are permitted (Table D.1 - Chemicals for cleaning or disinfecting livestock or poultry house, JAS 1608 Organic Livestock Products).

Ancillary Substances

The TR did not identify any ancillary substances.

Human Health and Environmental Issues

The amount of fresh water used in the lye peeling process and the release of effluent that increases biological oxygen demand are two key environmental concerns about the lye peeling process. The release of potassium hydroxide in untreated or improperly treated wastewater will raise the pH and potassium levels of the body of water receiving it. Soap manufacturing can also threaten environmental health in the immediate vicinity of the soap manufacturing facility, as nutrient loading of potassium may result in algal blooms and eutrophication [2016 TR, lines 341-344, 353-355].

Human health toxicity mainly involves the risk of ingestion of concentrated potassium hydroxide. Ingestion of lye inevitably leads to esophagus damage, with over 90% of the cases also involving stomach damage [2016 TR, lines 376-377].

Discussion

In 1995, the NOSB approved the addition of potassium hydroxide at § 205.605(b), with an annotation prohibiting its use in the lye peeling of fruits and vegetables. This restriction was based on concerns about the environmental effects of the waste products of the lye peeling process, and the fact that mechanical and non-chemical alternatives were available for most fruits and vegetables.

In 2001, a petitioner sought to expand the use of potassium hydroxide by amending the annotation to read —prohibited for use in lye peeling of fruits and vegetables except when used for peeling peaches during the Individually Quick Frozen (IQF) production process. The 2001 TAP review for that expansion noted that the stone fruit (peaches, nectarines, and apricots) do not appear to currently have alternative methods available on a commercial scale to achieve peeling without the use of caustic substances. The 2001 TAP review also noted that the environmental effects that had originally resulted in the restrictive annotation could be mitigated with the use of good wastewater management practices. Peach processing plants are generally restricted by state and local wastewater treatment requirements, and the natural acidity of the fruit and additional pH adjustments buffer the alkalinity of the wastewater. Because no commercially viable alternatives are available, and processing practice mitigates the potential environmental effects, the NOSB approved the expanded annotation.

A new petition from the same petitioner was filed in 2011, seeking to expand the annotation again to allow the use of potassium hydroxide for the peeling of fresh peaches to be canned. The petition confirms the lack of commercially viable alternatives for this use, and the mitigation of potential environmental impact. The processing of peaches for canning and freezing is identical up until the freezing or canning step. Based on the petition, the 2001 TAP review, and the rationale of the 2001 NOSB, the Handling Subcommittee supported the expansion of this annotation to allow potassium hydroxide to be used in the peeling of both IQF and canned peaches. Accordingly, since canning and freezing are the primary commercial processing methods used for peaches, the NOSB favored removing the language regarding IQF methods so that the exception to the prohibition on lye peeling applies to all peach peeling.

Alternatives to potassium hydroxide include naturally occurring alkali substances such as sodium carbonate and sodium bicarbonate. The drawbacks of these natural materials are that they are less soluble than potassium hydroxide and they may not be effective in raising the pH. For fruit peeling, mechanical, steam, or hand peeling is an alternative. As noted above, while potassium hydroxide was not initially allowed for peeling in organic processing, subsequent petitions and NOSB decisions allowed for its limited use for the peeling of peaches.

Public comments during the Spring 2026 NOSB meeting generally supported the relisting of potassium hydroxide. A few commentors asked for an annotation change to reframe the annotation from a negative (what is not allowed) to a positive (specifying what uses it is approved for). Public comments noted current use of this material as a boiler chemical, defoamer or egg wash, pH control, and an antimicrobial. The subcommittee discussed the potential of an annotation change. The subcommittee found that revising the annotation to list all permitted uses, rather than identifying prohibited uses, would result in an annotation that is unnecessarily lengthy and impractical to administer.

Questions to our Stakeholders

None

Justification for Vote

The Subcommittee finds potassium hydroxide **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove potassium hydroxide from the National List

Motioned by: Amanda Felder

Seconded by: Andrea Hatziyannis

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Potassium lactate

Reference: § 205.605(b)(27) Potassium lactate - for use as an antimicrobial agent and pH regulator only.

Technical Report: [2015 TR](#)

Petition(s): [2004](#); [2014 NOP memo to NOSB](#)

Past NOSB Actions: [04/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Potassium lactate comes as a liquid and may be added to meat as an antimicrobial ingredient. It is affirmed as generally recognized as safe (GRAS) at 21 CFR 184.1639. The FDA does not authorize its use in infant foods and formulas [2015 TR, lines 209-211].

Manufacture

Potassium lactate is generally produced from natural (fermented) lactic acid, which is then reacted with potassium hydroxide. Lactic acid is produced from the fermentation of natural food sources such as dextrose (from corn) and sucrose (from sugar cane or sugar beets) or starch [2015 TR, lines 102-103, 115-116].

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- **Potassium lactate** is not explicitly mentioned in the regulations.

[European Economic Community \(EEC\) Council Regulation, EC No. 2018/848 and 2021/1165](#)

- **Potassium lactate** is not explicitly mentioned in the regulations.

[CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods \(CXG 32-1999\)](#)

- **Potassium lactate** is not explicitly mentioned in the regulations.

[International Federation of Organic Agriculture Movements \(IFOAM\) Norms](#)

- **Potassium lactate** is not explicitly mentioned in the regulations.

[Japan Agricultural Standard \(JAS\) for Organic Production](#)

- **Potassium lactate** is not explicitly mentioned in the regulations.

Ancillary Substances

None reported in the 2015 TR.

Human Health and Environmental Issues

There does not appear to be any human health concerns associated with potassium lactate as provided by the 2015 TR. There was an environmental issue raised about the amount of gypsum created in the manufacturing of lactic acid, the necessary precursor of potassium lactate. However, according to a report published by the EPA, lactic acid and its salts are readily biodegradable and have low potential to persist in the environment [2015 TR, lines 772-773].

Discussion

Many stakeholders view this listing as “enormously complicated,” saying that it is the procedural history that is complicated and not the substance itself. Potassium lactate has been allowed for use in organic handling since its approval in January of 2004. The decision to not require a petition for this material for inclusion to the National List was based on the fact that both of the materials used to produce potassium lactate (lactic acid and potassium hydroxide) were already approved on the National List. It was later determined that this decision was not consistent with previous NOSB recommendations on classification of materials and that the material needed to go through the petition process. Potassium lactate was

added to the National List effective January 28, 2019. In past sunset reviews, the Handling Subcommittee found significant merit to keep potassium lactate on the National List at § 205.605(b) with the annotation: for use as an antimicrobial agent and pH regulator only.

In previous rounds of public comments, a majority of commenters were in support of relisting potassium lactate. A review of the use tables supplied by several associations indicate that potassium lactate is a widely used material. Some stakeholders asked why both potassium and sodium lactates are on the National List as they appear to be used nearly interchangeably. It was noted that there are certain uses, such as low sodium meat alternatives, that require potassium lactate specifically.

Questions to our Stakeholders

1. Are there any new technologies or ingredients that could replace the lactates?
2. What applications are potassium and sodium lactate used in conjunction with?

Justification for Vote

The Subcommittee finds potassium lactate **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove potassium lactate from the National List

Motioned by: Andrea Hatziyannis

Seconded by: Allison Johnson

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Silicon dioxide

Reference: § 205.605(b)(29) Silicon dioxide - Permitted as a defoamer. Allowed for other uses when organic rice hulls are not commercially available.

Technical Report: [1996 TAP](#); [2010 TR](#), [2025 TR](#)

Petition(s): [2010 petition to remove](#)

Past NOSB Actions: [09/1996 minutes and vote](#); [11/2005 recommendation](#); [12/2011 recommendation](#); [11/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL 12/21/2000 ([65 FR 80548](#)); National list amended 05/28/2013 (effective 11/03/2013) ([78 FR 31815](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Synthetic amorphous silica (SAS), the most common form of the chemical compound silicon dioxide used commercially, is used as a food additive for various functions including as:

- a flow agent in syrups, oligodextrines, fruit snacks and cheese powders
- an anticaking agent in foods, specifically spice blends and organic seed pellets
- a stabilizer in beer production (filtered out of the beer prior to final processing)

- an adsorbent in tableted foods
- a carrier
- a defoaming agent

Silicon dioxide is also available in the form of crystalline silica. The crystalline silica form is not used in food manufacturing.

Additionally diatomaceous earth (DE) is a nonsynthetic form silicon dioxide. DE has its own listing on the National List at § 205.605(a)(10). Its use is limited as a filtering aid only.

Manufacture

SAS can be manufactured by two main pathways.

1. Thermal process: The thermal process forms silicon dioxide through high-temperature fusion yielding pyrogenic silica, commonly known as fumed silica.
2. Wet process. The wet process forms silicon dioxide through silicic acid polymerization yielding precipitated silica, silica gel or colloidal silica.

The 2025 technical report (TR) provides an extensive explanation of both processes [2025 TR, lines 728-950]. Both the thermal and wet manufacturing processes result in a synthetic substance according to the decision tree [2025 TR, lines 979-997].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

Silicon dioxide (silica) is allowed with no restrictions on sources or uses except for maple syrup production, at CAN/CGSB-32.311 Permitted Substances List Table 6.3-Ingredients classified as food additives, and Table 6.5-Processing Aids. CAN/CGSB-32.310 7.2.12.6 allows silica powder in organic maple syrup production only for simple filtration with a filter press to remove suspended solids.

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

Silicon dioxide (E551) is permitted as outlined in Annex V, Section A1, which covers food additives, including carriers. It can be used in cocoa, herbs, spices in dried powdered form, flavorings, and propolis. However, there are specific conditions and limits for cocoa; it is only allowed for use in automated dispensing machines.

Annex V, Section A2 pertains to processing aids and other products that may be used to process ingredients of agricultural origin from organic production. It also permits “silicon dioxide gel or colloidal solution,” albeit with a restriction on plant origin.

Furthermore, Annex V, Part D, concerning authorized products and substances for the production and conservation of organic grapevine products in the wine sector, allows “silicon dioxide gel or colloidal solution.”

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

Silicon dioxide (amorphous) is included as INS No. 551 and is listed under CODEX guidelines specifically in Annex 2, Table 3.1. This table lists additives permitted for use under specified conditions in certain organic food categories or individual food items. Amorphous silicon dioxide is allowed in “herbs, spices, seasonings, and condiments,” such as seasonings for instant noodles. However, it is not permitted in foods of animal origin under these guidelines. Additionally, silicon dioxide is permitted in the form of a gel or colloidal solution, as outlined in Table 4 of the CODEX guidelines. This table details processing aids that

may be used in the preparation of products of agricultural origin, as specified in Section 3 of the guidelines, but their use is limited to plant products only.

International Federation of Organic Agriculture Movements (IFOAM) Norms

Silicon dioxide (amorphous) is included as INS 551 and is listed under IFOAM guidelines Appendix 4–Table 1: Approved additives and processing/post-harvest handling aids. It is allowed without limitation.

Japan Agricultural Standard (JAS) for Organic Production

Silicon dioxide (INS Number 551) is permitted as outlined in Annex A, Table A.1, for additives in organic processed foods, excluding organic alcoholic beverages. Its use is limited to processed products derived from plant sources, where it can be utilized as a gel or colloidal solution.

Additionally, these standards allow silicon dioxide as listed in Appendix B, Table B.1, for additives in organic alcoholic beverages, with no specific annotations regarding its use.

Korea: Republic of Korea (ROK) Korean Organic Act

We were unable to access the specific ROK standards that detail the allowance of silicon dioxide in organic food handling.

Switzerland: Federal Office for Agriculture (FOAG), Switzerland Organic Ordinances, Organic Farming Ordinance (SR 910.18), EAER Ordinance on Organic Farming (SR 910.181), FOAG Ordinance on Organic Farming (SR 910.184)

Silicon dioxide (E551) is permitted in the form of a gel or colloidal solution, as outlined in Annex 3, Section A, which lists authorized food additives, including carriers. According to the specific restrictions set forth in these standards, silicon dioxide is allowed for products of plant origin, specifically dried powdered herbs, spices, and flavorings. For animal-origin products, it is only permitted for flavorings.

Additionally, silicon dioxide in gel or colloidal solutions is permitted in Annex 3, Section B, which covers directly used technical aids and other products that may be used to process organically produced agricultural ingredients, only for plant-origin products. Lastly, in Annex 7, Part B, which discusses feed additives for animals, colloidal silicon dioxide is also allowed as a binder and/or release agent, with no special conditions or restrictions.

Taiwan: Organic Agriculture Regulations

Silicon dioxide is permitted without specific conditions in Chapter 2, entitled "Substances Allowed for Production, Processing, Packaging, Distribution, and Sale," as shown in Table 3, which lists food additives permitted for use.

United Kingdom (Great Britain): Organic Products Regulations (2009), Retained Council Regulations (EC) (834/2007, 889/2008, and 1235/2008)

Silicon dioxide (E551) is permitted as detailed in Annex VIII, Section A, which pertains to food additives, including carriers. Specifically, it can be used for dried powdered herbs, spices, flavorings, and propolis. This standard also allows silicon dioxide to be included in preparations of foodstuffs derived from both plant and animal origins.

Additionally, Annex VIII, Section B covers processing aids and other products that may be used to process ingredients of agricultural origin from organic production. It permits the use of silicon dioxide gel or colloidal solution solely in preparations of foodstuffs from plant origins without any specific conditions or restrictions.

Ancillary Substances

According to the 2016 NOSB Ancillary Substances Procedure, ancillary substances are intentionally added. The 2025 TR indicates that precipitated silica and silica gel may contain small amounts of sodium sulfate as an impurity. Since sodium sulfate appears to be residual from the acid-base reaction in the wet process and is not added intentionally, it appears that this does not meet the definition[2025 TR, Lines 1077-1083]

According to the 2025 TR, colloidal silica does contain stabilizing agents like aluminum oxide for the purpose of keeping SAS suspended in solution for up to six months. Certifiers should review stabilizing agents according to their ancillary substances policies[2025 TR, Lines 1085-1091].)

Human Health and Environmental Issues

Human Health

SAS toxicity is dependent on whether it is produced via wet processes (silica gel, precipitated silica, and colloidal silica) or thermal processes (fumed silica).

According to the 2025 TR, many recent studies have assessed the toxicity of food-grade SAS, including fumed silica and hydrated silica (such as precipitated silica, silica gel, and colloidal silica) and have not found conclusive evidence that SAS produces toxicity or harmful effects on human health when used as a food additive. Recent studies evaluating the oral toxicity of food-grade SAS in living animals have not shown adverse toxicological evidence. All studies published before 2022 indicate that oral exposure to SAS is safe.

Additionally, the 2025 TR notes recent concerns being raised by stakeholders in the food industry about the potential hazards and risks associated with SAS nanoparticles and their toxicity. The TR discusses several research studies that have been conducted. The following suggestions or results noted in the TR seem to indicate little to no impact on human health:

- SAS nanoparticles may not persist in living organisms after consumption because the material tends to form aggregates and agglomerates, or, in the case of colloidal silica, quickly polymerize.
- SAS nanoparticles may not be able to cross the mucus layer of the intestine.
- SAS nanoparticles were not internalized by the intestinal cells.
- Digested SAS nanoparticles did not induce any toxic effect on the intestinal barrier model.
- Overall absorption rates for SAS nanoparticles are relatively low and accumulation of these nanoparticles in tissue diminishes over time [2025 TR, Lines 1384-1404].

The TR did note one study that showed bioaccumulation of SAS particles in tissues—including the liver, placenta, and umbilical cord—can occur [2025 TR, Lines 1397-1399]. Also, there were some studies that discussed some specific toxicities. However, these studies are not all that relevant; in one case they used different forms of silicon dioxide (not SAS – which is used in food manufacturing) and in another case, the SAS particles were introduced intravenously (not ingested).

Lastly, the 2025 TR stated that inhalation of crystalline silica can cause silicosis. However, as stated earlier, crystalline silica form is not used in food manufacturing. The TR also noted that SAS exposure showed no evidence of adverse pulmonary effects, such as fibrosis of the lungs or any other permanent respiratory ailments.

Environmental

The 2025 TR states that while it is possible for SAS to negatively affect aquatic organisms, it is unlikely to have negative effects on the environment or biodiversity at the concentrations used in food processing [2025 TR, Lines 1178-1179].)

The SAS manufacturing processes (both thermal and wet), however, does pose some environmental concerns specifically regarding the precursors (silicon tetrachloride and sodium silicate). Silica sand, obtained through mining can lead to deforestation, biodiversity loss, soil erosion and acid drainage. However, the TR does state that most of the extracted sand is not used for SAS production but rather for hydraulic fracturing or well packing [2025 TR, Lines 1276-1686].

Additionally, silicon tetrachloride production uses chlorine and carbon black. Chlorine contributes significantly to the environmental impact of fumed silica production due to the energy needed to obtain it via electrolysis and the aquatic implications of the chemicals used during its manufacture Carbon black is sometimes derived from petrochemical sources, significantly impacting the environment on multiple levels. [2025 TR, Lines, 1292-1300].

Lastly, sodium silicate uses large amounts of energy.

Discussion

Silicon dioxide was petitioned for removal in 2010 by RIBUS, the manufacturer of a commercially produced rice-based certified organic alternative to silicon dioxide. Data was presented in the petition claiming that a reformulation of the rice-based alternative could be substituted for silicon dioxide at a nearly 1:1 ratio. The Handling Subcommittee felt the data was limited, not published from a third-party source, and did not conclusively demonstrate its applicability in all products and processes; however, they wished to acknowledge the availability of a natural alternative. An annotation was proposed resulting in its current listing, which requires the use of organic rice hulls when commercially available.

In its last sunset review in 2021, public comments indicated that organic rice hulls are *not* a viable alternative for all current uses of silicon dioxide such as when used as:

- An anticaking agent in organic powders, including organic cheese powders, and spice and seasoning blends, where it was noted that rice hulls absorb excess moisture and clump. Additionally, it was noted that in order to achieve the desired technical effect, rice hulls must be used at a rate of 15-50% compared to 2% silicon dioxide to achieve the same effect.
- In organic dry flavors in which rice hulls have not adequately or evenly disbursed flavor actives and have taken up moisture. Additionally, increased rates render the flavor unsuitable for its intended use of flavoring.
- A flow agent for rice syrup solids.
- A clarifier in the production of beer.

Most stakeholders were in favor of relisting based on essentiality and seemed comfortable with the current annotation. However, there were a few comments that suggested NOSB should review the current annotation against the original annotation passed by the Board to ensure the intent of the original annotation is accurately conveyed.

The Handling Subcommittee reviewed the history regarding the annotation change. On the cover sheet that accompanied the Board's recommendation in 2011, the following was stated:

"Motion to amend the annotation of the following substance: § 205.605 Nonagricultural (nonorganic) substances allowed as ingredients in or on processed products labeled as "organic" or "made with organic (specified ingredients or food group(s))." (b) Synthetics allowed—Silicon dioxide—providing sufficient evidence showing non-synthetic alternatives are not commercially available for a specific product/process is presented.

Correction made by NOP on 4/12/12: The motion as stated in the meeting transcript is: “Move to change the annotation of Silicon Dioxide on § 205.605 nonagricultural substances be synthetics allowed for use as a defoamer. May be used in other applications when non-synthetic alternatives are not commercially available.”

The cover sheet noted the original motion that was presented in the meeting packet. However, the Board did not vote on that motion. Rather, during the Fall 2011 meeting an alternative motion was drafted and voted on. This is the motion listed above as the correction made by NOP on 4/12/12.

The annotation was modified during the rulemaking process. NOP proposed to modify as follows: “permitted as a defoamer. Allowed for other uses when organic rice hulls are not commercially available” to specify the specific alternative substance (e.g. organic rice hulls) the Board was considering at that time so that certifying agents can consistently verify that organic handlers are in compliance with the regulations as well as reduce the burden on organic handlers since they would not be required to demonstrate that all nonsynthetic alternatives to synthetic silicon dioxide were considered prior to its use.

There was also one commenter that suggested the Board limit the use of organic rice hulls when commercially available for products labels as “organic” and not for products labeled as “made with organic.” This would more align with the yeast annotation. The Handling Subcommittee asked stakeholders for comments on this concept.

The 2025 TR evaluated alternatives to silicon dioxide. The TR explained that the silicon dioxide most commonly used in food handling cannot be obtained from nonsynthetic sources. As previously noted, the most common form used is SAS. The synthetic nature is right in the name of this substance. Natural forms, such as crystalline or diatomaceous earth (a type of amorphous silica) are unsuitable for food applications [2025 TR, Lines 1487-1500]. The TR goes on to state that a single material that serves as a substitute for SAS in all applications was not able to be identified. Table 4 in the 2025 TR [Line 1574] provides nonagricultural, nonsynthetic alternatives to silicon dioxide. The TR also notes some organic agricultural materials such as oat, barley and pelt hulls, rice and corn flours, and starches that could potentially be used for certain functionalities. As with the nonagricultural, nonsynthetic alternatives there is not one item that will work for all use cases, and these also are likely to have increased application rates similar to rice hulls, which would limit their viability [2025 TR, Lines 1637-1643]. The Handling Subcommittee asked stakeholders for information about alternatives.

Lastly, there has been some concern regarding whether silicon dioxide is an engineered nanomaterial. The TR authors state they were unable to classify SAS according to the definitions outlined in NOP Policy Memo 15-2 (i.e., “engineered nanomaterial”), based on the available analytical measurement data, as measurement estimates are limited in accuracy. The TR references one study whereby the researchers indicate that they do not understand SAS to be intentionally engineered under 100 nm for functional purposes. The TR references another study that states that particles between 1-100 nm are likely included in commercial products. However, in this second reference there isn’t any indication that these are engineered nanomaterials, only that they are nano-sized [2025 TR, Lines 1007-1069].

In reviewing the historical record (previous TRs and recommendations), there is no reference to “nanotechnology” or “nanomaterials.” In the 2010 TR there is reference to the “submicron particle size” having unique physical and chemical properties [2010 TR, Lines 40-41]. Another place in the 2010 TR states that the most outstanding characteristics of amorphous silica, particularly synthetic amorphous silica, are their small particle size and high specific surface area, which determine their numerous

applications [2010 TR, Lines 58-59]. It appears that previous Boards have recognized the small particle size and have not flagged these as engineered nanomaterials, which are prohibited from inclusion on the National List per NOP Policy Memo 15-2. The Handling Subcommittee asked stakeholders for current information about this issue.

At the Spring 2026 meeting, the Board received numerous comments on this material, with the majority supporting relisting.

Several commenters noted that the current annotation is less restrictive than the one the Board had recommended and asked that the annotation be revisited. One certifier requires a commercial availability confirmation for products labeled “organic,” but not for “made with organic” products.

Commenters noted that Europe disallowed a nano version of titanium dioxide due to health issues. Limited information was provided in response to the Handling Subcommittee’s questions about nano particles. A certifier commented that the nano status is unclear, but that no one has filled out their nanotechnology affidavit with regard to this material.

Multiple commenters noted that rice hulls are not viable replacements for some uses, including in seasoning blends because of flow and mouthfeel. It was also noted that while calcium phosphate could be an alternative for some applications, there are also concerns about phosphate levels in the diet.

Multiple certifiers noted that certified operations do use this material.

In the Board’s discussion at the Spring 2026 meeting it was noted that the current annotation does not appear to be working well, as it is both too restrictive (requiring a commercial availability search that is not likely to yield results for certain products) and too permissive (not aligning with the broader commercial availability search that the Board previously recommended). The Handling Subcommittee requests additional input on whether the current annotation is driving shifts in use from SAS to rice hulls.

Questions to our Stakeholders

1. Are there examples of organic operations that have switched to rice hulls from SAS as a result of the current annotation?
2. How would a certified operation complete a broader search for organic and nonsynthetic alternatives to SAS?

Justification for Vote

The Subcommittee finds silicon dioxide **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove silicon dioxide from the National List

Motioned by: Allison Johnson

Seconded by: Amanda Felder

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

Sodium lactate

Reference: § 205.605(b)(33) Sodium lactate - for use as an antimicrobial agent and pH regulator only.

Technical Report: [2015](#)

Petition(s): [2004](#); [2014 NOP memo to NOSB](#)

Past NOSB Actions: [04/2016 recommendation](#); [10/2021 recommendation](#)

Recent Regulatory Background: Added to NL effective 01/28/2019 ([83 FR 66559](#)); Sunset renewal notice effective 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Sodium lactate comes as a liquid and may be added to meat as an antimicrobial ingredient. It is affirmed as generally recognized as safe (GRAS) at 21 CFR 184.1639. The FDA does not authorize its use in infant foods and formulas [2015 TR, lines 203-204].

Manufacture

Sodium lactate is generally produced from natural (fermented) lactic acid, which is then reacted with sodium hydroxide. Lactic acid is produced from the fermentation of natural food sources such as dextrose (from corn) and sucrose (from sugar cane or sugar beets) or starch [2015 TR, lines 102-103, 115-116].

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- **Sodium lactate** is not explicitly mentioned in the regulations.

[European Economic Community \(EEC\) Council Regulation, EC No. 2018/848 and 2021/1165](#)

- **Sodium lactate** is permitted in products of plant origin, milk-based products, and meat products (Annex V: Authorised products and substances for use in the production of processed organic food and of yeast used as food or feed, EC No. 2021/1165).

[CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods \(CXG 32-1999\)](#)

- **Sodium lactate** is not explicitly mentioned in the regulations.

[International Federation of Organic Agriculture Movements \(IFOAM\) Norms](#)

- **Sodium lactate** is not explicitly mentioned in the regulations.

[Japan Agricultural Standard \(JAS\) for Organic Production](#)

- **Sodium lactate** is not explicitly mentioned in the regulations.

Ancillary Substances

None reported in the 2015 TR.

Human Health and Environmental Issues

There does not appear to be any human health concerns associated with sodium lactate as provided by the 2015 TR. There was an environmental issue raised about the amount of gypsum created in the manufacturing of lactic acid; however, according to a report published by the EPA, lactic acid and its salts are readily biodegradable and have low potential to persist in the environment [2015 TR, lines 772-773].

Discussion

Many stakeholders view this listing as “enormously complicated,” saying that it is the procedural history that is complicated and not the substance itself. Sodium lactate has been allowed for use in organic handling since its approval in January of 2004. The decision to not require a petition for this material for inclusion to the National List was based on the fact that both of the materials used to produce sodium lactate (lactic acid and sodium hydroxide) were already approved on the National List. It was later determined that this decision was not consistent with previous NOSB recommendations on classification of materials and that the material needed to go through the petition process. Sodium lactate was added to the National List effective January 28, 2019. In past sunset reviews, the Handling Subcommittee found significant merit to keep sodium lactate on the NL at § 205.605(b) with the annotation: for use as an antimicrobial agent and pH regulator only.

In previous rounds of public comments, a majority of comments were supportive of relisting sodium lactate. A review of the use tables supplied by several associations indicate that sodium lactate is a widely used material. Some stakeholders asked why both sodium and potassium lactates are on the National List as they appear to be used nearly interchangeably. It was noted that there are certain uses, such as low sodium meat alternatives, that require potassium lactate specifically.

Questions to our Stakeholders

1. Are there any new technologies or ingredients that could replace the lactates?
2. What applications are potassium and sodium lactate used in conjunction with?

Justification for Vote

The Subcommittee finds sodium lactate **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove sodium lactate from the National List

Motioned by: Andrea Hatziyannis

Seconded by: Kathryn Deschenes

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 0

National Organic Standards Board (NOSB)
Materials Subcommittee (MS) Discussion Document
Induced Mutagenesis
Fall 2026

Introduction

This discussion document describes the Board’s work to determine whether induced mutagenesis (IM) is an excluded method prohibited in organic agriculture. It summarizes the feedback and discussions to date and identifies factors that make it difficult to reach a determination at this time. The Materials Subcommittee encourages future NOSB members to take the issue up again if the state of the seed industry has shifted such that barriers to oversight of IM are reduced.

Background

The Materials Subcommittee brought forward discussion documents on IM for the Fall 2024 and Fall/Winter 2025 NOSB meetings and further discussed the issue at the Spring 2026 meeting, following presentations from an expert panel on seed.

Definitions & Current Law To be sold as organic, products must be produced and handled without the use of “excluded methods” (7 CFR 205.105).

Current USDA organic regulations (7 CFR 205.2 Terms defined) define **excluded methods** as:

A variety of methods used to genetically modify organisms or influence their growth and development by means that are not possible under natural conditions or processes and are not considered compatible with organic production. Such methods include cell fusion, microencapsulation and macroencapsulation, and recombinant DNA technology (including gene deletion, gene doubling, introducing a foreign gene, and changing the positions of genes when achieved by recombinant DNA technology). Such methods do not include the use of traditional breeding, conjugation, fermentation, hybridization, in vitro fertilization, or tissue culture.

It is important to note that this definition refers to **means** not possible under natural conditions, not **results** not possible under natural conditions.

Excluded Methods Background

There are three key prongs to the excluded methods definition:

- (1) “methods used to genetically modify organisms or influence their growth and development”;
- (2) “by means that are not possible under natural conditions or processes”; and
- (3) “[by means that] are not considered compatible with organic production.”

The use of “and” to connect these prongs within the definition indicates that for a method to be excluded under the regulations, **all three elements must be met**.

The phrases “natural conditions or processes” and “not considered compatible with organic production” were intended to be “subject to interpretation,” because consumer and industry expectations may evolve over time and the NOSB can help resolve questions arising with regard to specific techniques (Proposed Rule, 65 Fed. Reg. 13512, 13521 (Mar 13, 2000)). In the fall 2025 discussion document on IM, the Materials Subcommittee recommended that the lack of available testing methods to detect the use of a particular

genetic modification technology should not prevent the NOSB from listing it as an excluded method if it otherwise fits the definition; rather, the NOSB should anticipate that appropriate testing or detection methods will develop over time.

Induced Mutagenesis Current Status

Currently, varieties bred using IM are in use in organic production. In vivo IM is on the NOSB's "[TBD list](#)" of potentially excluded methods, which includes methods that are controversial and have not yet had recommendations from the NOSB. Stakeholders, particularly organic seed breeders and producers, have pushed for resolution of TBD methods since the list was established in 2016.

The most recent Technical Review on induced mutagenesis was conducted by the Organic Materials Review Institute in 2023. As per the TR, "[i]nduced mutagenesis refers to a collection of methods used to create mutations in organisms. Researchers identify beneficial mutations within mutated entities and use those mutations in further breeding of organisms with desired traits."

Discussion

The Materials Subcommittee has received substantial feedback on IM from the rest of the NOSB and organic stakeholders. There seems to be general consensus that most, if not all, processes that would fall under the IM definition meet prongs 1 and 2 of the excluded methods definition, with a possible exception of radiation or certain substance exposure that could occur naturally in some form. On prong 3, many commenters concurred that exposing plant materials to toxic chemicals and radiation is not consistent with organic principles. However, many commenters also expressed practical concerns about losing access to existing IM varieties and/or restricting future variety development through IM techniques.

Concerns about the feasibility of enforcing a limitation on IM have also been raised. In particular, the Materials Subcommittee has been informed that in the current seed market, in which few companies control the vast majority of crop seeds, there is a risk that requiring an affidavit or some other form of verification to confirm that IM was not used in production of a particular seed could negatively impact commercial seed availability for organic producers. This might not be a significant concern for organic production in the future if there is an increase in certified organic seed availability, as more operations would be under NOP scope of enforcement and organic producers would be less reliant on the nonorganic seed sector. However, given that organic seed use and production have stagnated in recent years, at this time reaching a determination that IM is an excluded method and suggesting a verification method could inadvertently dramatically reduce access to seed for organic producers, including seed that is not actually produced using IM, because that verification might not be available.

The Materials Subcommittee recommends that the NOSB not reach a determination at this time but resume work on this topic in the future when market conditions are at a scale to achieve desired outcomes and implementation would have fewer risks to organic producers.

Questions to Stakeholders

None

Subcommittee Vote

Motion to accept the discussion document on Induced Mutagenesis

Motioned by: Cat McCluskey

Seconded by: Dilip Nandwani

Yes: 5 No: 0 Abstain: 0 Recuse: 0 Absent: 0

National Organic Standards Board (NOSB)
Materials Subcommittee (MS)
2027 Research Priorities Discussion Document
Fall 2026

INTRODUCTION

The National Organic Standards Board (NOSB) presents an annual list of research priorities for organic food and agriculture, a [process originally established by the Board in 2012](#). The NOSB requests that integrated research be undertaken with consideration of the whole farm system in multiple regions, recognizing the interplay of agroecology, the surrounding environment, and both native and farmed species of plants and animals.

As part of this year's process, the Livestock, Crops, and Handling Subcommittees have made an effort to categorize and differentiate highest priority topics from ongoing topics. In addition, stakeholder comments from the Spring 2025 meeting emphasized the need for research on topics that covered multiple sectors. We are expanding this new category called "Interdisciplinary" which incorporates those and what we had previously classed as "General."

BACKGROUND

The list of priorities is revisited each year by the NOSB. The list is made meaningful by input through the written and oral public comments shared with the Board, through the expertise of the Board itself, and through interactions throughout the year with those engaged in some dimension of the organic farm to fork continuum. When the NOSB has determined that a priority area has been sufficiently addressed, it is removed from the list of priorities. Priorities are also reviewed and updated each year to more accurately reflect the current need for new knowledge.

The NOSB encourages collaboration among laboratories, federal agencies, universities, foundations, organizations, business interests, organic farmers, and the broader organic community to address pressing issues in organic agriculture and processing/handling. We especially encourage university researchers to conduct non-intrusive studies on working organic farms.

The NOSB encourages integrated, whole farm research into the areas described below.

SUMMARY LISTS (see following sections for expanded explanations)

INTERDISCIPLINARY RESEARCH PRIORITIES

1. Increasing Access to Organic Foods
2. Barriers to Transitioning to Organic Production
3. Whole farm ecosystem service assessments to determine the economic, social, and
 - a. environmental impact of farming system choices
4. Research-based information on the economics of organic certification, and production as well as profitability of organic enterprises
5. Information on the impact of organic enterprises on regional economies
6. Organic yield gaps and system-level productivity
7. Measuring and improving the effectiveness of research extension programs
8. Research-based information on farmer mental health and quality of life
9. Information on the availability, quality, and cost of farm labor
10. A comprehensive study of National List sanitizers used in all phases of organic production and handling
11. Organic agroforestry and perennial-based systems

CROPS

Top priorities for organic crop research

1. Assess the extent and impact of plastic use in organic crop production and identify ways organic producers can lead in reducing it and aligning with consumer concerns.
2. Efficacy Comparisons of Inputs and Practices for Organic Production. Side-by-side trials of approved organic pesticide products, both synthetic and natural, and cultural methods, in multiple regions, with a request for collaboration with the IR4 project.
3. Develop alternatives to eliminate the use of Per- and Polyfluoroalkyl (PFAS) substances and implement remediation strategies to mitigate contaminated areas.
4. Assess the extent, economic impact and potential compensation mechanisms for GMO contamination and prohibited pesticide drift, such as from Dicamba, on organic crops.
5. Conduct whole farm ecosystem service assessments to determine the economic, social, and environmental impact of farming system choices.

Ongoing organic crop research topics

Inputs

6. Develop NOP-compliant, biobased, biodegradable film mulches and hydro-mulches that control weeds, conserve moisture, and protect the soil. Include studies of decomposition rates, the effects of residues on soil biology, and the factors that affect the breakdown of biodegradable bio-based mulch film.
7. Impartial evaluation of microbial inoculants, soil conditioners, and other amendments and their contribution to soil health.
8. Holistic soil research to quantify soil biodiversity and activity.
9. The demand for organic nursery stock far exceeds the supply. Research is needed to identify the barriers to expanding supply.
10. Conduct a comprehensive review of the positive and negative impacts of copper products in pest management.
11. Increase the availability and supply of organic seeds by developing cultivars with improved performance. More breeding of cover crops is also needed. Also, conduct regional comparative trials to evaluate the performance and quality of organic varieties, seeds and planting stock.
12. Investigate the occurrence and fate of prohibited substances such as antibiotics, heavy metals, and pesticides in compost.
13. Investigate contaminated inputs from non-organic sources.
14. Investigate plasticizers and other additives to paper and their behavior in the environment.

Systems

15. Practices that reduce greenhouse gas emissions and that contribute to farming systems' resilience in the face of climate change.
16. Factors impacting organic crop nutrition, and comparison of organic and/conventional crop nutrient profiles.
17. Organic no-till and low-till practices for diverse climates, crops, and soil types.
18. Develop cover cropping practices that come closer to meeting the annual fertility demands of commonly grown organic crops.
19. More research, extension, and education are needed to fully understand the relationship between on-farm biodiversity and pathogen presence and abundance.

20. Strategies for the prevention, management, and control of problem insects, diseases, and weeds in the context of a changing climate, with an emphasis on predicting new pest problems and systems-based approaches.
21. Studies of the effects of long-term (2+ years) use of in-situ plastic weed barriers/landscape fabric on soils in greenhouse and container growing systems. This includes changes in nutrient levels and biodiversity above and below the soil level, as well as any needed remediation measures once the plastic has been removed.
22. Research-based information on corn and soybean trade deficits: assessment of imports and exports to determine the causal factors and viable solutions to unfavorable trade disparities; organic traceability and supply chain technology; market data and supply/demand transparency.
23. Opportunities for increasing use of products grown from organic seed.

LIVESTOCK

Top priorities for organic livestock research

1. Elucidate the barriers to increased domestic organic pork and beef production and markets.
2. Develop balanced organic livestock rations incorporating high percentages of diverse, regionally adapted grain crops to complement corn and soybeans, creating more marketing opportunities for robust crop rotations.

Ongoing organic livestock research topics

3. Prevention and management of parasites in all livestock species across regions, including evaluation of natural parasiticides and methodologies such as nutritional programs, herbs, essential oils, homeopathic remedies, diatomaceous earth, pasture rotation, pasture species selections, mixed species grazing, and use of genetic within and between breeds.
4. Evaluate natural alternatives to DL-Methionine in a systems approach for organic poultry feed program.
5. Develop dairy programs that address climate change mitigation strategies while maintaining production capacity and maximizing effective forage rotations.
6. Alternatives to eliminate usage and remediation strategies to mitigate contaminated areas and water for Per- and Polyfluoroalkyl (PFAS) substances.
7. Barriers to increased organic insect production.

FOOD HANDLING AND PROCESSING

Prioritized order within categories; categories not ordered by priority. See Expanded Explanation section for more detail, as applicable.

Improving methods and practices for organic handling and processing

1. Best practices for identifying potential vectors of heavy metal contamination in organic systems, including strategies for effective testing in soils, water, and processing facilities to support prevention measures.
2. Effect of various types of food packaging on organic products, including suitable alternatives to packaging that contain any of the following: phthalates, plasticizers, per- and polyfluoroalkyl substances (PFAS), BPA (Bisphenol-A), and antimicrobial nanoparticle surface coatings. Additionally, PFAS research should include testing for total organic fluorine as well as specific PFAS materials.

3. Evaluation of postharvest physiology of organic fruit and effective decay management practices to address unique post-harvest issues.
4. Environmental, economic, and health benefits of organic handling and processing for society, communities, businesses, and/or individuals.

Expanding market opportunities for organic products – e.g., consumer expectations, products based on rotational crops, etc.

5. Evaluation of the essentiality of § 205.605(a), § 205.605(b), and § 205.606 substances and the suitability of organic alternatives (i.e., including commercial availability) in applicable food formulations via laboratory testing, sensory evaluation, and/or market analysis.
6. Alternatives to conventional celery powder for curing organic meat.
7. Consumer food product development research for crops integral to organic farming systems (e.g., rotational crops).
8. Multi-product stream crops with potential for use in organic products, including organic produce items with strong pigment levels that could be sold for direct consumption and processed into organic colors.
9. Opportunities and barriers to organic alcohol production from rotational crops
10. Effects of the bioaccumulation of phosphate containing compounds on human health.

Complete (or full) materials review

11. Research on the creation of an overarching ancillary ingredient review process for materials used in processing and handling vs reviewing ancillaries as part of the petition or sunset review process, including cost/benefit of each process.

MATERIALS/GENETICALLY MODIFIED ORGANISMS (GMOS)

1. Fate of Genetically Engineered Plant Material in Compost
2. Integrity of Breeding Lines and Ways to Mitigate Small Amounts of Unwanted Genetic Material
3. Assess the Genetic Integrity of Organic Crops At-Risk
4. Prevention of GMO Crop Contamination: Evaluation of effectiveness
5. Testing for Fraud: Developing and implementing new technologies and practices
6. Improving our understanding of the (1) potential threats and (2) costs to the organic sector that result from the use of excluded methods

EXPANDED EXPLANATIONS

INTERDISCIPLINARY RESEARCH PRIORITIES

1. Increasing Access to Organic Foods

What factors influence access to organically produced foods? Individual-based studies are needed to assess the constraints to accessing organic food. Research should be funded that builds on an understanding of constraints by asking what community, market, and policy-based incentives would enhance access to organic foods.

2. Barriers to Transitioning to Organic Production

What are the specific production barriers and/or yield barriers that farmers face during the three-year transition period to organic production? Statistical analysis of what to expect economically during the transition is needed to help transitioning growers prepare and successfully complete the transition process.

3. Whole farm ecosystem service assessments to determine the economic, social, and environmental impact of farming system choices

This can include the full spectrum of crop, livestock, and integrated systems as well as soilless systems.

4. Research-based information on the economics of organic certification, and production as well as profitability of organic enterprises

Production budgets and profitability analyses can be broken down for specific sectors, farm scales, and crops. Some are well-studied, and literature reviews could be worthwhile. Conditions and conclusions vary over time as relative prices change. How important is the perception of integrity or its lack in the market? Farmers will benefit from this information.

5. Information on the impact of organic enterprises on regional economies

Ground-breaking studies have been done in this area and need to be expanded and followed up.

6. Organic yield gaps and system-level productivity

These studies have been done for specific crops and regions. More needs to be done on diversified farm operations, including those with both crops and livestock.

7. Measuring and improving the effectiveness of research extension programs

How to ensure that results from these Research Priorities are fully shared with farmers and other organic stakeholders? The Extension system appears to be losing funding and is unable to reach many organic farmers. Alternative information outlets may be biased or oriented toward product sales. Farmer-to-farmer networks need to be studied and optimized as well. Organic farming is under multiple threats, and the entire organic community needs accurate and timely information.

8. Research-based information on farmer mental health and quality of life

Much research has been done on farming stresses and their effects on mental health. More needs to be done, and results circulated to farmers and farm service providers.

9. Information on the availability, quality, and cost of farm labor

The availability and quality of farm labor is in flux. Farmers and lawmakers need to fully understand the situation.

10. A comprehensive study of National List sanitizers used in all phases of organic production and handling

Holistic studies are needed on all phases of sanitizer use in organic food production, processing, and distribution, including disinfection of irrigation, maple, and dairy lines; dairy bulk tanks and trucks; post-harvest treatments; processing equipment and packing lines, etc. Suggested topics:

- Effective alternatives to current sanitizers. Effectiveness of sanitizers includes both reduction of pathogenic organisms and reduction of post-harvest spoilage.
- effects on occupational and consumer human health and the environment

- optimizing rotational use strategies for various situations and purposes
- Collaboration among researchers, agencies that regulate sanitizers and food safety, and NOP with the goal of developing an alternative process for evaluating sanitizers and sanitation practices for use by organic operations
- Is there a measurable transfer of sanitizer residue to organic food following the sanitization of food contact surfaces? If residues are not found, is it even necessary for the National List to regulate surface/environmental sanitizers? (Residue studies should not be limited to only National List materials but should also include sanitizers such as quaternary ammonia compounds.)
- What amount of sanitizer/disinfectant remains on or in various organic products after a processing or packing step that includes direct treatment with a sanitizer such as immersion in a water bath treated with a sanitizer?
- Could the development of robust, post-harvest handling standards better identify which sanitation, disinfectants, or treatment practices impact organic integrity? Could expanded handling standards assist in regulating and enforcing the use of sanitizers instead of, or in addition to, the National List?
- Could restructuring the National List to separate sanitizers from ingredients and processing aids create a pathway to development of an alternative set of evaluation criteria for sanitizers?
- What would the impact on handlers and processors be if any specific sanitizers were removed from the National List?

11. Organic agroforestry and perennial-based systems

There has been a dearth of research into the organic establishment and management of agroforestry, permaculture, and woody perennial conservation buffers. These systems offer multiple ecosystem benefits including enhanced soil health and organic matter, improved nutrient cycling and reduced input needs, improved water quality, increased biodiversity, and improved microclimate for crops and livestock. In addition, woody perennial buffer plantings can protect organic crops from pesticide and GMO pollen drift from neighboring non-organic farms. These benefits need to be quantified and optimized.

CROPS

Top priorities for organic crop research

1. The extent and impact of plastic use in organic crop production

Both consumers and producers are concerned about the use of plastics in organic agriculture. The Crops Subcommittee is requesting research and information on the following:

- Statistics on current use (acreage and quantity) of crop production plastics, including mulches, drip tape, containers, row covers, tarps, high tunnels, greenhouses, etc.
- What is the turnover and fate of these plastics? This information is needed for the U.S. and major production areas such as Mexico, Spain, Chile, Holland, Canada, etc.
- What are the effects of breakdown products, airborne releases, and microplastics on soil organisms and crop plants? What is the fitness cost to beneficial microbial/fungal communities due to the presence of plastics, resins, and other breakdown substances in soil and compost?
- What are the economics of alternatives?
- If approved biodegradable biobased mulch films are developed, how many organic farmers

- would switch to them, and what would impact overall plastic usage?
- Can longer-term mulches, such as landscape fabric, reduce overall plastic use if allowed to remain in place over several years?
- What are the best first steps to reduce plastic use in organic production?

2. Efficacy Comparisons of Inputs and Practices for Organic Production

Organic farmers need to have information from side-by-side trials between allowed and petitioned synthetic inputs versus non-synthetic alternative inputs or practices. During its five-year review of sunset materials on the National List and in the evaluation of newly petitioned materials, the NOSB often lacks sufficient information of the effectiveness of these materials as compared with other synthetics on the National List, natural materials, and cultural methods. Side-by-side trials with approved organic inputs, both synthetic and natural, and cultural methods to evaluate efficacy would strengthen the review process and provide growers with valuable information in pest and disease management decisions. The NOSB specifically requests collaboration with the Minor Crop Pest Management Program Interregional Research Project #4 (IR4) to include materials on the National List in their product trials. Such studies would help inform the NOSB review process of sunset materials and to determine if materials are sufficiently effective for their intended purpose, particularly when weighed against the natural and cultural alternatives. It should be noted that growers commonly rely on a mix of cultural practices and both non-synthetic materials and materials from the National List to produce crops of marketable quality and sufficient yield for profitability; it is understood that such studies would serve as a starting point and would form part of the comprehensive material review process.

3. Per- and Polyfluoroalkyl (PFAS): Alternatives to eliminate usage and remediation strategies to mitigate contaminated areas.

Background: There is a need for increased research examining PFAS substances. PFAS is a broad term that contains thousands of chemicals used in consumer, commercial, and industrial products. There is evidence that PFAS substances, also known as “forever chemicals,” contaminate farmland, water, food, consumer goods, and more. PFAS substances can negatively impact human health and animal health in direct and indirect ways over time. Many researchers and scientists are looking into matters related to PFAS substances.

The NOSB is requesting additional research on the following:

- To find safe and eco-friendly alternatives so PFAS substances can be eliminated in the production of consumer, commercial, and industrial products to prevent any future contamination.
- To quantify the impact of PFAS substances on the environment, including agricultural land and water, and human and animal health.
- To utilize tools to identify, measure, and remediate PFAS contamination that has already occurred in the environment and on organic and non-organic farmland. Explore measuring total organic chlorine to ensure that all PFAS variants are captured.
- To identify viable programs for addressing the financial and emotional costs of land that must be removed from production due to PFAS contamination.

4. Assessing the economic impact of GMO contamination on organic crops

Background: Genetically engineered crops and organic crops can exist in adjacent fields. There are many risks, including cross-pollination, that are mitigated as best as possible by the growers involved, but much to the expense of the organic producer. Organic growers use borders, at a

minimum of thirty feet, off-set planting timeframes to avoid cross-pollination (causing organic crops to be planted sometimes at undesirable times) and change cropping rotations, all to mitigate risk. In addition, dicamba drift from sources further away can damage crops.

Research is needed on the following:

- The total cost of GMO contamination on organic farms for the full range of crops with GMO varieties (including lesser-studied crops like apples, canola, summer squash, sweet corn, etc.). This would include recommended buffer requirements, recommended planting delays windows, testing costs, a variety of pollen receptivity restrictions, loss of sales, etc.
- Are USDA coexistence provisions adequate?
- Drifting chemicals can be considered “chemical trespassing.” Could pollen contamination be considered trespassing as well? Are there avenues for compensation for organic crops damaged or with reduced sale value due to contamination from other farms?

5. Ecosystem service provisioning and biodiversity of organic systems

How do organic systems impact ecosystem service provisioning, both on-farm and off-farm through the materials and inputs sourced and used for production? For example, life-cycle analysis of environmental costs and benefits of inputs used for organic production, such as manure, seaweed, and fish-based soil amendments, would be beneficial. Additionally, what is the impact of diversified and agroecologically designed organic farming systems on biodiversity and ecosystem services within the farm and in its surroundings? Can farm-mapping be performed to quantify the impact of the location of a farm (in a broader landscape) and the arrangement of fields and non-crop habitats to enhance biodiversity and ecosystem service provisioning?

Ongoing organic crop research topics

Inputs

6. Biodegradable Bio-based Mulch Film--develop NOP-compliant, biobased, biodegradable film mulches and hydro-mulches that control weeds, conserve moisture, optimize temperatures, and protect the soil.

More studies are needed addressing the following bullets. Data from Europe, where BBMF mulches are allowed for organic production, may be particularly useful.

- How rapidly do these mulches fully decompose, to what extent do cropping system, soil type, and climate mediate decomposition rates, and does the percentage of the polymers in the mulch film affect the decomposition rate?
- Are there metabolites or breakdown products of these mulches that do not fully decompose?
- Do any of these mulches fully decompose?
- Do breakdown byproducts influence the community ecology and ecosystem function of soils, plants, and the livestock that graze on crops grown in these soils?
- As fragments degrade, do they pose a problem to terrestrial and aquatic wildlife? What are the environmental fates of micro- and nano-plastic fragments resulting from biodegradable mulch film degradation, and what hazards do they present to organisms that they interact with on the way to that fate?
- Do the residues of these films accumulate after repeated use?
- Are the testing protocols in place to ensure decomposition standards?

- Are there ways that paper mulches can be improved for commercial use?

7. Evaluation of Microbial Inoculants, Soil Conditioners, and Other Amendments

Vendors of organic amendments now offer a large and growing array of microbial inoculants, organic soil conditioners, and other materials claimed to improve soil health, crop vigor and quality, and combat weeds, pests, and diseases. There is an urgent need for impartial evaluation of these materials to help producers decide which products to use and to avoid unnecessary expenditures on products that are unlikely to yield benefits.

8. Holistic Soil Research to Quantify Soil Biology

Organic farmers are presented with many alternative ways of assessing the health of their soil and its biological components. Which assessments give the most accurate and useful information to help farmers best manage soil over the short and long term?

9. Identify Barriers and Develop Protocols for Organic Nursery Stock Production

The demand for organic nursery stock far exceeds the supply. Research is needed to identify the barriers to expanding this market, then develop and assess organic methods for meeting the growing demand for organically grown nursery stock. Research centered on the development of practical organic methods for the nursery industry to implement is needed, including:

- Disease and insect control materials that are allowed under organic standards and may be accepted under specific phytosanitary regulatory requirements.
- New materials for controlling pests addressed by phytosanitary rules that show promise of compatibility with National List review criteria.
- Alternative protocols for phytosanitary certification of nursery stock that are based on outcomes (such as testing or inspection) rather than requirements for use of synthetic materials during production.
- evaluate the use of mycorrhizal inoculants in nursery production

10. Comprehensive Review of Copper

Systems research that identifies disease-resistant material and biological controls that can reduce the use of copper-based compounds where possible is needed. Use of copper has documented negative effects on human and ecosystem health. Continued strong efforts need to be made to reduce the reliance on copper in organic production.

- Develop alternative formulations of materials containing copper so that the amount of elemental copper is reduced.
- Develop biological agents that work on diseases that copper is now used on.
- Research on tadpole shrimp and algae control in rice, and whether sodium carbonate peroxyhydrate or other materials are suitable copper alternatives in an aquatic environment.
- Research on movement and fate of applied copper in aquatic and field environments.
- Establish available and total copper threshold levels above, and identify which soil organisms are harmed, for different regions and soil types.
- Breeding plants that are resistant to the diseases that copper influences.

11. Increase the availability and supply of organic seeds by developing cultivars with improved performance. More breeding of cover crops is also needed. Also, conduct regional comparative trials to evaluate the performance and quality of organic varieties, seeds and planting stock.

Investigate barriers to production and adoption of organic seed. Identify specific gaps and suggest solutions. In addition, rigorous, unbiased trials are needed to compare performance of different sources of organic and conventional varieties. These can reflect a range of common organic production practices, such as high or low nitrogen status or with and without plastic mulch.

12. Research on the fate of prohibited substances in compost – antibiotics, heavy metals, pesticides, etc.

Can composting reduce or eliminate some undesired contaminants? Are some recalcitrant?

Research is needed on the fate of what may be unavoidable contaminants in compost feedstocks.

13. Investigate contaminated inputs from non-organic sources

In addition to PFAS and GMO drift, there are many other sources of contamination that can negatively impact organic farms and crops. Examples would be contaminants in manures and other fertilizers, irrigation water, etc. Research to identify these and whether they are avoidable needs to be ongoing.

14. Investigate plasticizers and other additives to paper and their behavior in the environment.

Modern paper may contain many additives. The extent of these materials and their behavior in compost, the soil, and the environment needs to be studied.

Systems

15. Climate Change (Reducing Greenhouse Emissions and Sequestering Carbon)

A growing body of research demonstrates that organic farming can help prevent anthropomorphic climate change, and some strategies employed by organic farming can also help with resilience to current climate challenges such as drought and flooding. Although several researchers are examining this issue, additional work is needed to pinpoint specific strategies that organic farmers can take to reduce greenhouse gas emissions and respond to current climate challenges threatening the future of our food security. Life cycle analysis of organic inputs and practices is critical. In particular, work is needed on comparing soil-based and soil-less systems, as well as the effects of farm scale on greenhouse emissions.

16. Nutritional Value of Organic Crops

How do organic soil health and fertility practices - crop rotations cover crops, compost and other organic or natural mineral amendments, etc. - affect the nutritional value or “nutrient density” of organically produced crops? How do organic production and shipping methods (including methods of production, handling, and time in transport) influence the nutritional quality, taste, palatability, and ultimately preference for organic vegetables and fruits? There is a lack of sound, rigorously conducted studies of this kind. How can growers and handlers retain nutrition through post-harvest handling and transportation? Additionally, can providing organic producers with information on soil biology and soil nutrient composition help improve nutrition? Finally, more studies are needed to examine how organic crops compare to conventional crops with regards to nutritional value.

17. Organic No-Till and Minimum Tillage

Organic no-till can increase soil health and provide for increased biodiversity. Organic no-till preserves and builds soil organic matter, conserves soil moisture, reduces soil erosion, and requires less fuel and labor than standard organic row crop farming. Farmers are employing several different approaches to organic no-till. Some are using a roller-crimper to terminate cover crops for in-place

mulching. They then transplant or seed directly into the cover crop mulch. Others are utilizing polyethylene sheets (silage tarps) to prepare land for no-till planting. This approach often involves termination of a cover crop, as with the roller-crimper systems, but seemingly as often, or more frequently, is utilized to prepare fallow ground (for stale seed bedding, termination of crop residue and subsequent incorporation via soil fauna), or in conjunction with large applications of compost or other sources of organic matter.

Increased research is needed to develop organic no-till systems that function for a wide variety of crops in diverse climates and soil types. Annual crops such as commodity row crops and specialty crops, as well as perennial crops such as tree fruits, berries, and grapes, would all benefit from these organic no till practices.

Research areas that could be covered include:

- Development of plant varieties that have specific characteristics, such as early ripening, to aid in the effectiveness and practicality of organic no-till.
- What combination of mulch crops and cultural systems sustain crop yields, provide soil health benefits, and suppress weeds?
- How does organic no-till influence pest, weed, and disease management?
- What potential pest problems can be caused or exacerbated by cover crops used as mulches, and how can those problems best be managed?
- In perennial cropping systems, such as fruits, what are the benefits or drawbacks of using this mulching system on weed, pest, and disease management, as well as soil fertility?
- What are the biodiversity benefits to living and/or killed mulches, and how does this contribute to pest, weed, and disease management?
- Do these systems affect the nutrient balance of the soil and subsequent fertilization practices, including use of outside inputs?
- Based on the improved soil health, when there is less soil disturbance and more plant decomposition resulting in higher organic matter, how does this system affect soil microbial life and nutrient availability, and does this then result in crops that are less susceptible to disease and pests?
- Research is needed on seeds, specifically for good cold germination, rapid emergence and establishment, seedling vigor, nutrient uptake efficiency, and overall weed competitiveness to crop cultivar development goals for organic conservation tillage systems.
- How can reduced tillage weed management be improved, including development of new tools and techniques that provide greater weed control for less soil disturbance?
- Finally, organic farmers use whole-farm planning when deciding what will be done in each of their fields. Research that assesses the ecosystem benefits of reducing tillage in patches (field-level) across a farm is also needed. For example, the relative benefits of reducing tillage are greater in areas prone to surface water runoff. Research is needed to “inform” where reduced tillage practices are likely to have their greatest impact.

18. Managing Cover Crops for On-Farm Fertility

Growing cover crops and green manures is a foundational practice on many organic farms. In addition to conserving soil, increasing water holding capacity, and providing weed suppression, cover crops supply important plant nutrients and increase soil organic matter. As farmers seek to grow their own fertility, more research is needed on the efficacy of relying primarily on cover crops to meet production needs, particularly for horticultural crops. At present, there is inadequate data on the nutrient benefits of different cover crop mixes and how those benefits vary according to species mix, mowing practices, tillage regimes, subsequent planting time of the cash crops, and the preceding practices that define the legacy of individual fields. Further, there need to be more

programs to breed seeds for cover crops.

19. Pathogen Prevention

Third-party food safety auditors believe that some biodiversity-maintenance strategies employed by organic farmers may increase the risk for introduction of human pathogens on the field. While some research has been conducted disproving this hypothesis, more research, extension and education are needed to fully understand the relationship between on-farm biodiversity and food safety – and this research must be communicated to third-party food safety auditors and incorporated into their audits.

20. Management of Problem Insects, Diseases, and Weeds

There is a large pool of research on the control of insects, diseases, and weeds using organic methods. Many controls use a systems approach and are quite effective. However, some arthropod pests, including new invasive species, are problematic, and in several cases the organic control options are very limited or nonexistent. The organic community needs more information on their biology, life cycle weak points, and natural enemies to implement targeted and systemic management.

Some examples of problem insects:

- Spotted wing drosophila
- Brown marmorated stinkbug
- Spotted lanternfly
- Swede midge
- Leek moth, Corn rootworm beetle (northern and western)
- Cutworms (army, western bean, etc.)

Disease management in organic fruit and vegetable production relies on a systems approach to succeed, but even with current systems plans in place, growers frequently struggle to manage commonly occurring blights and citrus greening. The NOSB underscores the need for systems research that addresses solutions to these and related diseases that are workable for farmers, that reduces adverse health effects on farmers and fieldworkers, and that also limits adverse effects on the soil and water in which the crops grow. To this end, we call for systems research that identifies disease resistant material and biological controls that limit the use of copper-based compounds and other fungicides where possible. Specifically, targeted research is needed to identify management practices and less toxic alternative materials for a wide range of crops.

More research is needed on many of the crop/disease combinations, including:

- Comprehensive, systems-based approaches for managing individual crops in a way that decreases the need for copper-based materials including researching crop rotations, sanitation practices, plant spacing, and other factors that influence disease.
- Soil management and crop cultivar development for enhanced beneficial crop-root microbe partnerships that protect organic crops from soil borne and foliar pathogens.
- Improved materials and methods for fire blight control in rosaceous crops.
- Evaluate plant nutritional strategies to lessen disease impacts.

Further research into certain diseases in vegetables (including, but not limited to, early blight, late blight, downy mildews, etc.), fruits (including, but not limited to, apple scab, fire blight, peach leaf curl, little cherry disease, X-disease, grape botrytis, etc.), and soilborne or other diseases affecting organic crops that require mitigations such as approved fungicides or the increased use of copper.

Weed management is one of the greatest challenges to successful organic crop production.

Development of integrated organic management strategies that effectively control weeds in specific

cropping systems without excessive tillage continues to be a top research priority for organic producers. For instance, Canadian thistle, pigweed (including invasive palmer amaranth and water hemp), wild sunflower, giant ragweed, cocklebur, and other perennial weeds can be very difficult to control in reduced tillage systems.

Research into new technologies, such as electroshock weeders, interrow mowers, camera-guided cultivators, laser-weeders incorporating AI (artificial intelligence) and robotics, propane flamers, etc., is critical to success in field crops, whereas tarping, solarization, and a new generation of hand tools have great potential in small- to medium-scale vegetable crops. For large scale vegetables as well as row-crop producers, strip tillage and compatible weed management tools including row cleaners, finger weeders, and high residue cultivators can combine reduced tillage and cover crops into one practice set.

Future cropping systems will utilize multiple elements of soil, crop, arthropod, disease, and weed management. The integration of tools, such as weed-suppressive cover crops and rotations, livestock grazing, flaming, beneficial insect habitat, intercropping, etc., into annual and perennial cropping systems needs more research.

21. Studies of the effects of long-term (2+ years) use of in-situ plastic weed barriers/landscape fabric on soils in greenhouse and container growing systems. This includes changes in nutrient levels and biodiversity above and below the soil level, as well as any needed remediation measures once the plastic has been removed.

These systems may rely on liquid fertility inputs and landscape cloth in the exact location for 10 years or more. What happens to the soil under that woven landscape plastic? Is there an imbalance of soil nutrients? Is the soil compacted or in good condition? Once the landscape cloth is removed, is there any special remediation that needs to be done to this soil to allow crops to grow in it? How does long-term use of landscape cloth affect biodiversity both above and below the soil?

22. Research-based information on corn and soybean trade deficits:

Assessment of imports and exports to determine the causal factors and viable solutions to unfavorable trade disparities will be very useful. Research on the use of organic traceability and supply chain technology will enhance the collection of accurate market data and generally improve supply/demand transparency.

The potential for fraud in the international organic market is high, and many organic farmer stakeholders have stated that they are under financial duress due to it. There is a need for unbiased research utilizing all available data to identify any fraudulent sales and weaknesses in the international organic market.

23. Increase the availability and supply of organic seeds by using conventional¹ breeding to develop cultivars² with improved performance.

More breeding of cover crops is also needed. Also, conduct regional comparative trials to evaluate the performance and quality of organic varieties, seeds and planting stock. Investigate barriers to production and adoption of organic seed. Identify specific gaps and suggest solutions. In addition, rigorous, unbiased trials are needed to compare performance of different sources of organic and

¹ The term 'conventional breeding' means the development of new varieties of an organism through controlled mating and selection without the use of transgenic methods.

² The term 'cultivar' means a variety of a species of plant that has been intentionally selected for use in cultivation because of the improved characteristics of that variety of the species.

conventional varieties. These can reflect a range of common organic production practices, such as high or low nitrogen status or with and without plastic mulch.

LIVESTOCK

Top priorities for organic livestock research

1. Elucidate the barriers to increased organic pork and beef production and markets

Production of organic pork has lagged behind chickens, eggs, and dairy. We request holistic investigations into what the barriers are including, but not limited to, markets, pricing, input costs, processing facilities, and production constraints such as lack of hardy breeds and housing/humane standards (including indoor and outdoor space standards as well as outdoor soil and vegetation requirements) and effective parasite management. Competition from non-organic pasture-raised, local, and other production claims should be included, as should evaluation of methods to avoid the need for farrowing crates. Similarly, the majority of organic beef marketed in the US appears to be imported. We request research into the reasons for this, and into how domestic production can be increased.

2. Develop balanced organic livestock rations that incorporate high percentages of diverse, regionally adapted grain crops to reduce the reliance on corn and soybeans and allow farmers to realize more marketing opportunities for a robust crop rotation

The US organic livestock demand and consumption of organic corn and soybean meal in feed rations exceeds US production. To help encourage farmers to utilize robust crop rotation programs that are specific to their geographical region, give livestock producers more product availability/flexibility of ingredients, and reduce the dependence on corn and beans, there needs to be proven equitable rations in all livestock segments that include alternative energy and protein sources.

Ongoing organic livestock research topics

3. Prevention and Management of Parasites

Livestock production places large numbers of cattle, sheep, goats, poultry, etc. in relatively close contact with each other on fields and in barns. Organic production does not allow antibiotic use and requires that livestock be raised in a manner which approximates the animal's natural behavior. The organic farmer can use synthetic parasiticides in an emergency but not prophylactically. Synthetic parasiticides have many limitations. Even if prophylactic treatment with parasiticides were possible, parasite immunity to chemical control will inevitably occur. Thus, prevention of parasites is critical.

The research questions on prevention and management of parasites must be systems-based. What farm systems, bird and animal breeds, and herd or flock management systems have shown the best results with parasite control over the last twenty years? What regional differences are there in the US in parasite prevention? Are there specific herbal, biodynamic, diatomaceous earth, or other treatments that have been proven to work overtime? What are the parasite-resistant breeds? Are there plant species in pastures, hayfields, and scrublands that could be incorporated into the annual grazing system to reduce the spread of parasites or to provide prevention through the flora, fauna, and minerals ingested? Which pasture management systems are best for parasite

prevention in various parts of the country? Are pasture mixes being developed that include plants known to prevent parasites in various breeds? An area of particular concern is control of *Ascaridia galli* and *Heterakis gallinarum* in laying and replacement chickens.

4. Evaluation of Methionine in the Context of a System Approach in Organic Poultry Production

Methionine is an essential amino acid for poultry. Prior to the 1950s, poultry and pigs were fed a plant and meat-based diet without synthetic amino acids such as methionine. One former NOSB member stated, in compliance with NOP regulations §205.237(5)(b) which prohibits organic operations from feeding mammalian or poultry slaughter by-products to mammals or poultry, “We have seemingly made vegetarians out of poultry and pigs.” As the organic community moves toward reducing, removing, or providing additional annotations to synthetic methionine in the diets of poultry, a heightened need exists for the organic community to rally around omnivore producers to assist in marshaling our collective efforts in finding viable alternatives to synthetic methionine and to help find approaches for making them more commercially available.

Continued research on the use of synthetic methionine in the context of a systems approach (nutrition, genetic selection, management practices, etc.) is consistent with the NOSB unanimous resolution¹ passed at the Spring 2015 Board meeting in La Jolla, California. A systems approach that includes industry and independent research by USDA/ARS, on farms, and by agricultural land grant universities is needed for:

- A. Evaluation of the merits and safety of natural alternative sources of methionine such as herbal methionine, high methionine corn, and corn gluten meal, potato meal, fishmeal, animal byproducts, and other non-plant materials including insect protein in organic poultry production systems. Additional research on the more promising alternative methionine sources with the goal of bringing them into commercial production is also encouraged.
- B. Evaluation of poultry breeds selection that could be adapted to existing organic production systems – inclusive of breeds being able to adequately perform on less methionine.
- C. Management practices impacting the flock’s demand for methionine should be included, such as flock management practices, access to pasture, and pasture management; and
- D. Using the European Union as a case study, assessing how EU farmers manage the methionine needs of their flocks in the absence of synthetic methionine use. Research findings and collaborations under various climates, housing types, geographical regions, and countries should be noted and researched, where applicable.

The fruition of these types of research topics could take years to achieve; however, an aggressive and/or heightened research focus could lead to findings that can positively impact the organic poultry industry and the organic brand.

¹The National Organic Standards Board is committed to the phase-out of synthetic methionine for organic poultry production and encourages aggressive industry and independent research on natural alternative sources of methionine, breeding poultry that perform well on less methionine, and management practices for improved poultry animal welfare.

5. Develop a dairy program to address climate change mitigation strategies where production capabilities are not hindered, and effective forage rotations are maximized

To further acknowledge the central role the certified organic industry will play in the fight against climate change, an opportunity exists to both empower the economic resilience of organic dairy

farmers while harnessing the soil building potential of diverse perennial and annual forages, we encourage the research community to dedicate resources to the following needs:

- A. Identify an index of dairy cattle genetics to which producers could breed their existing herds and achieve a minimum of 12,000 lbs. of milk production per year on 100% forage diets. In considering the genetics selected, also identify animals bred for longevity as the more lactations on a cow, the more spread out the fixed costs of raising her as a heifer becomes.
- B. To assist dairy farmers in having the tools to consider a forage-based rotation for their herds, research and identify crop rotations that have three functions: produce high quality forage, maximize soil building, and provide the most profitable outcome for the dairy producer.

6. Per- and Polyfluoroalkyl (PFAS): Alternatives to eliminate usage and remediation strategies to mitigate contaminated areas

Background: There is a need for increased research examining PFAS substances. PFAS is a broad term that contains thousands of chemicals used in consumer, commercial, and industrial products. There is evidence that PFAS substances, also known as “forever chemicals,” contaminate farmland, water, food, consumer goods, and more. PFAS substances can negatively impact human health and animal health in direct and indirect ways over time. Many researchers and scientists are looking into matters related to PFAS substances.

The NOSB is requesting additional research on the following:

- A. To find safe and eco-friendly alternatives so PFAS substances can be eliminated in the production of consumer, commercial, and industrial products to prevent any future contamination.
- B. To quantify the impact of PFAS substances on the environment, including agricultural land and water, and human and animal health.
- C. To utilize tools to identify, measure, and remediate PFAS contamination that has already occurred in the environment and on organic and non-organic farmland. Explore measuring total organic chlorine to ensure that all PFAS variants are captured.
- D. To identify viable programs for addressing the financial and emotional costs of land that must be removed from production due to PFAS contamination.

7. Barriers to increased organic insect production

There is interest in producing organic insects for high-methionine chicken feed. Stakeholders have pointed out that insects, though technically livestock, do not fit well into NOP livestock regulations, including outdoor access requirements, etc.

An overview of insect rearing practices and how they may be accommodated into organic systems is needed.

FOOD HANDLING AND PROCESSING

Top priorities for organic food handling and processing

Improving methods and practices for organic handling and processing

- 1. Research on best practices** for identifying potential vectors of heavy metal contamination in organic systems, including strategies for effective testing in soils, water, organic processing, etc. that could lead to the identification and prevention of heavy metals transgression in organic

systems

- 2. Effect of various types of food packaging on organic products,** including suitable alternatives to packaging that contain any of the following: phthalates, plasticizers, per- and polyfluoroalkyl substances (PFAS), BPA (Bisphenol-A), and antimicrobial nanoparticle surface coatings. Additionally, PFAS research should investigate testing for total organic fluorine in addition to specific PFAS materials.
- 3. Evaluation of postharvest physiology of organic fruit and effective decay management practices to combat unique post-harvest issues:**
Many varieties of organic fruit on the market require specific post-harvest handling conditions (e.g., temperature, moisture, light). There are few items on the National List aimed at supporting decay management, but these may work better on some items than others and/or be restricted only for use on specific products. Research aimed at illuminating unique problems and effective strategies depending on the fruit type would be beneficial to organic fruit handlers.
- 4. Research on the potential benefits of organic handling, including the environmental, economic, and health benefits that accrue to society, communities, businesses, and/or individuals from organic processing:**
The current body of research compares the on-farm productivity and the profitability of organic farms relative to conventional operations. A smaller body examines handling of organic products, including studies of the supply chain. However, questions related to whether organic handling facilities are less damaging to the environment or communities have not been addressed. It is well understood that lack of markets, including access to certified organic processing, remains a barrier to expansion of organic acreage and introduction of new organic crops and products. Improved access to information about the benefits of organic handling may help more processors enter the organic market and offer organic handling capacity.

Expanding market opportunities for organic products – e.g., consumer expectations, products based on rotational crops, etc.

- 5. Evaluation of the essentiality of § 205.605(a), § 205.605(b), and § 205.606 substances:**
In review of substances on the National List at 205.605 and 205.606 during the sunset process questions related to essentiality and commercial availability of organically produced substances, and if supplies are lacking knowledge of the barriers to organic production, are often the focus of the review by the Handling Subcommittee and of stakeholder comments. There are often commenters that blanketly state that all items should be removed from 205.606 - inferring that there should be the ability to produce all these substances organically. Therefore, it would be beneficial to comprehensively understand the status of essentiality of these substances and if organic alternatives exist; and if not what the barriers are that prevent a vibrant organic market for these substances.
- 6. Alternatives to conventional celery powder for curing organic meat:**
Celery Powder is used in a variety of processed meat product (hot dogs, bacon, ham, corned beef, pastrami, pepperoni, salami, etc.) to provide “cured” meat attributes without using prohibited nitrites (note: products must still be labeled “uncured”). Celery powder is naturally high in nitrates that are converted to nitrites during fermentation by a lactic acid culture. It has proven difficult to

produce celery powder under organic production practices with sufficient levels of nitrates for cured meat applications. Are there growing practices or regions that could produce celery under organic conditions that would yield a crop with sufficient nitrate content for cured meat applications? Are there agriculturally derived substances (other than celery) that could be produced under organic production practices that provide nitrate levels sufficient for cured meat product applications of comparable quality?

7. Consumer food product development research for crops integral to organic farming systems (e.g., rotational crops).

8. Multi-product stream crops with potential for use in organic products, including organic produce items with strong pigment levels that could be sold for direct consumption and processed into organic colors.

Several nonorganic colors remain on the National List; while the crops named as the color source are grown organically, those crops may not be varieties appropriate for color production. Research on crops that are both directly palatable and potentially useful as organic color sources could give farmers additional flexibility and market opportunities and help the organic sector transition to use of exclusively organic colors.

9. Opportunities for and barriers to organic alcohol production from rotational crops:

Organic (and nonorganic) farmers are increasingly incorporating new crops into rotations to support soil health and natural pest control, but the economics of this practice remain challenging where the rotation crops do not have strong existing markets. The organic spirits sector could potentially incorporate some of these crops, but more research is needed on which crops and how to use them in alcohol production.

10. Phosphates used in processed foods.

Phosphates appear in many different compounds used in processed foods. For example; calcium phosphates provide unique functionality in organic baked goods and are used in a variety of other organic food products. Additionally, calcium phosphates provide two essential nutrients in food – calcium and phosphorus –and may be used as an alternative to replace sodium phosphate and lower the sodium content in food. Some research has alleged that phosphates are associated with adverse health effects, such as cancer and cardiovascular risk, and more research is needed for conclusive results. Currently these claims have not been validated and are not supported by current scientific literature. The risk of bioaccumulation of phosphorus in the human body and at what level does it produce adverse effects to the cardiovascular and renal system need to be researched.

Complete (or full) materials review

11. Overarching ancillary ingredient review process for materials used in processing and handling:

The topic of ancillary substances contained in substances on 205.605 and 205.606 and how the NOSB should review them has been a topic of discussion since 2013 but has not reached a full resolution. The current process is to review individually during the petition or sunset review process. However, as noted by stakeholder comments this has the potential to result in different decisions due to the gap in time, available information and/or people responsible for conducting the review being different. It would be beneficial to analyze and compare different strategies for conducting ancillary substance review in a more comprehensive manner as opposed to the current individual review process that includes a cost/benefit analysis of each proposed review strategy.

MATERIALS/Genetically Modified Organisms (GMOs)

In previous years, the Materials Subcommittee prioritized the reduction of genetically modified content of breeding lines (2013) and seed purity from GMOs (2014), issues that are currently being addressed through a comprehensive stream of work on excluded methods. The following research priorities are among the areas that the excluded methods work continues to elevate.

1. Fate of Genetically Engineered Plant Material in Compost

What happens to transgenic DNA in the composting process? Materials such as cornstalks from GMO corn or manure from cows receiving rBGH are often composted, yet there is little information on whether the genetically engineered material and traits break down in composting process. Do these materials affect the microbial ecology of a compost pile? Is there trait expression of Bt (*Bacillus thuringiensis*) after composting that would result in persistence in the environment or plant uptake?

2. Integrity of Breeding Lines and Ways to Mitigate Small Amounts of Unwanted Genetic Material

Are public germplasm collections that house at-risk crops threatened by transgenic content? Breeding lines may have been created through genetic engineering methods such as doubled haploid technology, or they may have had inadvertent presence of GMOs from pollen drift. The extent of this problem needs to be understood.

3. Assess the Genetic Integrity of Organic Crops At-Risk

Develop then implement methods of assessing the genetic integrity of crops at risk to quantify the current state of the organic and conventionally produced non-GMO seed. Such assessments are needed on the front (seed purchased by farmers) and back end (seed harvested from a farmer's field) of the production chain as well as on points of contamination in the production chain.

4. Prevention of GMO Crop Contamination: Evaluation of effectiveness

How well are some of the prevention strategies proposed by the NOSB working to keep GMOs out of organic crops? For instance, how many rows of buffer are needed for corn? How fast does contamination percentage go up or down if there are more or fewer buffer rows? Other examples could be whether cleanout of combines and hauling vehicles reduces contamination using typical protocols for organic cleaning, whether situating at-risk crop fields upwind from GMO crops can reduce contamination, and what the role may be of pollinators in spreading GMO pollen. Lastly, research is needed on a mechanism to provide conventional growers incentive to take their own prevention measures to prevent pollen drift and its impact on organic and identity-preserved crops. This is policy research rather than field research but is equally important.

5. Testing for Fraud: Developing and implementing new technologies and practices

New technologies, tests, and methodologies are needed to differentiate organic crop production from conventional production to detect and deter fraud. Testing to differentiate conventional and organic livestock products, for example omega 3 or other indicators, is also needed. Additional tools to identify fraudulent processed and raw organic crops require research to combat this problem. Current methodologies include pesticide residue testing, in field soil chemical analysis, and GMO testing. Areas in need of further testing methodology include phostoxin residues, fumigant residues, carbon isotope ratios for traceability, validating nitrogen sources using nitrogen isotope ratios, or other experimental testing instruments that can be utilized to distinguish organic raw and/or processed crops from conventional items. Additionally, there is a

need to develop rapid detection technologies for adaptation to field-testing capacities.

6. Improving our understanding of the (1) potential threats and (2) costs to the organic sector that result from the use of excluded methods

First, identify the set of potential threats the use of excluded methods presents to organic businesses (farms and handlers). The potential threats include crop damage and cross contamination, but we recognize there might be others not yet identified. Second, estimate the costs the threats present to organic farms and organic handlers.

Subcommittee Vote

Motion to accept the 2027 Research Priorities discussion document

Motioned by: Andrea Hatziyannis

Seconded by: Franklin Quarcoo

Yes: 5 No: 0 Abstain: 0 Recuse: 0 Absent: 0

**National Organic Standards Board
Crops Subcommittee (CS)
Petitioned Material Proposal
Chitosan – Reclassification
Fall 2026**

Summary of Petition [[May 2025 – Reclassification](#)]:

The Crops Subcommittee (CS) received two petitions in 2025 related to chitosan in crop production. The first was received in May 2025 and requests NOSB reclassify chitosan as “nonsynthetic,” rendering it allowed for use in organic crop production. The second was received in August 2025 and requests NOSB add chitosan to the National List as a synthetic substance allowed for use in organic crop production. This evaluation addresses the reclassification petition.

Reclassification Petition: The main argument of this reclassification petition is that since versions of chitosan exist in nature, and most chitosan is commercially produced via extraction from a natural source (i.e. crustacean shell waste), chitosan should be considered nonsynthetic. This approach does not apply organic classification guidance appropriately, and CS continues to consider chitosan produced using chemical deproteinization and demineralization to be synthetic.

Subcommittee Review

The Subcommittee reviewed the manufacturing process of chitosan and agrees that the use of synthetic substances in its extraction and the chemical change in the substance that those synthetic substances cause render the final product of chitosan a synthetic substance.

Category 1: Classification

1. For CROP use: Is the substance _____ **Non-synthetic** or x **Synthetic?**
Is the substance formulated or manufactured by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral sources? [7 U.S.C. 6502(21)] If so, describe, using [NOP 5033-1](#) as a guide.

Chitosan is chemically extracted from a naturally occurring animal source – crustacean shells. However, at the end of the extraction process, the material has been transformed into a different substance via chemical change. The use of strong synthetic alkali materials like sodium or potassium hydroxide deproteinates shells during chitin isolation [2020 TR 595-598]. Then manufacturers use strong acids to demineralize the chitin [2020 TR 604-605]. Strong alkali materials are then again used for the deacetylation process to convert chitin into chitosan.

The TR also describes that chitosan production using biological means is possible, it remains a process limited solely to the laboratory and no commercial production using this method is known [2020 TR 670-674]

2. Reference to appropriate [OFPA](#) category:
Is the substance used in production, and does it contain an active synthetic ingredient in the following categories: [§6517(c)(1)(B)(i)]; copper and sulfur compounds; toxins derived from bacteria; pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals; livestock parasiticides and medicines and production aids including netting, tree wraps and seals,

insect traps, sticky barriers, row covers, and equipment cleansers; or (ii) is used in production and contains synthetic inert ingredients that are not classified by the Administrator of the Environmental Protection Agency as inert of toxicological concern?

N/A

Category 2: Adverse Impacts

1. What is the potential for the substance to have detrimental chemical interactions with other materials used in organic farming systems? [§6518(m)(1)]

N/A

2. What is the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment? [§6518(m)(2)]

N/A

3. Describe the probability of environmental contamination during manufacture, use, misuse or disposal of such substance? [§6518(m)(3)]

N/A

4. Discuss the effect of the substance on human health. [§6517(c)(1)(A)(i); §6517(c)(2)(A)(i); §6518(m)(4)].

N/A

5. Discuss any effects the substance may have on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock. [§6518(m)(5)]

N/A

6. Are there any adverse impacts on biodiversity? (§205.200)

N/A

Category 3: Alternatives/Compatibility

1. Are there alternatives to using the substance? Evaluate alternative practices as well as non-synthetic and synthetic available materials. [§6518(m)(6)]

N/A

2. In balancing the responses to the criteria above, is the substance compatible with a system of sustainable agriculture? [§6518(m)(7)]

N/A

Classification Motion

Motion to classify Chitosan (CAS 9012-76-4) as synthetic

Motion by: Nate Lewis

Seconded by: Franklin Quarcoo

Yes: 3 No: 0 Abstain: 0 Recuse: 0 Absent: 2

**National Organic Standards Board
Crops Subcommittee
Petitioned Material Proposal
Chitosan – Addition to National List
Fall 2026**

Summary of Petition [\[August 2025\]](#):

The Crops Subcommittee (CS) received two petitions in 2025 related to chitosan in crop production. The first was received in May 2025 and requests NOSB reclassify chitosan as “nonsynthetic,” rendering it allowed for use in organic crop production. The second was received in August 2025 and requests NOSB add chitosan to the National List as a synthetic substance allowed for use in organic crop production. This evaluation addresses the petition to list chitosan on the National List.

Listing Petition: The CS received a petition from chitosan manufacturer, Tidal Vision, in August of 2025. The review of the petition, a Technical Report (TR) produced in 2020 for the CS, and a TR produced in 2026 for the Handling Subcommittee (HS) revealed that while the petitioner requested addition to the National List at 7 CFR 205.601(i) for plant disease control, chitosan can also be used as a plant and soil amendment, which would not require application of restrictions outlined at §205.206 prior to its use. This review covers both chitosan’s use as a plant disease control material as well as a crop and soil amendment.

Subcommittee Review

The Subcommittee discussed whether chitosan meets National List criteria (7 U.S.C. 6517-6518) and should be added to the National List. In general, the Subcommittee agreed that the substance meets National List criteria and should be added to the National List. There were questions about the need for a better understanding about the mode of action for chitosan as a crop disease control. However, there was also agreement that it is a nontoxic alternative to other more toxic crop disease control substances. The subcommittee discussed listing as both a crop disease control agent as well as a crop and soil amendment. Since chitosan’s mode of action supports plant resilience, rather than by taking direct action against plant diseases, it made sense to expand the use pattern allowances for this material to include crop and soil amendments.

Category 1: Classification

1. For CROP use: Is the substance _____ **Non-synthetic** or x **Synthetic**?
Is the substance formulated or manufactured by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral sources? [7 U.S.C. 6502(21)] If so, describe, using [NOP 5033-1](#) as a guide.

Chitosan is chemically extracted from a naturally occurring animal source – crustacean shells. However, at the end of the extraction process, the material has been transformed into a different substance via chemical change. The use of strong synthetic alkali materials like sodium or potassium hydroxide deproteinates shells during chitin isolation [2020 TR 595-598]. Then manufacturers use strong acids to demineralize the chitin [2020 TR, lines 604-605]. Strong alkali materials are then again used for the deacetylation process to convert chitin into chitosan.

The TR also describes that chitosan production using biological means is possible, it remains a process limited solely to the laboratory and no commercial production using this method is known [2020 TR, lines 670-674]

2. Reference to appropriate [OFPA](#) category:

Is the substance used in production, and does it contain an active synthetic ingredient in the following categories: [§6517(c)(1)(B)(i)]; copper and sulfur compounds; toxins derived from bacteria; pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals; livestock parasiticides and medicines and production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleansers; or (ii) is used in production and contains synthetic inert ingredients that are not classified by the Administrator of the Environmental Protection Agency as inert of toxicological concern?

Chitosan was added, via federal rulemaking, to EPA's list of Section 25(b) pesticides which are exempt from registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Therefore, it is a synthetic active ingredient that is considered pesticidal. Additionally, however, it can be used as a soil amendment to stimulate plant resilience, and much like sulfur, should be considered for inclusion on the National List in multiple locations.

Category 2: Adverse Impacts

1. What is the potential for the substance to have detrimental chemical interactions with other materials used in organic farming systems? [§6518(m)(1)]

The application of chitosan as an active ingredient in pesticidal products or as a plant or soil amendment is unlikely to be harmful to the environment. It occurs naturally in quantities exceeding what would be used in organic crop production and it degrades into substances that are non-toxic and readily used as nutrients. [2020 TR, lines 70-736]

2. What is the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment? [§6518(m)(2)]

Due to the variety of results found in different studies it is likely that chitosan has multiple antibacterial modes of action. One hypothesis is that positively charged chitosan binds to negatively charged cell surface molecules. Another hypothesis is that smaller chitosan molecules move through cell walls and inhibit gene transcription. There is also another thought that chitosan chelates essential nutrients making them unavailable to bacteria. Chitosan can also initiate systemic resistance in plants and may act directly between host and pathogen to block the growth of the pathogen itself. Since chitosan is used at low levels and is degraded by soil microorganisms there is expected to be no increase in the environment [2020 TR, lines 742-754].

3. Describe the probability of environmental contamination during manufacture, use, misuse or disposal of such substance? [§6518(m)(3)]

Because of the low toxicity of chitosan, the misuse of the product or its disposal are expected to have minimal effects on the environment. Both chlorine and sodium hydroxide are used in production of chitosan and are toxic in the environment if not contained in transport [2020 TR,

lines 759-814]. These concerns related to the chemicals used for the extraction and manufacturing are most concerning when chitosan is manufactured outside of the United States and, therefore, not subject to EPA handling requirements.

4. Discuss the effect of the substance on human health. [§6517(c)(1)(A)(i); §6517(c)(2)(A)(i); §6518(m)(4)].

According to numerous sources as reported in the Technical Report, chitosan is nearly non-toxic to humans and most other animals, and its degradation products do not cause side effects in the body (US EPA). [2020 TR, lines 912-913].

5. Discuss any effects the substance may have on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock [§6518(m)(5)].

Pesticide studies about the use of chitosan as an active ingredient have shown that there might be temporary changes to soil microbial communities. Being a large polymer with numerous reactive sites, it is difficult to characterize all possible chemical interactions involving chitosan. The Technical Report found studies that chitosan can limit the ability of some microorganisms to absorb nutrients, but it can also act as a chelator. It has been suggested because of this it might be used as a material to improve the anionic exchange capacity of soils to limit the leaching of anionic nutrients and improve nutrient delivery to plants [2020 TR, lines 845-888].

6. Are there any adverse impacts on biodiversity? (7 CFR 205.200)

At the rates this substance is applied, no adverse impacts on biodiversity are expected. [2020 TR 894-906]

Category 3: Alternatives/Compatibility

1. Are there alternatives to using the substance? Evaluate alternative practices as well as non-synthetic and synthetic available materials. [7 U.S.C. 6518(m)(6)]

As the Technical Report emphasizes, good farming practices, including suppressive soils, creating unfavorable conditions for pathogens, managing disease vectors such as aphids, sterilizing soils with heat and planting resistant cultivars reduce the need to use disease control substances. Also, there are more than 200 products listed by OMRI for use as plant disease control. Some do contain synthetic active ingredients, but many contain nonsynthetic active ingredients such as bacteria, microorganism extracts, botanical substances, oils, and natural acids [2020 TR, lines 950-955]. Additionally, chitosan has the potential to replace or reduce toxic copper compound use, which, while currently allowed in organic production, do pose their own environmental impacts in both manufacturing and application. Chitosan is clearly less toxic than copper, and its use has the potential to reduce copper usage in organic plant disease control. Chitosan is also allowed as a crop and soil amendment to stimulate plant resiliency [2020 TR, lines 373-375]. Soil amendments, by definition, do not contain high concentrations of plant nutrients, but are used to improve physical, chemical, or biological properties.

2. In balancing the responses to the criteria above, is the substance compatible with a system of sustainable agriculture? [§6518(m)(7)]

Chitosan is a fairly benign substance with little toxic impact on the environment when used as either a pesticide or as a soil amendment. Its manufacturing process does raise some concerns related to toxic substances, especially when manufactured outside of the United States and EPA oversight. However, the potential for chitosan to reduce copper usage on organic farms, its mode of action which is to increase plant resiliency (as opposed to provide a toxic impact on plant diseases), and the fact that it is derived from a waste material, lead the CS to conclude that the substance is compatible with a system of organic agriculture and should be added to the National List at 7 CFR 205.601(i) As plant disease control, and at 7 CFR 205.601(j) As crop or soil amendments

Classification Motion:

Motion to classify Chitosan (CAS 9012-76-4) as synthetic

Motion by: Nate Lewis

Seconded by: Franklin Quarcoo

Yes: 3 No: 0 Abstain: 0 Recuse: 0 Absent: 2

National List Motions:

Motion to add chitosan (CAS 9012-76-4) to the National List at § 205.601(j) as a crop or soil amendment

Motion by: Nate Lewis

Seconded by: Franklin Quarcoo

Yes: 3 No: 0 Abstain: 0 Recuse: 0 Absent: 2

Motion to add chitosan (CAS 9012-76-4) to the National List at § 205.601(i) as a crop disease control

Motion by: Nate Lewis

Seconded by: Dilip Nandwani

Yes: 3 No: 0 Abstain: 0 Recuse: 0 Absent: 2

Sunset 2028
Meeting 2 – Review
Crops Substances § 205.601 & § 205.602
Fall 2026

Introduction

As part of the [Sunset Process](#), the National Organic Program (NOP) announces substances on the National List of Allowed and Prohibited Substances (National List) that are coming up for sunset review by the National Organic Standard Board (NOSB). The following list announces substances that must be reviewed by the NOSB and renewed by the USDA before their sunset dates. This document provides the substance's current status on the National List, annotation, references to past technical reports, past NOSB actions, and regulatory history, as applicable. If a new technical report has been requested for a substance, it is noted in this list. Substances included in this document may also be viewed in the NOP's [Petitioned Substances Index](#).

Request for Comments

Written comments should be submitted via Regulations.gov at www.regulations.gov during the comment period as explained in the meeting notice published in the Federal Register.

Public comments are necessary to guide the NOSB's review of each substance against the criteria in the Organic Foods Production Act ([7 U.S.C. 6518\(m\)](#)) and the USDA organic regulations ([7 CFR 205.600](#)). The current substances on the National List were originally recommended by the NOSB based on evidence available to the NOSB at the time of their last review, which demonstrated that the substances were: (1) not harmful to human health or the environment, (2) necessary because of the unavailability of wholly nonsynthetic alternatives, and (3) consistent and compatible with organic practices.

Public comments should clearly indicate the commentor's position on the allowance or prohibition of substances on the National List and explain the reasons for the position. Public comments should focus on providing relevant new information about a substance since its last NOSB review. Such information could include research or data that may support a change in the NOSB's determination for a substance (e.g., scientific, environmental, manufacturing, industry impact information, etc.). Public comment should also address the continuing need for a substance or whether the substance is no longer needed or in demand.

For Comments that Support the Continued Use of §205.601 Substances in Organic Production:

If you provide comments supporting the allowance of a substance at §205.601, you should provide information demonstrating that the substance is:

1. not harmful to human health or the environment;
2. necessary to the production of the agricultural products because of the unavailability of wholly nonsynthetic substitute products; and
3. consistent with organic crop production.

For Comments that Do Not Support the Continued Use of §205.601 Substances in Organic Production:

If you provide comments that do not support a substance at §205.601, you should provide reasons why the use of the substance should no longer be allowed in organic production. Specifically, comments that support the removal of a substance from the National List should provide new information since its last NOSB review to demonstrate that the substance is:

1. harmful to human health or the environment;
2. unnecessary because of the availability of alternatives; and/or
3. inconsistent with organic crop production.

For Comments that Support the Continued Prohibition of §205.602 Substances in Organic Production:

If you provide comments supporting the prohibition of a substance on the §205.602 section of the National List, you should provide information demonstrating that the substance is:

1. harmful to human health or the environment; and
2. inconsistent with organic crop production.

For Comments that Do Not Support the Continued Prohibition of §205.602 Substances in Organic Production:

If you provide comments that do not support the prohibition of a substance at §205.602, you should provide reasons why the use of the substance should no longer be prohibited in organic production. Specifically, comments that support the removal of a substance from the §205.602 section of the National List should provide new information since its last NOSB review to demonstrate that the substance is:

1. not harmful to human health or the environment; and/or
2. consistent with organic crop production.

For Comments Addressing the Availability of Alternatives:

Comments may include information about the viability of alternatives for a substance under sunset review. Viable alternatives include, but are not limited to:

- Alternative management practices or natural substances that would eliminate the need for the specific substance;
- Other substances that are on the National List that are better alternatives, which could eliminate the need for this specific substance; and/or
- Other organic or nonorganic agricultural substances.

Your comments should address whether any alternatives have a function and effect equivalent to or better than the allowed substance, and whether you want the substance to be allowed or removed from the National List. Assertions about alternative substances, except for those alternatives that already appear on the National List, should, if possible, include the name and address of the manufacturer of the alternative. Further, your comments should include a copy or the specific source of any supportive literature, which could include: product or practice descriptions, performance and test data, reference standards, names and addresses of organic operations who have used the alternative under similar conditions and the date of use, and an itemized comparison of the function and effect of the proposed alternative(s) with substance under review.

Written public comments will be accepted via www.regulations.gov during the open comment period noted in the Federal Register. Comments received after that date may not be reviewed by the NOSB before the meeting.

§ 205.601 Sunsets: Synthetic substances allowed for use in organic crop production:

- Chlorine materials
 - [\(i\) Calcium hypochlorite](#)
 - [\(ii\) Chlorine dioxide](#)
 - [\(iii\) Hypochlorous acid - generated from electrolyzed water](#)
 - [\(v\) Sodium hypochlorite](#)
- [Copper sulfate \(§ 205.601\(a\)\(3\) & § 205.601\(e\)\(4\)\)](#)
- [Ozone gas](#)
- [Peracetic acid \(§ 205.601\(a\)\(6\) & § 205.601\(i\)\(8\)\)](#)

- [Magnesium oxide](#)
- [EPA List 3 - Inerts of unknown toxicity](#)

§ 205.602 Sunsets: Nonsynthetic substances prohibited for use in organic crop production:

- [Calcium chloride](#)
- [Rotenone](#)

Chlorine materials – Calcium hypochlorite

Reference: § 205.601(a) - As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems. (2) Chlorine materials -For pre-harvest use, residual chlorine levels in the water in direct crop contact or as water from cleaning irrigation systems applied to soil must not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act, except that chlorine products may be used in edible sprout production according to EPA label directions.

(i) Calcium hypochlorite

Technical Report(s): [1995 TAP](#); [2006 TR](#); [2011 TR](#); 2025 TR (pending post)

Petition(s): N/A

Past NOSB Actions: [10/1995 NOSB minutes and vote](#); [04/2006 NOSB sunset recommendation](#); [04/2011 NOSB sunset recommendation](#); [10/2015 sunset recommendation](#); [11/2017 sunset recommendation](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: Added to National List 02/20/2001 ([65 FR 80547](#)), Sunset renewal notice 03/21/2017 ([82 FR 14420](#)); Sunset renewal notice effective 10/30/2019 ([84 FR 53577](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

In addition to USDA, chlorine materials are regulated by FDA, EPA, and FSIS when used in organic production [2025 TR, line 429]. Calcium hypochlorite, a chlorine material, is an Environmental Protection Agency (EPA)-pesticide (PC Code 014701). The EPA approved the registration of calcium hypochlorite pesticides for use on crops, soil, and livestock to control bacteria, fungi, and slime-forming algae that can cause diseases in people and animals [2025 TR, lines 444-445]. It is an antimicrobial disinfectant and pesticide used to control harmful microorganisms and viruses on inanimate objects and surfaces primarily in indoor environments [2006 TR, lines 66-67, 85-86]. It is allowed for disinfecting and sanitizing food contact surfaces. An important annotation for the use of this and other chlorine materials is that residual chlorine levels for wash water in direct crop or food contact and in flush water from cleaning irrigation systems that is applied to crops or fields, should not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (SDWA) (currently 4mg/L expressed as Cl₂) [2006 TR, lines 77-79]. Information provided by three NOP-accredited certifying agents revealed that only one certifier had approved the use of chlorine products in irrigation systems. The certifier stated that the most common chlorine product used for irrigation systems was calcium hypochlorite.

Calcium hypochlorite is an "indirect" food additive approved by the Food and Drug Administration (FDA). Calcium hypochlorite may be used as a final sanitizing rinse on food-processing equipment (21 CFR 178.1010). Calcium hypochlorite also can be used in postharvest, seed, or soil treatment on various fruit and vegetable crops [2006 TR, lines 93-99].

For organic food handling facilities and equipment, chlorine materials may be used up to maximum-labeled rates for disinfecting and sanitizing food contact surfaces. Rinsing is not required unless mandated by the label use directions. Water used in direct post-harvest crop or food contact (including flume water to transport fruits or vegetables, wash water in produce lines, egg or carcass washing) is permitted to contain chlorine materials at levels approved by the FDA or the EPA for such purposes. Rinsing with potable water that does not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA must immediately follow this permitted use. Certified operators should monitor the chlorine level of the final rinse water at the point at which the water last contacts the

organic product. The level of chlorine in the final rinse water must meet limits as set forth by the SDWA. Water used as an ingredient in organic food handling should not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA, as required by the Organic Food Production Act (7 U.S.C. 6510(a)(7)).

Manufacture

Calcium hypochlorite is produced by passing chlorine gas over hydrated (slaked) lime. It is then separated from the coproduct, calcium chloride, and air dried or vacuum dried [2006 TR, lines 151-152].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- The following chlorine compounds are permitted: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite. Shall not exceed maximum levels for safe drinking water. Chlorine compounds may be used: a) for wash water in direct contact with crops or food; b) in flush water from cleaning irrigation systems, equipment, storage or transport units—application to crops or fields is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).
- The following chlorine compounds are permitted up to maximum label rates: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- Calcium hypochlorite is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- Calcium hypochlorite is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Calcium hypochlorite is permitted with the following limitation: an intervening event or action must occur to eliminate risks of contamination (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- Calcium hypochlorite is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

Chlorine sanitizing compounds currently on the National List are strong oxidants and can pose serious risks to human health if acute high exposures occur or from chronic lower-level exposures – especially in occupational environments when these materials are used daily. Chlorine compounds are dermal, respiratory, ocular, and mucous membrane irritants. In addition, sodium hypochlorite (bleach) can cause asthma, as classified by the Association of Occupational and Environmental Clinics. Given the similar chemical properties and mechanisms of action, other chlorine-based oxidant sanitizers are also likely to cause asthma. Chlorine compounds are toxic to fish and other aquatic organisms. Strict adherence to the label is required when used, including the use of personal protective equipment when appropriate. Use of chlorine compounds in organic processing and crop production have been reviewed in the 2006, 2011 and 2025 Technical Reports (TR) (referenced above). In 1991 the US Environmental Protection Agency reported

that calcium hypochlorite is highly toxic to freshwater fish and invertebrates [2025 TR, lines 718-719]. In 1992 the EPA also stated that sodium and calcium hypochlorite were low risk to both upland game birds (quail) and waterfowl (ducks) [2025 TR, lines 733-734].

The EPA exempts calcium hypochlorite (40 CFR 180.1054), potassium hypochlorite (40 CFR 180.1300), and sodium hypochlorite (40 CFR 180.1235) from the requirement of a tolerance in food [2025 TR, lines 446-447].

In 2025 the US EPA reported that 88 of the 651 chlorine material incidents reported to the US EPA'S Incident Data System between September 1, 2010 and September 1, 2025 were due to calcium hypochlorite [2025 TR, lines 802-805]. Sodium hypochlorite accounted for 556 of the reported incidents. Most of the incidents involved humans and were classified as either minor or moderate. No human fatality and one animal fatality was recorded for Calcium hypochlorite.

Discussion

Comments about calcium hypochlorite submitted to the NOSB during the last sunset review (in 2021) addressed essentiality and impact on human and environmental health. Below is a summary of the public comments and discussions.

Arguments in support of calcium hypochlorite include its use in protecting food from contamination by human pathogens which is essential in safeguarding organic integrity. Despite the potential for significant risks to human health and the environment, chlorine compounds have been deemed essential to ensure food safety and to comply with food safety regulations under the Food Safety Modernization Act (FSMA). The Crops Subcommittee (CS) generally supported the continued listing of chlorine materials but encouraged ongoing discussion (at the time) on the listing of sanitizers and disinfectants for post-harvest handling and processing. Some public comments outlined the need for a comprehensive technical review of sanitizers and listing of sanitizers on the National List itemized "by specific use or application" with clear identification of the hazards to humans and the environment. It was said that further restructuring of the National List with a designated category for cleaners, sanitizers and disinfectants would help to ensure certified operations understand which cleaners, sanitizers and disinfectants may be used and would facilitate better organic education.

The CS, in 2021, stated its support for research priorities that investigate alternatives to chlorine compounds and encouraged the use of alternative, less toxic materials, when their use can meet strict food safety standards.

In the 2025 sunset review of another chlorine material (potassium hypochlorite), the CS received public comments that were not supportive of the proposed annotation requiring the use of chlorine produced via environmentally friendly methods in the synthetic production of chlorine materials.

Public comments at the Spring 2026 meeting

A human and environmental health advocacy group stated its belief that there were mistaken translations of NOSB recommendations into regulations. It asked the NOSB and NOP to clarify whether chlorine is required by other statutes. It referred to statements by some stakeholders that other laws required the use of chlorine at higher concentrations than those listed on the National List. It stated that if other laws require the use of chlorine, then it must be allowed under the organic program and if it is required, it should be included on the National List with specific citations for the requirements. It also referenced the 2026 limited scope TR as having established a foundational need for developing a comprehensive review of sanitizers and disinfectants. It asked the NOSB to determine whether the exception of sprouts from the

Safe Drinking Water Act requirements was necessary. It stated that even though organic producers should not have to filter chlorine from water used for irrigation, cleaning equipment, washing vegetables, or cleaning food-contact surfaces, they should not be adding more chlorine. It asked for organic production and handling to be chlorine-free to the extent possible.

Another advocacy organization stated that chlorine is harmful to humans and the environment during production and use. It referenced the technical report of sodium dodecylbenzene sulfonate which listed alternatives to Chlorine to include Hydrogen Peroxide, ozone, essential oils, grapefruit seed extract, salt (sodium chloride), organic acids (including ascorbic acid, citric acid, lactates, tartaric acid, malic acid and vinegar (acetic acid), egg white lysozyme, high temperatures, and biocontrols. It further quoted the following statement from the TR, “However, it is much easier to prevent contamination of products from the first steps of the food production process than to remove contamination later in the process or at the point of use.” It stated that chlorine materials are not compatible with organic production partly because of the production of persistent toxic chemicals from the use of chlorine materials.

A certifying organization stated that it understood the fact that a review of cleaners and sanitizers that contain inactive or ancillary ingredients, including chlorine materials used in direct and indirect contact with organic products, is beyond the scope of the sunset review but would be in support of future Board discussion and work agenda items that address this topic.

A stakeholder organization put chlorine materials on the list of materials that may not be essential for all producers but may be deemed essential to any given producer.

Questions to our Stakeholders

Is there any additional information/research data on the performance and cost-effectiveness of alternatives to Chlorine materials?

Justification for Vote

The Subcommittee finds calcium hypochlorite **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove calcium hypochlorite from the National List

Motioned by: Franklin Quarcoo

Seconded by: Amanda Felder

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Chlorine materials – Chlorine dioxide

Reference: § 205.601(a) - As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems. (2) Chlorine materials - For pre-harvest use, residual chlorine levels in the water in direct crop contact or as water from cleaning irrigation systems applied to soil must not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act, except that chlorine products may be used in edible sprout production according to EPA label directions.

(ii) Chlorine dioxide

Technical Report(s): [1995 TAP](#); [2006 TR](#); [2011 TR](#); 2025 TR (pending post)

Petition(s): N/A

Past NOSB Actions: [10/1995 NOSB minutes and vote](#); [04/2006 NOSB sunset recommendation](#); [04/2011 NOSB sunset recommendation](#); [10/2015 sunset recommendation](#); [11/2017 sunset recommendation](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: Added to National List 02/20/2001 ([65 FR 80547](#)); Sunset renewal notice 03/21/2017 ([82 FR 14420](#)); Sunset renewal notice effective 10/30/2019 ([84 FR 53577](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))
Sunset Date: 05/29/2028

Subcommittee Review

Use

In addition to USDA, chlorine materials are regulated by FDA, EPA, and FSIS when used in organic production [2025 TR, line 429]. Chlorine dioxide is an antimicrobial disinfectant and pesticide used to control harmful microorganisms including bacteria, viruses, and fungi on inanimate objects and surfaces primarily in indoor environments [2006 TR, lines 66-67]. It is allowed for disinfecting and sanitizing food contact surfaces. Residual chlorine levels for wash water in direct crop or food contact and in flush water from cleaning irrigation systems that is applied to crops or fields cannot exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (currently 4mg/L expressed as Cl₂).

For organic food handling facilities and equipment, chlorine materials may be used up to maximum-labeled rates for disinfecting and sanitizing food contact surfaces. Rinsing is not required unless mandated by the label use directions. The FDA permits direct food use of chlorine dioxide to wash fruits and vegetables. The maximum amount of ClO₂ allowed is 3 ppm for fruits and vegetables, followed by a potable water rinse, blanching, cooking, or canning [2025 TR, lines 482-485]. Water used in direct post-harvest crop or food contact (including flume water to transport fruits or vegetables, wash water in produce lines, egg or carcass washing) is permitted to contain chlorine materials at levels approved by the Food and Drug Administration (FDA) or the Environmental Protection Agency (EPA) for such purposes. Rinsing with potable water that does not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA must immediately follow this permitted use. Certified operators should monitor the chlorine level of the final rinse water at the point at which the water last contacts the organic product. The level of chlorine in the final rinse water must meet limits as set forth by the SDWA. Water used as an ingredient in organic food handling should not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA, as required by the Organic Food Production Act (7 U.S.C. 6510(a)(7)).

Chlorine dioxide is a strong oxidant. It is likely a better bactericide than hypochlorous acid. In general, the disinfection efficiency of chlorine dioxide decreases as temperature decreases (2011 TR, lines 149-150).

Manufacture

To form chlorine dioxide, sodium chlorate (NaClO₃) and sulfuric acid (H₂SO₄) are reacted with sulfur dioxide (SO₂), or chloric acid (Cl-H-O₃) is reacted with methanol (CH₃OH). Alternatively, chlorine dioxide can be formed with chlorine (Cl₂) and sodium chlorite; sodium hypochlorite with hydrochloric acid; potassium chlorate with sulfuric acid; or by passing nitrogen dioxide through a column of sodium chlorate (2011 TR, lines 206-210).

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- Teat dips and udder wash are permitted. Substances, such as alcohol, iodine, hydrogen peroxide, chlorine dioxide and ozone, can be used as disinfectants for a pre- or post-teat dip or udder wash if they are registered for this use by Canada's Food and Drug Regulations. Chlorhexidine can be used as a post-milking teat dip if alternative germicidal agents and physical

barriers have lost their effectiveness (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).

- The following chlorine compounds are permitted: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite. Shall not exceed maximum levels for safe drinking water. Chlorine compounds may be used: a) for wash water in direct contact with crops or food; b) in flush water from cleaning irrigation systems, equipment, storage or transport units—application to crops or fields is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).
- The following chlorine compounds are permitted up to maximum label rates: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- Chlorine dioxide is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- Chlorine dioxide is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Chlorine dioxide is permitted with the following limitation: an intervening event or action must occur to eliminate risks of contamination (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- Chlorine dioxide is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

Chlorine sanitizing compounds currently on the National List are strong oxidants and can pose serious risks to human health if acute high exposures occur or from chronic lower-level exposures – especially in occupational environments when these materials are used daily. Chlorine compounds are dermal, respiratory, ocular, and mucous membrane irritants. Sodium hypochlorite (bleach) can cause asthma, as classified by the Association of Occupational and Environmental Clinics. Given the similar chemical properties and mechanisms of action, other chlorine-based oxidant sanitizers are also likely to cause asthma. Chlorine compounds are toxic to fish and other aquatic organisms. Strict adherence to the label is required when used, including the use of personal protective equipment when appropriate. Use of chlorine compounds in organic processing and crop production have been reviewed in the 2006, 2011, and 2025 Technical Reports (TR) (referenced above).

The EPA established Maximum Residual Disinfectant Levels (MRDLs) of 4.0 mg/L for chloramines (as Cl_2), and 0.8 mg/L for chlorine dioxide (as ClO_2) (40 CFR 141.65(a)). In addition, the EPA established Maximum Contaminant Levels (MCLs) for the chlorine disinfection by-products (DBPs) total trihalomethanes (TTHMs) of 0.080 mg/L and haloacetic acids (HAAs) of 0.060 mg/L (40 CFR 141.64(b)(1) [2025 TR, lines 495-498]).

Discussion

Comments about chlorine dioxide submitted to the NOSB during the last sunset review (in 2021) addressed essentiality and impact on human and environmental health. Below is a summary of the public comments and discussions.

Arguments in support of chlorine dioxide and other chlorine materials include its use in protecting food from contamination by human pathogens which is essential in safeguarding organic integrity. Despite the potential for significant risks to human health and the environment, chlorine compounds have been deemed essential to ensure food safety and to comply with food safety regulations under the Food Safety Modernization Act (FSMA). The Crops Subcommittee (CS) generally supported the continued listing of chlorine materials but encouraged ongoing discussion at the time on the listing of sanitizers and disinfectants for post-harvest handling and processing. Some public comments outlined the need for a comprehensive technical review of sanitizers and listing of sanitizers on the National List itemized “by specific use or application” with clear identification of the hazards to humans and the environment. It was said that further restructuring of the National List with a designated category for cleaners, sanitizers and disinfectants would help to ensure certified operations understand which cleaners, sanitizers and disinfectants may be used and would facilitate better organic education.

The CS in 2021 stated its support for research priorities that investigate alternatives to chlorine compounds and encouraged the use of alternative, less toxic materials, when their use can meet strict food safety standards.

In the 2025 sunset review of another chlorine material (potassium hypochlorite), the CS received public comments that were not supportive of the proposed annotation requiring the use of chlorine produced using environmentally friendly methods in the synthetic production of chlorine materials. It was stated that this annotation would make it difficult to obtain chlorine materials that meet this requirement.

Public comments at the Spring 2026 meeting

A human and environmental health advocacy group stated its belief that there were mistaken translations of NOSB recommendations into regulations. It asked the NOSB and NOP to clarify whether chlorine is required by other statutes. It referred to statements by some stakeholders that other laws required the use of chlorine at higher concentrations than those listed on the National List. It stated that if other laws require the use of chlorine, then it must be allowed under the organic program and if it is required, it should be included on the National List with specific citations for the requirements. It also referenced the 2026 limited scope TR as having established a foundational need for developing a comprehensive review of sanitizers and disinfectants. It asked the NOSB to determine whether the exception of sprouts from the Safe Drinking Water Act requirements was necessary. It stated that even though organic producers should not have to filter chlorine from water used for irrigation, cleaning equipment, washing vegetables, or cleaning food-contact surfaces, they should not be adding more chlorine. It asked for organic production and handling to be chlorine-free to the extent possible.

Another advocacy organization stated that chlorine is harmful to humans and the environment during production and use. It referenced the technical report of sodium dodecylbenzene sulfonate which listed alternatives to Chlorine to include Hydrogen Peroxide, ozone, essential oils, grapefruit seed extract, salt (sodium chloride), organic acids (including ascorbic acid, citric acid, lactates, tartaric acid, malic acid and vinegar (acetic acid)), egg white lysozyme, high temperatures, and biocontrols. It further quoted the following statement from the TR, “However, it is much easier to prevent contamination of products from the first steps of the food production process than to remove contamination later in the process or at the point of use.” It stated that chlorine materials are not compatible with organic production partly because of the production of persistent toxic chemicals from the use of chlorine materials.

A certifying organization stated that it understood the fact that a review of cleaners and sanitizers that contain inactive or ancillary ingredients, including chlorine materials used in direct and indirect contact with organic products, is beyond the scope of the sunset review but would be in support of future Board discussion and work agenda items that address this topic.

A stakeholder organization put chlorine materials on the list of materials that may not be essential for all producers but may be deemed essential to any given producer.

Questions to our Stakeholders

Is there any additional information/research data on the performance and cost-effectiveness of alternatives to Chlorine materials?

Justification for Vote

The Subcommittee finds chlorine dioxide **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove chlorine dioxide from the National List

Motioned by: Franklin Quarcoo

Seconded by: Nate Lewis

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Chlorine materials – Hypochlorous acid – generated from electrolyzed water

Reference: § 205.601(a) - As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems. (2) Chlorine materials -For pre-harvest use, residual chlorine levels in the water in direct crop contact or as water from cleaning irrigation systems applied to soil must not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act, except that chlorine products may be used in edible sprout production according to EPA label directions.

(iii) Hypochlorous acid - generated from electrolyzed water.

Technical Report(s): [1995 TAP \(Chlorine materials\)](#); [2006 TR \(Chlorine materials\)](#); [2011 TR \(Chlorine materials\)](#); [2015 TR \(Hypochlorous acid\)](#); 2025 TR (pending post)

Petition(s): [2015](#)

Past NOSB Actions: [04/2016 recommendation to add](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: Added to NL 12/27/2018 ([83 FR 66559](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Hypochlorous acid (HOCl) is the most effective form of chlorine for killing microbial pathogens and parasites that pose food safety risks [2025 TR, lines 504-506]. In addition to USDA, chlorine materials are regulated by FDA, EPA, and FSIS when used in organic production [2025 TR, line 429]. It is allowed for disinfecting and sanitizing food contact surfaces. Residual chlorine levels for wash water in direct crop or food contact and in flush water from cleaning irrigation systems that is applied to crops or fields cannot exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (currently 4mg/L expressed as Cl₂). For organic food handling facilities and equipment, chlorine materials may be used up to maximum-

labeled rates for disinfecting and sanitizing food contact surfaces. Rinsing is not required unless mandated by the label use directions.

Water used in direct post-harvest crop or food contact (including flume water to transport fruits or vegetables, wash water in produce lines, egg or carcass washing) is permitted to contain chlorine materials at levels approved by the Food and Drug Administration (FDA) or the Environmental Protection Agency (EPA) for such purposes. Rinsing with potable water that does not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA must immediately follow this permitted use. Certified operators should monitor the chlorine level of the final rinse water, the point at which the water last contacts the organic product. The level of chlorine in the final rinse water must meet limits as set forth by the SDWA. Water used as an ingredient in organic food handling should not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA, as required by the Organic Food Production Act (7 U.S.C. 6510(a)(7)).

Hypochlorous acid molecules are neutral and small in size. As a result, when hypochlorous acid molecules exist in equilibrium with hypochlorite ions, they easily diffuse through the cell walls of bacteria. This changes the oxidation-reduction potential of the cell and inactivates 3-phosphate dehydrogenase, an enzyme which is essential for the digestion of glucose. Inactivation of this enzyme effectively destroys the microorganism's ability to function [2006 TR, lines 118-122].

Manufacture

When chlorine is added to water, it goes into solution as hypochlorous acid, a hydrogen ion, and a chloride ion (2025 TR, line 540). Electrolyzed water (EW) is the product of the electrolysis of a dilute sodium chloride solution in an electrolysis cell containing a semi-permeable membrane that physically separates the anode and cathode but permits ions to pass through. In the process, hypochlorous acid, hypochlorite ion, and hydrochloric acid are formed at the anode, and sodium hydroxide is formed at the cathode. The solution formed on the anode side is acidic EW (pH 2 to 6), and the solution formed on the cathode side is basic EW (pH 7.5 to 13). Neutral EW, with a pH of 6 to 7.5 is produced by mixing the anodic solution with hydroxide, or by using a single-cell chamber for electrolysis [2015 TR lines 48-68].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- The following chlorine compounds are permitted: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite. Shall not exceed maximum levels for safe drinking water. Chlorine compounds may be used: a) for wash water in direct contact with crops or food; b) in flush water from cleaning irrigation systems, equipment, storage or transport units—application to crops or fields is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).
- The following chlorine compounds are permitted up to maximum label rates: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- Hypochlorous acid is not explicitly mentioned in the regulations.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- Hypochlorous acid is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Hypochlorous acid is not explicitly mentioned in the regulations.

Japan Agricultural Standard (JAS) for Organic Production

- Any substances other than hypochlorous acid water and sodium hypochlorite, both of which are specified in Table D.1, should not be used for the seeds specified in 5.6.1 (Seeds used in cultivation facilities of sprout, JAS 1605 Organic Products of Plant Origin).
- Sodium hypochlorite is permitted with the following criteria: limited to the use in processed products of plant origin (limited to the use of hypochlorous acid water produced by electrolyzing salt water (limited to the use of salt containing 99% or more sodium chloride)), or the use for disinfecting the intestines of livestock animals for processed meat products, or cleaning of eggs (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- Hypochlorous acid water is permitted with the following criteria: limited to the use only for the purpose of disinfecting meat in the process of dismantling or cleaning eggs (Table K.1 - Substances for preparation or other purposes, JAS 1608 Organic Livestock Products).

Human Health and Environmental Issues

Hypochlorous acid, generated from electrolyzed water [2025 TR, line 59], is present in solutions of two chlorine sanitizers (sodium hypochlorite and calcium hypochlorite) currently allowed at § 205.601(a)(2)(i, ii). Like other chlorine compounds, hypochlorous acid is also an oxidant and can pose risks to human health. Strict adherence to the label is required when used, including the use of personal protective equipment when appropriate. Use of chlorine compounds in organic processing and crop production have been reviewed in the 2006, 2011, and 2025 Technical Reports (TR) (referenced above). When formulated via electrolyzed water, hypochlorous acid is effective as a sanitizer at lower chlorine concentrations and is likely safer for health and the environment than other currently listed chlorine sanitizers. Toxicological experiments on model laboratory animals showed that hypochlorous acid salts are less toxic than chlorine dioxide or sodium chlorite [2025 TR, line 739]. In 1991 the International Agency for Research on Cancer stated that there was no evidence that hypochlorite salts or chlorinated drinking water are carcinogenic [2025 TR, line 786].

In 2025 the US EPA reported that 1 of the 651 chlorine material incidents reported to the US EPA'S Incident Data System between September 1, 2010 and September 1, 2025 were due to hypochlorous acid [2025 TR, lines 802-807]. Sodium hypochlorite accounted for 556 of the reported incidents. Most of the incidents involved humans and were classified as either minor or moderate. No human or animal fatality was recorded for hypochlorous acid.

Chlorine disinfection byproducts (DBPs) are formed when chlorine in water reacts with natural organic matter. It is, however, important to note that not all toxic DBPs formed by chlorine products contain chlorine. Humic acid exposed to chlorine and hypochlorous acid disinfectants can also form benzene, aldehydes, alkanic acids, carboxylic acids, and other non-halogenated DBPs when the free chlorine breaks the chemical bonds in the organic matter.

A laboratory experiment treated soil samples with a sodium hypochlorite solution and a hypochlorous acid solution to measure soil enzyme activity [2025 TR, lines 1280-1288]. Soil samples were treated with commercial disinfectants with low concentrations of 250 mg/L and high concentrations of 500 mg/L of each

of the active ingredients. The researchers measured THMs after 24 hours. Hypochlorous acid generated higher levels of THMs with trichloromethane being the predominant DBP. They next measured urease, phosphatase, catalase, and sucrase activity at 7 days and 28 days. Phosphatase showed decreased activity with all treatments. Catalase, which is an oxygen scavenger, increased its activity. Urease activity decreased with the sodium hypochlorite treatments but increased with the low hypochlorous acid treatment. Plant available nitrogen in the form of ammonia is produced by urease activity. Sucrase activity was unchanged [2025 TR, lines 1280-1288]. Hypochlorous acid reportedly kills a broader range of microorganisms than any other approved sanitizer [2025 TR, lines 1296-1297]. Effective alternatives will often incur a higher cost, may require investment in new equipment, and in many cases will be less effective [2025 TR, lines 1297-1298].

Discussion

Comments about hypochlorous acid submitted to the NOSB during the last sunset review (in 2021) addressed essentiality and impact on human and environmental health. Below is a summary of the public comments and discussions.

Arguments in support of hypochlorous acid include its use in protecting food from contamination by human pathogens which is essential in safeguarding organic integrity. Despite the potential for significant risks to human health and the environment, chlorine compounds have been deemed essential to ensure food safety and to comply with food safety regulations under the Food Safety Modernization Act (FSMA). The Crops Subcommittee (CS) generally supported the continued listing of chlorine materials but encouraged ongoing discussion at the time on the listing of sanitizers and disinfectants for post-harvest handling and processing. Some public comments outlined the need for a comprehensive technical review of sanitizers and listing of sanitizers on the National List itemized “by specific use or application” with clear identification of the hazards to humans and the environment. It was said that further restructuring of the National List with a designated category for cleaners, sanitizers and disinfectants would help to ensure certified operations understand which cleaners, sanitizers and disinfectants may be used and would facilitate better organic education.

In the 2025 sunset review of another chlorine material (potassium hypochlorite), the CS received public comments that were not supportive of the proposed annotation requiring the use of chlorine produced using environmentally friendly methods in the synthetic production of chlorine materials. It was stated that this annotation would make it difficult to obtain chlorine materials that meet this requirement.

Public comments at the Spring 2026 meeting

A human and environmental health advocacy group stated its belief that there were mistaken translations of NOSB recommendations into regulations. It asked the NOSB and NOP to clarify whether chlorine is required by other statutes. It referred to statements by some stakeholders that other laws required the use of chlorine at higher concentrations than those listed on the National List. It stated that if other laws require the use of chlorine, then it must be allowed under the organic program and if it is required, it should be included on the National List with specific citations for the requirements. It also referenced the 2026 limited scope TR as having established a foundational need for developing a comprehensive review of sanitizers and disinfectants. It asked the NOSB to determine whether the exception of sprouts from the Safe Drinking Water Act requirements was necessary. It stated that even though organic producers should not have to filter chlorine from water used for irrigation, cleaning equipment, washing vegetables, or cleaning food-contact surfaces, they should not be adding more chlorine. It asked for organic production and handling to be chlorine-free to the extent possible.

Another advocacy organization stated that chlorine is harmful to humans and the environment during production and use. It referenced the technical report of sodium dodecylbenzene sulfonate which listed

alternatives to Chlorine to include Hydrogen Peroxide, ozone, essential oils, grapefruit seed extract, salt (sodium chloride), organic acids (including ascorbic acid, citric acid, lactates, tartaric acid, malic acid and vinegar (acetic acid), egg white lysozyme, high temperatures, and biocontrols. It further quoted the following statement from the TR, “However, it is much easier to prevent contamination of products from the first steps of the food production process than to remove contamination later in the process or at the point of use.” It stated that chlorine materials are not compatible with organic production partly because of the production of persistent toxic chemicals from the use of chlorine materials.

A certifying organization stated that it understood the fact that a review of cleaners and sanitizers that contain inactive or ancillary ingredients, including chlorine materials used in direct and indirect contact with organic products, is beyond the scope of the sunset review but would be in support of future Board discussion and work agenda items that address this topic.

A stakeholder organization put chlorine materials on the list of materials that may not be essential for all producers but may be deemed essential to any given producer.

Questions to our Stakeholders

Is there any additional information/research data on the performance and cost-effectiveness of alternatives to Chlorine materials?

Justification for Vote

The Subcommittee finds hypochlorous acid **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove hypochlorous acid from the National List at

Motioned by: Franklin Quarcoo

Seconded by: Dilip Nandwani

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Chlorine materials – Sodium hypochlorite

Reference: § 205.601(a) - As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems. (2) Chlorine materials -For pre-harvest use, residual chlorine levels in the water in direct crop contact or as water from cleaning irrigation systems applied to soil must not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act, except that chlorine products may be used in edible sprout production according to EPA label directions.

(iv) Sodium hypochlorite

Technical Report(s): [1995 TAP](#); [2006 TR](#); [2011 TR](#); 2025 TR (pending post)

Petition(s): N/A

Past NOSB Actions: [10/1995 NOSB minutes and vote](#); [04/2006 NOSB sunset recommendation](#); [04/2011 NOSB sunset recommendation](#); [10/2015 sunset recommendation](#); [11/2017 sunset recommendation](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: Added to National List 02/20/2001 ([65 FR 80547](#)), Sunset renewal notice 03/21/2017 ([82 FR 14420](#)); Sunset renewal notice effective 10/30/2019 ([84 FR 53577](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Sodium hypochlorite is an Environmental Protection Agency (EPA)--registered pesticide (PC Code 014703). Sodium hypochlorite in aqueous solution is generally referred to as "bleach." It is an antimicrobial disinfectant and pesticide used to control harmful microorganisms including bacteria, viruses, and fungi on inanimate objects and surfaces primarily in indoor environments. It is allowed for disinfecting and sanitizing food contact surfaces. Residual chlorine levels for wash water in direct crop or food contact and in flush water from cleaning irrigation systems that is applied to crops or fields cannot exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (currently 4mg/L expressed as Cl_2).

Sodium hypochlorite is an "indirect" food additive approved by Food and Drug Administration (FDA). Sodium hypochlorite may be used as a final sanitizing rinse on food processing equipment (21 CFR 178.1010); sodium hypochlorite may be used in washing and lye peeling of fruits and vegetables (21 CFR 173.315). Sodium hypochlorite also can be used in postharvest, seed, or soil treatment on various fruit and vegetable crops [2006 TR, lines 93-99].

For organic food handling facilities and equipment, chlorine materials may be used up to maximum-labeled rates for disinfecting and sanitizing food contact surfaces. Rinsing is not required unless mandated by the label use directions. Water used in direct post-harvest crop or food contact (including flume water to transport fruits or vegetables, wash water in produce lines, egg or carcass washing) is permitted to contain chlorine materials at levels approved by the FDA or the EPA for such purposes. Rinsing with potable water that does not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA must immediately follow this permitted use. Certified operators should monitor the chlorine level of the final rinse water, the point at which the water last contacts the organic product. The level of chlorine in the final rinse water must meet limits as set forth by the SDWA. Water used as an ingredient in organic food handling should not exceed the maximum residual disinfectant limit for the chlorine material under the SDWA, as required by the Organic Food Production Act (7 U.S.C. 6510(a)(7)).

In water and soil, sodium hypochlorite separates into sodium and hypochlorite ions and hydrochlorous acid molecules. Hypochlorous acid molecules are neutral and small in size. As a result, when hypochlorous acid molecules exist in equilibrium with the hypochlorite ions, they easily diffuse through the cell walls of bacteria. This changes the oxidation-reduction potential of the cell and inactivates triosephosphate dehydrogenase, an enzyme which is essential for the digestion of glucose. Inactivation of this enzyme effectively destroys the microorganism's ability to function [2006 TR, lines 117-122].

Information provided by three NOP-accredited certifying agents revealed that all three certifiers approved chlorine for post-harvest handling. They all approved sodium hypochlorite, acidified sodium chlorite, calcium hypochlorite, chlorine dioxide, and hypochlorous acid generated from electrolyzed water. Sodium hypochlorite was the most commonly used material for post-harvest handling, with calcium hypochlorite and chlorine dioxide also common, according to one certifier.

Manufacture

Generally, sodium hypochlorite is produced by reacting chlorine with a solution of sodium hydroxide (NaOH , also called lye or caustic soda). This method is used for most commercial productions of sodium hypochlorite. A more active, but less stable formulation of sodium hypochlorite can be produced by chlorinating a solution of soda ash (Na_2CO_3) [2006 TR, lines 156-159].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- The following chlorine compounds are permitted: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite. Shall not exceed maximum levels for safe drinking water. Chlorine compounds may be used: a) for wash water in direct contact with crops or food; b) in flush water from cleaning irrigation systems, equipment, storage or transport units—application to crops or fields is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).
- The following chlorine compounds are permitted up to maximum label rates: a) calcium hypochlorite; b) chlorine dioxide; c) hypochlorous acid generated via electrolyzed water; d) sodium hypochlorite (Table 7.4 - Cleaners, disinfectants and sanitizers permitted on organic product contact surfaces for which a removal event is mandatory, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- Sodium hypochlorite is not explicitly mentioned in the regulations.
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CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- Sodium hypochlorite is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Sodium hypochlorite is permitted with the following limitation: an intervening event or action must occur to eliminate risks of contamination (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).
- Sodium hypochlorite (e.g., as liquid bleach) is permitted (Appendix 5: Substances for pest and disease control and disinfection in livestock housing and equipment, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- Any substances other than hypochlorous acid water and sodium hypochlorite, both of which are specified in Table D.1, should not be used for the seeds specified in 5.6.1 (Seeds used in cultivation facilities of sprout, JAS 1605 Organic Products of Plant Origin).
- Sodium hypochlorite sodium chloride is permitted with the following criteria: limited to those obtained by electrolyzing the salt solution (limited to those using salt containing no less than 99% sodium chloride) (Table D.1 - Substances for preparation etc., JAS 1605 Organic Products of Plant Origin).
- Sodium hypochlorite is permitted with the following criteria: limited to the use in processed products of plant origin (limited to the use of hypochlorous acid water produced by electrolyzing salt water (limited to the use of salt containing 99% or more sodium chloride)), or the use for disinfecting the intestines of livestock animals for processed meat products, or cleaning of eggs (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- Sodium hypochlorite is permitted with the following criteria: limited to the use only for the purpose of disinfecting meat in the process of dismantling or cleaning eggs (Table K.1 - Substances for preparation or other purposes, JAS 1608 Organic Livestock Products).

Human Health and Environmental Issues

Chlorine sanitizing compounds currently on the National List are strong oxidants and can pose serious risks to human health if acute high exposure occurs or from chronic lower-level exposures – especially in occupational environments when these materials are used daily. Chlorine compounds are dermal, respiratory, ocular, and mucous membrane irritants. Sodium hypochlorite (bleach) can cause asthma, as classified by the Association of Occupational and Environmental Clinics. Given the similar chemical properties and mechanisms of action, other chlorine-based oxidant sanitizers are also likely to cause asthma. Chlorine compounds are toxic to fish and other aquatic organisms. Strict adherence to the label is required when used, including the use of personal protective equipment when appropriate. Use of chlorine compounds in organic processing and crop production have been reviewed in the 2006 and 2011 Technical Reports (TR) (referenced above). The EPA exempts calcium hypochlorite (40 CFR 180.1054), potassium hypochlorite (40 CFR 180.1300), and sodium hypochlorite (40 CFR 180.1235) from the requirement of a tolerance in food [2025 TR, lines 446-447].

A laboratory experiment treated soil samples with a sodium hypochlorite solution and a hypochlorous acid solution to measure soil enzyme activity [2025 TR, lines 1280-1288]. Soil samples were treated with commercial disinfectants with low concentrations of 250 mg/L and high concentrations of 500 mg/L of each of the active ingredients. The researchers measured Trihalomethanes (THMs) after 24 hours. Hypochlorous acid generated higher levels of THMs with trichloromethane being the predominant disinfection byproduct. They next measured urease, phosphatase, catalase, and sucrase activity at 7 days and 28 days. Phosphatase showed decreased activity with all treatments. Catalase, which is an oxygen scavenger, increased its activity. Urease activity decreased with the sodium hypochlorite treatments but increased with the low hypochlorous acid treatment. Plant available nitrogen in the form of ammonia is produced by urease activity. Sucrase activity was unchanged [2025 TR, lines 1280-1288].

Discussion

Comments about sodium hypochlorite submitted to the NOSB during the last sunset review (in 2021) addressed essentiality and impact on human and environmental health. Below is a summary of the public comments and discussions.

Arguments in support of sodium hypochlorite and other chlorine materials include its use in protecting food from contamination by human pathogens which is essential in safeguarding organic integrity. Despite the potential for significant risks to human health and the environment, chlorine compounds have been deemed essential to ensure food safety and to comply with food safety regulations under the Food Safety Modernization Act (FSMA). The Crops Subcommittee (CS) generally supported the continued listing of chlorine materials but encouraged ongoing discussion at the time on the listing of sanitizers and disinfectants for post-harvest handling and processing. Some public comments outlined the need for a comprehensive technical review of sanitizers and listing of sanitizers on the National List itemized “by specific use or application” with clear identification of the hazards to humans and the environment. It was said that further restructuring of the National List with a designated category for cleaners, sanitizers and disinfectants would help to ensure certified operations understand which cleaners, sanitizers and disinfectants may be used and would facilitate better organic education.

In the 2025 sunset review of another chlorine material (potassium hypochlorite), the CS received public comments that were not supportive of the proposed annotation requiring the use of chlorine produced using environmentally friendly methods in the synthetic production of chlorine materials. It was stated that this annotation would make it difficult to obtain chlorine materials that meet this requirement.

Public comments at the Spring 2026 meeting

A human and environmental health advocacy group stated its belief that there were mistaken translations of NOSB recommendations into regulations. It asked the NOSB and NOP to clarify whether chlorine is required by other statutes. It referred to statements by some stakeholders to the effect that other laws required the use of chlorine at higher concentrations than those listed on the National List. It stated that if other laws require the use of chlorine, then it must be allowed under the organic program and if it is required, it should be included on the National List with specific citations for the requirements. It also referenced the 2026 limited scope TR as having established a foundational need for developing a comprehensive review of sanitizers and disinfectants. It asked the NOSB to determine whether the exception of sprouts from the Safe Drinking Water Act requirements was necessary. It stated that even though organic producers should not have to filter chlorine from water used for irrigation, cleaning equipment, washing vegetables, or cleaning food-contact surfaces, they should not be adding more chlorine. It asked for organic production and handling to be chlorine-free to the extent possible.

Another advocacy organization stated that chlorine is harmful to humans and the environment during production and use. It referenced the technical report of sodium dodecylbenzene sulfonate which listed alternatives to Chlorine to include Hydrogen Peroxide, ozone, essential oils, grapefruit seed extract, salt (sodium chloride), organic acids (including ascorbic acid, citric acid, lactates, tartaric acid, malic acid and vinegar (acetic acid), egg white lysozyme, high temperatures, and biocontrols. It further quoted the following statement from the TR, "However, it is much easier to prevent contamination of products from the first steps of the food production process than to remove contamination later in the process or at the point of use." It stated that chlorine materials are not compatible with organic production partly because of the production of persistent toxic chemicals from the use of chlorine materials.

A certifying organization stated that it understood the fact that a review of cleaners and sanitizers that contain inactive or ancillary ingredients, including chlorine materials used in direct and indirect contact with organic products, is beyond the scope of the sunset review but would be in support of future Board discussion and work agenda items that address this topic.

A stakeholder organization put chlorine materials on the list of materials that may not be essential for all producers but may be deemed essential to any given producer.

Questions to our Stakeholders

Is there any additional information/research data on the performance and cost-effectiveness of alternatives to Chlorine materials?

Justification for Vote

The Subcommittee finds sodium hypochlorite **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove sodium hypochlorite from the National List

Motioned by: Franklin Quarcoo

Seconded by: Dilip Nandwani

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Copper sulfate

Reference: § 205.601(a)(3) Copper sulfate – for use as an algicide in aquatic rice systems, is limited to one application per field during any 24-month period. Application rates are limited to those which do not increase baseline soil test values for copper over a timeframe agreed upon by the producer and accredited certifying agent; and,

§ 205.601(e)(4) Copper sulfate—for use as tadpole shrimp control in aquatic rice production, is limited to one application per field during any 24-month period. Application rates are limited to levels which do not increase baseline soil test values for copper over a timeframe agreed upon by the producer and accredited certifying agent.

Technical Report: [1995 TAP \(Copper Sulfate and Other Coppers\)](#); [2001 TAP](#); [2011 TR](#); [2022 TR](#)
Petition(s): [2001](#)

Past NOSB Actions: [10/2001 meeting minutes and vote](#); [11/2007 recommendation](#); [04/2011 recommendation](#); [10/2016 sunset recommendation](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: National List amended 10/31/2003 ([68 FR 61987](#)); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 11/03/2013; Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Copper sulfate is used as an algicide for rice crops, as the growth of algal matting in flooded fields can dislodge young seedlings. It is broadcast aerially into the flooded rice fields by plane. Rice farmers also spray copper sulfate to control a freshwater invertebrate, *Triops longicaudatus*, otherwise known as tadpole shrimp. Tadpole shrimp are only detrimental to very young seedlings, as their burrowing activities can disrupt the seedling roots and the first emerging leaves.

Manufacture

Copper sulfate is manufactured by treating copper metal with hot concentrated sulfuric acid. Copper oxides can be treated with a more dilute sulfuric acid to produce copper sulfate. Copper sulfate is also known as copper vitriol.

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- Copper is permitted as a soil amendment. The following copper products may be used to correct documented copper deficiencies: **copper sulphate**, basic copper sulphate, copper oxide and copper oxysulphate. Copper ammonia base, copper ammonium carbonate, copper nitrate and cuprous chloride are prohibited. Shall be used with caution to prevent excessive copper accumulation in the soil. Copper build-up in soil shall prohibit future use. Visible residue of copper products on harvested crops is prohibited (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- Copper is permitted as a production aid. **Copper sulphate**, copper hydroxide, copper octanoate, Bordeaux mix, copper oxychloride and copper oxide. Permitted for use as a wood preservative, or for controlling pests, including diseases. Shall be used with caution to prevent excessive copper accumulation in the soil. Copper build-up in soil shall prohibit future use. Visible residue of copper products on harvested crops is prohibited (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).

- **Copper sulphate** is permitted as an essential nutrient (source of copper and sulphur) and for topical use (foot baths) (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- The following products or products containing the following active substances as listed in Annex VII to Regulation (EC) No 889/2008 cannot be used as biocidal products: caustic soda; caustic potash; oxalic acid; natural essences of plants with the exception of linseed oil, lavender oil and peppermint oil; nitric acid; phosphoric acid; sodium carbonate; **copper sulphate**; potassium permanganate; tea seed cake made of natural camelia seed; humic acid; peroxyacetic acids with the exception of peracetic acid (Annex IV: Authorized products for cleaning and disinfection, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- Copper in the form of copper hydroxide, copper octanoate, copper oxychloride, (tribasic) **copper sulphate**, cuprous oxide, Bordeaux mixture, and Burgundy mixture is permitted with the following conditions for use: need, prescription and application rates recognized by certification body or authority. As a fungicide on condition that the substance be used in such a way as to minimize copper accumulation in the soil (Table 2 - Substances for plant pest and disease control, CXG 32-1999).

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Trace elements (e.g., boric acid; sodium borate; calcium borate; borethanolamin; cobalt-acetate; cobalt-sulphate; copper oxide; **copper sulfate**; copper hydroxide; copper silicate; copper carbonate; copper citrate; ferric oxide; ferric sulfate; ferrous sulfate; iron citrate; iron sulfate; iron tartrate; manganous oxide; manganese sulfate; manganese carbonate; selenic acid; selenous acid; sodium molybdate; molybdic oxide; zinc carbonate; zinc oxide; zinc silicate; and zinc sulfate) are permitted as calcareous and magnesium amendments of mineral origin with the following conditions for use: use restricted to cases where soil/plant nutrient deficiency is documented by soil or tissue testing or diagnosed by an independent expert. Micronutrients in either chloride or nitrate forms are prohibited. Micronutrients may not be used as a defoliant, herbicide, or desiccant (Appendix 2: Fertilizers and soil conditioners, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Copper sulfate** is permitted with the following criteria: limited to the use for the preparation of Bordeaux mixture (Table B.1 - Agricultural chemicals, JAS 1605 Organic Products of Plant Origin).

Environmental and Human Health Issues

Copper sulfate is readily dissolved and suspended in the water and is lethal to fish and other aquatic organisms at fairly low concentrations. In amphibians, increasing concentrations of copper can alter behavior, reduce growth rates and final size, and at higher concentrations can result in death. Copper also has algicidal effects and can disrupt the food chain in aquatic environments. For this reason, its direct introduction into flooded rice fields is contentious, particularly since rice fields serve as replacement wetlands for many birds and other fauna in agricultural areas like Northern California. Previous comments to the NOSB have highlighted specific concerns that the application rates in organic rice fields in California are several times higher than the amounts known to be toxic to native amphibian species.

In the soil, copper can concentrate heavily in the topsoil and over time, altering the soil microbiota and killing soil-dwelling animals such as earthworms. Copper toxicity in the soil can reduce the growth and

nutrient value of crop plants, as well as damage the integrity of root systems (Van Assche and Clijsters, 1990). Because it accumulates in the soil over time and eventually results in poor plant outcomes, its use as a sustainable practice is called into question.

Copper sulfate has been shown to be toxic to bees, particularly in tropical environments. At sub-lethal levels, the heavy metal also changes behavior and movement ability of bees (Rodrigues et al, 2016). Despite this, there are multiples statements on the National Pesticide Information Center (NPIC) and in US Environmental Protection Agency Office of Pesticide Programs documents stating that copper sulfate is virtually non-toxic to bees. This is an important issue to clarify. The role that bees play in the pollination of commercial crops globally should make the use of copper sulfate a concern to farmers and the general public alike.

Copper sulfate has been classified as a human carcinogen by the European Chemicals Agency (ECHA), with specific concern for renal cancers (Buzio et al, 2002). Chronic exposure to fungicidal sprays elevated the risk of renal cancers by almost 3 times. While copper binds to soils readily, copper contamination of drinking water sources would also be a concern.

When copper sulfate is applied to flooded paddies, the copper becomes fixed to soil particles after 7 or more days. Thus this use elevates soil copper levels but does not contaminate other water bodies when the field is drained.

Discussion

Copper sulfate is a difficult substance to evaluate, as there appears to be broad consensus throughout the US, EU, and Canada that it is hazardous to both human health and the environment. Despite this, its use has repeatedly been extended in all three jurisdictions, as there isn't yet a viable organic alternative for copper in certain applications. The EU, Canada, and Japan all exclude copper sulfate for organic rice production but allow it as a fungicidal spray in organic orchards and vineyards.

In terms of copper sulfate use in rice paddies to control tadpole shrimp, it appears that there may be ways to circumvent the need for chemical control. The tadpole shrimp emerge from eggs and most hatch within 1-3 days of flooding. Tadpole shrimp primarily cause injury to the rice through chewing young roots and shoots and disrupting the roots with burrowing activities (Tindall and Fothergill, 2012). The shrimp do not injure older seedlings once they have reached the water surface and roots are well established in the soil. In fact, at this later stage in seedling development, the tadpole shrimp can be beneficial to the crop by controlling algae and mosquitos.

Transplanting in older seedlings eliminates any threat from algal mats to the delicate young seedling stage, as do practices such as dry seeding the rice or ensuring that the rice is seeded directly at the time of flooding. Transplanting seedlings has been the preferred method of rice production throughout most of human rice cultivation but is much more expensive than direct seeding. In Asian rice cultivation, the tadpole shrimp are often deliberately introduced as a means of controlling algae and mosquitos. The current approach of flooding the fields and then direct wet-seeding didn't gain popularity until broad chemical use was implemented and was demonstrated to marginally reduce costs and increase yields.

An important issue for this use of copper sulfate on organic farms is the annotation requirement that, "application rates are limited to those which do not increase baseline soil test values for copper over a timeframe agreed upon by the producer and accredited certifying agent." The 2022 TR indicates that available soil copper levels have been shown to increase dramatically over time in some situations [2022 TR lines 1114-1117, & 1210-1223]. While copper is an element and does not break down when added to the

soil, it does leave the soil in harvested crops and leachate. In addition, it may be tightly adsorbed to soil particles and not show up on a soil test. Soil tested copper levels appear to increase rapidly when multiple heavy applications are used over years. In order to fulfill this requirement, the original soil baseline copper level needs to be compared to current levels by the certifier. While pesticide applications of copper can be a source of increasing soil test copper levels, manure applications can also include even larger amounts of copper [TR In 2519-2524].

The maximum labeled application rate for one product (Brandt Copper Sulfate Crystals, 25.1% copper) is 10.88 lb. per acre-foot for algae control and 27.2 lb. per acre foot for tadpole shrimp control. At a typical maximum paddy water depth of 5 inches, this translates to 11.3 lb. of copper sulfate per acre or 2.8 lb. of elemental copper for shrimp control.

A Swiss study showed yearly copper leaching rates of only 2.65 to 11.7 grams per hectare in dryland grain systems, less than an ounce per acre (Wiggenhauser et al., 2024). If these rates are close to what happens in organic rice soil systems, copper will accumulate over time. Since some of the total copper is strongly held by the soil particles, soil test results will likely not increase as quickly as total soil copper. It is necessary to research alternate algicides and other means of controlling tadpole shrimp.

It appears that to date there is sufficient evidence to conclude that:

1. Use of copper sulfate in rice fields can cause environmental damage.
2. Alternative seeding practices could eliminate the need for copper sulfate as both algae and tadpole shrimp cease to be problematic once seedlings are established.
3. International standards do not allow spraying of copper sulfate for organic rice production.
4. It is not feasible to apply amounts of copper sulfate that will not raise soil copper levels over time

Subcommittee Review. Much of the Crops Subcommittee’s review of copper sulfate centered on public comments and on interviewing stakeholders after the Spring 2026 NOSB meeting. The overwhelming majority of written and oral commenters were in favor of keeping copper sulfate on the National List. A stakeholder opposed to the use of copper sulfate did not advocate immediate delisting, but rather, strongly urged the program to: Get serious about “Continuous Improvement” and to put some real effort into finding alternative methods or materials that would limit or end its use.

At the Spring 2026 meeting, the full Board discussed the 2022 TR, which contained updated and expanded information regarding environmental and human health concerns. The Board also discussed public comments, which are largely in favor of re-listing copper sulfate. Though one stakeholder recommended delisting copper sulfate, while another stakeholder suggested annotating copper sulfate for use in crops.

Questions to our Stakeholders

1. How do certifiers verify compliance with this annotation?
2. Are there practical alternatives for algae and tadpole shrimp management in paddy rice?
3. Are there practical methods to remediate high soil copper levels?
4. What are common organic rice rotations? Is rice ever grown in successive years?
5. If so, is copper sulfate allowed to be applied to rice in successive years, alternating control of algae and tadpole shrimp?

Justification for Vote

The Subcommittee finds copper sulfate **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove copper sulfate at § 205.601(a)(3) Copper sulfate – for use as an algicide in aquatic rice systems and at § 205.601(e)(4) Copper sulfate—for use as tadpole shrimp control in aquatic rice production

Motioned by: Dilip Nandwani

Seconded by: Franklin Quarcoo

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

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Ozone gas

Reference: § 205.601(a)(5) Ozone gas—for use as an irrigation system cleaner only.

Technical Report: [2002 TAP](#); [2021 TR](#)

Petition(s): [2001](#)

Past NOSB Actions: [09/2002 meeting minutes and vote](#); [11/2007 recommendation](#); [12/2011 recommendation](#); [10/2016 sunset recommendation](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: National List amended 10/31/2003 ([68 FR 61987](#)); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Ozone gas is a strong oxidant and works by oxidizing plant tissue and bacterial membranes. The primary use of ozone globally is as a water treatment. In this capacity, ozone oxidizes organic and inorganic compounds,

improving water quality when used as a broad-scope disinfectant. It is used in organic crop production primarily as a sanitizer for water, equipment, and post-harvest handling systems to reduce microbial contamination. It is applied as a processing aid or treatment agent and does not persist in the environment, as it rapidly decomposes to oxygen. Ozone is found in the atmosphere at levels of 0.05 ppm, but at levels of 0.5 ppm in cities with smog.

Manufacture

Ozone occurs naturally, mostly in the upper atmosphere. Naturally occurring ozone is often the product of ultraviolet radiation on atmospheric oxygen. Producers generate most ozone by applying a low-current electrical discharge (corona discharge) to atmospheric oxygen. Increasingly, producers generate ozone through the electrolysis of water. Ozone can also be manufactured photochemically by exposing oxygen in air or water to ultraviolet light. Ozone is an unstable gas in the air and even more so in water, so it must be produced on site.

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- Teat dips and udder wash are permitted. Substances, such as alcohol, iodine, hydrogen peroxide, chlorine dioxide and **ozone**, can be used as disinfectants for a pre- or post-teat dip or udder wash if they are registered for this use by Canada's *Food and Drug Regulations*. *Chlorhexidine can be used as a post-milking teat dip if alternative germicidal agents and physical barriers have lost their effectiveness* (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).
- **Ozone** is permitted (Table 6.3 - Ingredients classified as food additives, CAN/CGSB-32.311-2020).
- **Ozone** is permitted (Table 6.5 - Processing aids, CAN/CGSB-32.311-2020).
- **Ozone** is permitted (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- With regard to disease prevention, the following rules shall apply: (i) ultraviolet light and **ozone** may only be used in hatcheries and nurseries (Disease prevention, EC No. 2018/848).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Ozone** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Ozone** is permitted (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Ozone** is permitted (Table D.1 - Substances for preparation etc., JAS 1605 Organic Products of Plant Origin).
- **Ozone** is permitted with the following criteria: limited to the use for disinfecting the processed meat products, or cleaning of eggs (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- **Ozone** is permitted with the following criteria: limited to the use only for the purpose of disinfecting meat or cleaning eggs (Table K.1 - Substances for preparation or other purposes, JAS 1608 Organic Livestock Products).

Human Health and Environmental Issues

When ozone gas is used for water treatment, it oxidizes or disinfects many components that impact water quality and could result in crop iron deficiencies. It will oxidize iron and manganese, which precipitate as ferric and manganese hydroxides. Ozone partially oxidizes organic matter to forms that are more easily biodegradable. It is also germicidal against many types of pathogenic organisms including viruses, bacteria, and protozoa. It is rated as a strong irritant via inhalation, and is irritating to skin, eyes, and mucous membranes. Exposure to atmospheric ozone generated from on-site production can be minimized through equipment maintenance. Ozone is Generally Recognized as Safe (GRAS) by the U.S. Food and Drug Administration (FDA) without limitations other than current good manufacturing practices. Ozone systems that inject directly into irrigation lines use relatively low concentrations of ozone and there is little potential for off-gassing. In water, ozone decomposes rapidly and the only decomposition product is oxygen, as opposed to chlorine, which can generate trihalomethanes. Cleaning of irrigation lines should not lead to problems with soil structure because most of the ozone is contained in the irrigation tubing.

Discussion

Ozone is still in active use by the organic community. Public comments during the last sunset review supported relisting ozone, and the Board unanimously approved its relisting. During the Spring 2026 meeting, commenters mostly supported the relisting of ozone, emphasizing that the annotation allows its use for crops as an irrigation system cleaner only. All other uses would fall under the Handling listing for ozone for post-harvest uses or would be prohibited. Commenters highlighted that due to drought conditions, specifically in the Pacific Northwest, many growers have switched to using overhead mist systems or micro sprinklers to reduce water usage to prevent sunburn of apples. This type of irrigation requires careful attention to the need to control algae build up within its infrastructure. Drip irrigation is also being utilized more heavily to reduce water usage and mirrors a similar need to control algae buildup. Two public comments asked for an annotation that does not allow application to soil. As this material already has the annotation “for use as an irrigation system cleaner only”, the subcommittee discussed this is sufficient to prevent direct application to soil.

Questions to our Stakeholders

Is the current annotation sufficient to prevent application to soil? If not, how?

Justification for Vote

The Subcommittee finds ozone gas **compliant** with the Organic Foods Production Act (OFPA) (7 U.S.C. 6518(m) and 6517) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove ozone gas from the National List

Motioned by: Amanda Felder

Seconded by: Nate Lewis

Yes: 0 No: 3 Abstain: 0 Recuse: 0 Absent: 2

Peracetic acid

Reference: § 205.601(a)(6) Peracetic acid—for use in disinfecting equipment, seed, and asexually propagated planting material. Also permitted in hydrogen peroxide formulations as allowed in § 205.601(a) at concentration of no more than 6% as indicated on the pesticide product label; and,

§ 205.601(i)(8) Peracetic acid - for use to control fire blight bacteria. Also permitted in hydrogen peroxide formulations as allowed in § 205.601(i) at concentration of no more than 6% as indicated on the pesticide product label.

Technical Report: [2000 TAP](#); [2016 TR](#)

Petition(s): [2008](#)

Past NOSB Actions: [11/2007 recommendation](#); [11/2009 annotation change](#); [12/2011 sunset recommendation](#); [10/2016 sunset recommendation](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: National List amended 10/31/2003 ([68 FR 61987](#)); Sunset renewal notice effective 10/09/2008 ([73 FR 59479](#)); Annotation change 05/28/2013 ([78 FR 31815](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

In organic crop production, peracetic acid, or PAA, is used to disinfect equipment. It can also be used as a disinfectant to treat seeds or asexually propagated planting material. It can be used to disinfect pruning equipment to help prevent the spread of the fire blight bacterium and is also used in one of the hydrogen peroxide formulations for control on the tree canopy of this same disease (2016 TR, lines 91-98, 731-734). PAA is also used in formulations of hydrogen peroxide, allowed at a concentration of no more than 6%, for use in organic crop production (2016 TR, lines 20-24). Peracetic acid was relisted during the 2016 sunset review for Handling and the 2017 sunset review for Livestock. Peracetic acid is an unstable oxidizing agent, which makes it an effective sanitizer (2016 TR, line 38).

First industrially developed in 1950, it has historically been used to treat fruits and vegetables to reduce spoilage from bacteria and various fungi. It is used to treat bulbs, to disinfect potting soil, clean irrigation equipment, and as a seed treatment to inactivate fungi or other plants diseases. Additionally, in organic crop production, it is also used as a bactericide/fungicide in wash waters to help decrease *Escherichia coli* O157:H7 on some fruit and vegetable crops. With the removal of two antibiotics previously allowed for use in organic crop production to assist in fire blight reduction, use of this substance as part of a rotational control and fire blight prevention program has increased in recent years, according to information provided by some organic stakeholders during public comment periods.

Manufacture

According to the 2016 Technical Report (TR), solutions of peracetic acid, hydrogen peroxide, acetic acid, and water are produced by reacting glacial acetic acid with hydrogen peroxide, frequently in the presence of a catalyst such as a mineral acid (e.g., sulfuric acid). Most commercially available PAA solutions contain a synthetic stabilizer and chelating agent such as HEDP (1-hydroxyethylidene-1, 1-diphosphonic acid) or dipicolinic acid (2, 6-dicarboxypyridine) to slow the rate of oxidation or decomposition (2016 TR, lines 46-48, 342-344).

PAA appears to be a straightforward material in that it is made from, and decomposes back to, acetic acid, oxygen, and water. PAA is a very strong oxidizing agent and can be produced by the interaction between

methyl (or acetaldehyde) and air, or by mixing acetic acid and hydrogen peroxide (methyl itself derives from plants, commonly coffee, bread grains, and ripe fruit). It can also be produced within laundry detergents and is considered a more effective bleach than hydrogen peroxide.

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- **Peracetic (peroxyacetic) acid** is permitted as a production aid. Formulations of **peracetic acid** may include unreacted residual reagents and catalysts, such as hydrogen peroxide, acetic acid and sulphuric acid. Permitted for: a) pest control; and b) disinfecting and cleaning seeds and plant stock (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- **Peracetic (peroxyacetic) acid** is permitted. On food and plants: **peracetic acid** may be used in wash or rinse water. **Peracetic acid** may also be used on food contact surfaces (Table 7.3 - Food-grade cleaners, disinfectants and sanitizers permitted without a mandatory removal event, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- The following products or products containing the following active substances as listed in Annex VII to Regulation (EC) No 889/2008 cannot be used as biocidal products: caustic soda; caustic potash; oxalic acid; natural essences of plants with the exception of linseed oil, lavender oil and peppermint oil; nitric acid; phosphoric acid; sodium carbonate; copper sulphate; potassium permanganate; tea seed cake made of natural camelia seed; humic acid; **peroxyacetic acids with the exception of peracetic acid** (Annex IV: Authorised products for cleaning and disinfection, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- **Peracetic acid** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- **Peracetic acid** is permitted (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).
- Citric, **peracetic acid**, formic, lactic, oxalic and acetic acid are permitted (Appendix 5: Substances for pest and disease control and disinfection in livestock housing and equipment, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Peracetic acid** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

If misused, peracetic acid can irritate eyes, skin, and breathing [2016 TR, lines 683-684].

Discussion

Peracetic acid was registered by the EPA for indoor antimicrobial use in 1985 [2016 TR, lines 382-383]. In the December 2011 NOSB recommendation for the 2013 sunset review of peracetic acid for the two Crops listings at § 205.601(a)(6) and § 205.601(i)(8), the Board clarified the annotation change from the 2009 recommendation and supported it.

The original recommended annotation change was:

§ 205.601(a)(6) Peracetic acid—for use in disinfecting equipment, seed, and asexually propagated planting material. Permitted in hydrogen peroxide formulations at concentration of no more than 5%.

§ 205.601(i)(8) Peracetic acid—for use to control fire blight bacteria. Permitted in hydrogen peroxide formulations at concentrations of no more than 5%.

This annotation was later implemented by the NOP with a slight change. The recommended 5% limit was changed to a 6% limit, based on information provided during public comment stating the recommended 5% limit was too low compared to percentages in use at the time. This point of concern was discussed at the Spring 2011 NOSB meeting, and it was decided that this slight increase in the percentage was necessary to adequately accommodate use rates.

While there does appear to be other materials that could be used as possible alternatives, peracetic acid is selected for use by many organic crop producers for many reasons: it is a strong oxidizing compound, it works well in cold conditions, it does not give off chlorine into the environment, it is used as part of a rotation process in fire blight disease control, and it is the more benign of the sanitizers and disinfectants since it reverts back to acetic acid, oxygen, and water in the environment (2016 TR, lines 600-601). It has also been described as a no-rinse material. This information was provided during public comment and can be found in the 2016 TR.

Concerns about the various forms of peracetic acid mentioned in the 2016 TR were raised during public comment submitted for the Spring 2016 NOSB meeting. The NOSB determined the majority of those other sources (that were raising a concern) would not be allowed for use in organic crop production or other currently allowed uses, as currently shown on the National List. Several commenters mentioned that all sanitizers and disinfectants should be looked at to determine need and to prioritize allowed uses. The NOSB determined this request was outside of the scope of this specific sunset review and would need to be addressed as a separate issue/topic.

Other public comments mentioned that the implementation of the Food Safety Modernization Act (FSMA), which oversees an enhanced approach to food safety at the farm and handling levels, places an even higher degree of necessity in having this material and/or other sanitizers available for use in organic crop production.

Additionally, public commenters suggest that PAA remains necessary as a tool to control fire blight, and its allowance for such use should continue. Additionally, commenters shared related research out of Washington State University quantifying PAA's effectiveness against firelight bacteria and the increased need for PAA for this use with the limited other materials available.

There was overwhelming support for the continued listing of peracetic acid for use in organic crop production. While a few commenters took a neutral position, there were no commenters, either during the written or oral public comment periods, that were specifically opposed to the relisting of peracetic acid. Based on the information provided (comments, 2016 TR, etc.), discussion during public comment periods (in-person, webinar, and written), and Subcommittee review and discussion, the NOSB determined this material satisfies the OFPA evaluation criteria and the Crops Subcommittee supported the relisting of peracetic acid. Additionally, peracetic acid was relisted during the 2016 sunset review for Handling and the 2017 sunset review for Livestock.

There is widespread use of peracetic acid by many stakeholders, and it is generally considered to be critical to the sanitizer, cleaner, and disinfectant toolkit as one of the most benign and effective materials available for crop-specific uses. Many certifiers report that it is a sanitizer in increasingly widespread use.

Organic producers consider peracetic acid essential to ensure food safety and compliance with food safety regulations under FSMA. Stakeholders broadly support the need for a comprehensive technical review of sanitizers and listing of sanitizers on the National List itemized “by specific use or application” with clear identification of the hazards to humans and the environment (NOC, 2020). Further, restructuring the National List so that cleaners, sanitizers, and disinfectants have a designated category would help to ensure certified operations understand which cleaners, sanitizers, and disinfectants may be used, and it would facilitate better organic education. Overall, a unique category on the National List could help the NOSB in its review of cleaners, sanitizers, and disinfectants, and it could support the use of alternative, less toxic materials, when their use can meet strict food safety standards (OTA, 2021).

Justification for Vote

The Subcommittee finds peracetic acid **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove peracetic acid from the National List

Motioned by: Corie Pierce

Seconded by: Nate Lewis

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 1

Magnesium oxide

Reference: § 205.601(j)(5) Magnesium oxide (CAS # 1309-48-4)—for use only to control the viscosity of a clay suspension agent for humates.

Technical Report(s): [2021 TR](#)

Petition(s): [2013](#)

Past NOSB Actions: [05/2014 NOSB recommendation to add](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: Added to NL 12/27/2018 ([83 FR 66559](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Magnesium oxide (MgO) is a synthetic substance approved for organic crop production to control the viscosity of a clay suspension agent for humates. MgO occurs as the mineral magnesite and in its hydrated form – magnesium hydroxide – as the naturally occurring mineral periclase. Magnesium oxide appears to be a fairly benign compound with a wide range of uses, including as an antacid and laxative (milk of magnesite) and in lots of industrial processes such as in producing cement, abrasive materials, and furnace linings.

MgO is neither a strong acid nor a strong base. Instead, it acts as a buffering agent when in an aqueous solution. Buffering agents are materials that create an effective resistance to change in pH of an aqueous solution when a strong acid or base is added.

Manufacture

Magnesium oxide is a naturally occurring compound that is found in the mineral periclase. There are several manufacturing processes used to produce MgO. However, most commercially available magnesium oxide is formed by calcinating magnesium carbonate-containing minerals (e.g., magnesite, hydro-magnesite) [2021 TR, lines 421-424].

Magnesium can also be sourced from other mineral sources in the form of magnesium chlorides and silicates, which can be converted to magnesium hydroxide via acid-base and metathesis reactions. Magnesium hydroxide sourced as brucite or by the chemical processing of other magnesium-containing minerals is calcined to form magnesium oxide [2021 TR, lines 424-428].

Magnesium oxide is also produced from seawater and salt lake brine sources. While magnesium is a common elemental component of brine, magnesium oxide is not present in brine sources due to its water insolubility. Magnesium chloride is the primary source of magnesium within brine and is converted to magnesium hydroxide using the same reactions used to process mineral sources of magnesium chloride. Additionally, brine may be treated with sulfuric acid to remove carbonates, reducing calcium in the final product. Magnesium oxide from brine is also obtained by calcination of magnesium hydroxide [2021 TR, lines 430-437].

NOP guidelines classify substances produced by the “heating or burning of non-biological matter (e.g., minerals) to cause a chemical reaction” as synthetic (NOP 5033). Based on this classification, all commercial sources of magnesium oxide are considered synthetic, formed by calcination (heating) to liberate carbon dioxide (Equation 3) or water (Equation 8) [2021 TR, lines 440-443].

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- Minerals, trace minerals, and elements are permitted with the following origin/usage conditions: non-synthetic chelated or sulphated minerals. Examples include oyster shell, calcium chloride and **magnesium oxide**. Synthetic nutrient minerals may be used if non-synthetic sources are not commercially available. Minerals from any source are permitted for medical use (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. 2018/848 and 2021/1165

- Crude potassium salt is permitted. The minimum content of nutrients (percentage by weight): 9% K₂O; potassium expressed as water-soluble K₂O; **2% MgO; magnesium in the form of water-soluble salts, expressed as magnesium oxide** (Annex II: Authorised fertilisers, soil conditioners and nutrients, EC No. 2021/1165).
- Magnesium oxide** is permitted as a feed material of mineral origin (Annex III: Authorised products and substances for use as feed or in feed production, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- Magnesium oxide** is not explicitly mentioned in the regulations.

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Magnesium oxide** is not explicitly mentioned in the regulations.

Japan Agricultural Standard (JAS) for Organic Production

- Magnesium oxide** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

The 2021 TR states that, at the time of publication, the authors found no studies on magnesium oxide's environmental persistence or toxicity. The insoluble nature of magnesium oxide makes it unlikely to contaminate water systems, and its insolubility results in low bioavailability within terrestrial environments [2021 TR, lines 448-451, 462-463]. Moreover, when used as approved within organic agriculture, magnesium oxide is applied in limited quantities as a viscosity control additive, making environmental contamination unlikely [2021 TR, lines 479-480].

The Code of Federal Regulations (CFR), Title 21, Part 184 (Direct food substances affirmed as generally recognized as safe) lists magnesium oxide at § 184.1431 as an ingredient used in food with no limitation other than current good manufacturing practice and affirms the ingredient as generally recognized as safe (GRAS) as a direct human food ingredient [2021 TR, lines 131-135].

The original petitioner noted that magnesium oxide is safely used in numerous applications for other materials because it is considered non-hazardous, environmentally safe, and non-toxic. Some of the applications include:

- wastewater treatment,
- toxic metal removal,
- adsorption of dyes and excess phosphorus from industrial wastewater,
- odor control,
- treatment of acid mine drainage,
- nontoxic flame retardant for clothing,
- flue gas desulfurization, and
- hazardous spill clean-up.

Magnesium oxide and the hydrated form of magnesium hydroxide have been used safely for over a century as a laxative and antacid (milk of magnesia).

Discussion

This is the second sunset review for magnesium oxide since it was added to the National List. A previous technical report covered its use in livestock production, and in 2021 the NOSB requested and received a technical report specific to its use in crop production. The petition and TR describe magnesium oxide as a material used to modify clays so that humic substances can remain suspended in aqueous solutions without recrystallizing, preventing nozzle plugging and improving the stability and viscosity of liquid humate products.

In 2021 the NOSB reviewed the limited stakeholder comments, but most were generally supportive of maintaining the listing. Commenters affirmed that magnesium oxide is currently used for its petitioned purpose and that humates continue to play an important role in organic agriculture by stimulating biological activity, supporting nutrient cycling, improving soil structure, and enhancing water retention and root development. Stakeholders also reiterated that while several non-synthetic materials—such as dolomitic limestone, wood ash, periclase, brucite, or pelletized humates—are cited as potential alternatives, they are either not commercially available or do not meet the chemical or physical specifications needed to suspend humates in solution.

During the 2021 public discussion, one commenter suggested adding an expiration date for reevaluation of the material, though such a change would require annotation outside of the sunset process. Questions

were raised regarding the use of nonsynthetic acids in place of sulfuric acid during manufacturing. Environmental considerations shared during the meeting focused on the use of sulfuric or hydrochloric acid in production, which can release carbon dioxide; however, stakeholders noted that without magnesium oxide, dry humates would likely need to be applied, raising concerns about dust exposure.

The Spring 2026 public comments highlighted that the annotation restricting its use to only control the viscosity of a clay suspension agent for humates limits its role to a technical formulation purpose. Commentors noted this is the most effective material for viscosity control which makes the product less watery, prevents separation, improves pourability and helps maintain a uniform suspension during storage and application. One commentor stated that there are a small number of manufacturers that report the use of magnesium oxide in the production of their liquid humate products, including those that use alkali extractants. Public commenters were more supportive of using magnesium oxide instead of humates.

Questions to our Stakeholders

None

Justification for Vote

The Subcommittee finds magnesium oxide **compliant** with the Organic Foods Production Act (OFPA) (7 U.S.C. 6518(m) and 6517) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove magnesium oxide from the National List

Motioned by: Amanda Felder

Seconded by: Dilip Nandwani

Yes: 0 No: 3 Abstain: 0 Recuse: 0 Absent: 2

EPA List 3 – Inerts of unknown toxicity

Reference: § 205.601(m)(2) EPA List 3—Inerts of unknown toxicity—for use only in passive pheromone dispensers.

Technical Report: N/A

Petition(s): N/A

Past NOSB Actions: [10/2002 meeting minutes and vote \(see pheromones\)](#); [11/2007 recommendation](#); [05/2012 recommendation](#); [08/2015 recommendation to change annotation at 7 CFR § 205.601\(m\)](#); [10/2016 sunset recommendation](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: National List amended 10/31/2003 ([68 FR 61987](#)); Sunset renewal notice effective 10/09/2008 ([73 FR 59479](#)); Sunset renewal notice effective 10/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

The annotation for EPA List 3 inerts limits their use in organic crop production to passive pheromone dispensers. The dispensers are generally manufactured as either tubes that contain pheromones or as an impregnated substance containing the pheromone. Passive pheromone dispensers may be used to trap and

monitor insect populations, or they may be used for control of a pest through pheromone mating disruption. For trapping, the pheromone-impregnated dispenser is placed in a trap, and the insect catch is monitored to determine when an economic threshold is reached, and the particular insect needs to be controlled. For pheromone mating disruption, the dispensers are tied to branches of trees or placed in such a manner that they are distributed throughout an area being covered by the pheromones. Throughout the season, the design of the pheromone dispensers regulates the volatilization of pheromones into the air. Once in the air of the production area, the pheromones act to disrupt mating by interfering with the insect communication systems. A wide variety of insects, mostly *Lepidoptera*, can be managed with pheromones including codling moth, peach twig borer, peach crown borer, leafrollers, pink bollworm, boll weevil, gypsy moth, and others. When they are placed in the production area, the pheromone dispensers are not in contact with the organic product being grown but are instead suspended from the trees or plants. Since the pheromone dispensers do not contact the product grown, there is no movement of the pheromones into the product. Passive pheromone dispensers are different from other forms of dispensers such as microencapsulated products, which are sprayed throughout the production area and could be in direct contact with the fruit or other product being grown.

Manufacture

Manufacture varies based on which List 3 inert is being used, so will not be addressed.

International Acceptance

Canadian General Standards Board Allowed Substances List (CAN/CGSB 32.311-2020)

- Formulants used in crop production aids may only be used with substances listed in Column 2 of this table. Only formulants classified as List 4A or 4B by the Pest Management Regulatory Agency (PMRA) or derived from biological or mineral sources may be used with substances in Table 4.2 (Column 2). Formulants classified as **List 3** by PMRA may be used with passive **pheromone dispensers**. Formulants classified as **List 4A, 4B or 3** by PMRA are not subject to 1.4 or 1.5 of CAN/CGSB-32.310. Formulants classified as List 1 or 2 by PMRA are prohibited (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- Formulants (**inerts**, excipients) shall be used in conjunction with substances listed in Table 5.3. Formulants are not subject to 1.4 or 1.5 of CAN/CGSB-32.310 or 5.1.2 of this standard (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).
- Vitamin **formulants** that comply with Canadian regulations are accepted. Vitamins not compliant to 5.1.2 of this standard are permitted. Orally, topically or by injection (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).
- Formulants may only be used with substances listed in Table 8.2. Only formulants classified as List 4A or 4B by the Pest Management Regulatory Agency (PMRA) or derived from biological or mineral sources may be used with substances in Table 8.2. Formulants classified as **List 3** by PMRA may be used with passive **pheromone dispensers**. Formulants classified as **List 4A, 4B or 3** by PMRA are not subject to 1.4 or 1.5 of CAN/CGSB-32.310. Formulants classified as List 1 or 2 by PMRA are prohibited (Table 8.2 - Facility pest management substances, CAN/CGSB-32.311-2020).
- Formulants may only be used with substances listed in Table 8.3. Only formulants classified as List 4A or 4B by the Pest Management Regulatory Agency (PMRA) or are non-synthetic may be used with substances in Table 8.3. Formulants classified as **List 3** by PMRA may be used with passive **pheromone dispensers**. Formulants classified as **List 4A, 4B or 3** by PMRA are not subject to 1.4 or 1.5 of CAN/CGSB-32.310. Formulants classified as List 1 or 2 by PMRA are prohibited (Table 8.3 - Post-harvest substances, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- The following products and substances referred to in Article 2(3) of Regulation (EC) No 1107/2009 shall be allowed for use in organic production, provided that they are authorised pursuant to that Regulation: (a) safeners, synergists and **co-formulants** as components of plant protection products (General production rules, EC No. 2018/848).
- In accordance with Article 9(3) of Regulation (EU) 2018/848, safeners, synergists and **co-formulants** as components of plant protection products, and adjuvants that are to be mixed with plant protection products shall be allowed for use in organic production, provided that they are authorised pursuant to Regulation (EC) No 1107/2009. The substances in this Annex may only be used for the control of pests as defined in Article 3(24) of Regulation (EU) 2018/848 (Annex I: Active substances contained in plant protection products authorised for use in organic production, EC No. 2021/1165).
- In relation to products and substances used in traps or in dispensers of products and substances other than **pheromones**, the traps or dispensers shall prevent the products and substances from being released into the environment and shall prevent contact between the products and substances and the crops being cultivated. All traps, including **pheromone traps**, shall be collected after use and shall be safely disposed of (Annex II: Detailed production rules, EC No. 2018/848).
- **Pheromones and other semiochemicals are permitted with the following conditions:** only in traps and dispensers (Annex I: Active substances contained in plant protection products authorised for use in organic production, EC No. 2021/1165).

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (CXG 32-1999)

- The above criteria are intended to be evaluated as a whole in order to protect the integrity of organic production. In addition, the following criteria should be applied in the evaluation process:
b) if they are used for the purpose of plant disease or pest and weed control: they should be essential for the control of a harmful organism or a particular disease for which other biological, physical, or plant breeding alternatives and/or effective management practices are not available; and their use should take into account the potential harmful impact on the environment, the ecology (in particular non-target organisms) and the health of consumers, livestock and bees; and substances should be of plant, animal, microbial, or mineral origin and may undergo the following processes: physical (e.g. mechanical, thermal), enzymatic, microbial (e.g. composting, digestion); however, if they are products used, in exceptional circumstances, **in traps and dispensers such as pheromones**, which are chemically synthesized they will be considered for addition to lists if the products are not available in sufficient quantities in their natural form, provided that the conditions for their use do not directly or indirectly result in the presence of residues of the product in the edible parts; their use may be restricted to specific conditions, specific regions or specific commodities (Section 5: Requirements for inclusion of substances in Annex 2 and criteria for the development of lists of substances by countries, CXG 32-1999).
- Pests should be avoided by good manufacturing practice. Pest control measures within storage areas or transport containers may include physical barriers or other treatments such as sound, ultra-sound, light, ultra-violet light, **traps (pheromone traps and static bait traps)**, controlled temperature, controlled atmosphere (carbon dioxide, oxygen, nitrogen), and diatomaceous earth (Handling, Storage, Transportation, Processing and Packaging, CXG 32-1999).
- **Pheromone preparations are permitted in traps** (Table 2 - Substances for plant pest and disease control, CXG 32-1999).

International Federation of Organic Agriculture Movements (IFOAM) Norms

- Organic crop production ensures that **co-formulants** (e.g. **inerts** and synergists) in formulated farm input products are not carcinogens, mutagens, teratogens or neurotoxins (Main objectives and detailed requirements of the COROS, IFOAM NORMS 2014).
- **Pheromones – in traps and dispensers only** are permitted (Appendix 3: Crop protectants and growth regulators, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Sex pheromone agents** are permitted with the following criteria: limited to the agent containing a substance having the pheromone action of insects harmful to crops as the active ingredient (Table B.1 - Agricultural chemicals, JAS 1605 Organic Products of Plant Origin).
- **Pheromone agents** are permitted with the following criteria: limited to chemical agents containing a substance having insect pheromone as the active ingredient; excluding cases in which it is used on plant products for the purpose of controlling pests and diseases (Table C.1 - Chemical agents, JAS 1605 Organic Products of Plant Origin).
- **Pheromones** are permitted with the following criteria: limited to those chemical agents containing substances with insect pheromone actions as the active ingredients; not permitted for use in plant products for controlling pests and diseases (Table C.1 - Chemical agents, JAS 1606 Organic Processed Foods).
- **Pheromones** are permitted with the following criteria: limited to those chemical agents containing a substance with insect pheromone action as the active ingredient; excluding the cases where it is applied to the plant products for the purpose of controlling pests and diseases (Table B.1 - Chemical agents, JAS 1607 Organic Feed).
- **Pheromones** are permitted with the following criteria: limited to those chemical agents containing a substance with insect pheromone action as the active ingredient; excluding the cases where it is applied to the plant products for the purpose of controlling pests and diseases (Table J.1 - Chemical agents, JAS 1608 Organic Livestock Products).

Human Health and Environmental Issues

Passive pheromone dispensers used to monitor insects are crucial to integrated pest management programs in that they help to determine the size and impact of insect populations. The use of passive pheromone dispensers for mating disruption often precludes the need for other chemical controls. When used with adequate sanitation practices, monitoring, biocontrol methods, and environmental controls, pheromones can be effective in controlling certain *Lepidoptera* insects. Without pheromone use, and despite the other natural controls listed, insecticides may be needed for control of a specific pest insect. Insecticides may either be natural or synthetic, but would most often be applied directly to the product being grown and might require preharvest intervals. While pheromones are very specific to individual insect species, other insecticides may be broader spectrum and affect more species than those requiring control and may have more detrimental environmental impacts.

Other potential environmental issues relate to the number of pheromone dispensers containing List 3 inerts used per acre. Often, maximum applications are in the range of 400 dispensers per acre. Information from the package of one manufacturer lists 8% other ingredients which may include List 3 inerts, and that the total amount of pheromone applied per acres is 50 grams. Given the small amount of pheromone applied, there is a very small volume of List 3 inerts applied to any given acre. This application rate is very low when compared to the amounts of allowed List 4 inerts applied in spray materials or the number of synthetics applied in allowed newspaper mulch. While application of any material to organic acreage should be considered, it is also important to consider the scale of the application. In addition, the ingredients other than pheromones are heavier than the pheromone itself and remain inside the dispenser. Thus, the List 3

inerts are not dispersed into the atmosphere and do not have direct crop contact. The manufacture of pheromones may have possible environmental impacts, but because these materials are grouped together as List 3 inerts, these impacts cannot be independently categorized.

Discussion

For reference, the old EPA lists can be found at: <https://www.epa.gov/pesticide-registration/categorized-lists-inert-ingredients-old-lists>.

As noted in the 2020 review of List 4 inerts, the List 3 inerts listing is also outdated because EPA no longer maintains these lists. Thus, the process to review materials for addition or removal is broken. The listing for List 3 inerts is more specific than that for List 4 inerts in that it is limited to only those materials needed for and used in passive pheromone dispensers. These dispensers do not come into direct contact with the agricultural products being produced, whether they are used for trapping or mating disruption.

At the Fall 2024 NOSB meeting, the Board passed a recommendation to NOP modernizing the listing for inert substances used in organic pesticide formulations. The recommendation provided NOP with two options:

1. Allow all inert ingredients that are exempt from the requirement for a tolerance.
2. List inert ingredients currently allowed in pesticide products individually.

The substances used in passive pheromone dispensers that are found on List 3 are included in both of these options. NOSB does not anticipate any disruptions to the allowance of pheromone products when NOP pursues rulemaking using either of these options. As the organic industry awaits rulemaking action on inert ingredients used in organic pesticide products, the existing allowances will be maintained to ensure there are no disruptions to the availability of passive pheromone products for organic farmers.

Comments received for this group of substances used in passive pheromone dispensers reflected the general consensus that passive pheromone dispensers are necessary for organic production, and the ingredients used in their formulations should be allowed. No new information was presented to indicate that NOSB should vote to remove this substance from the National List prior to the anticipated rulemaking action by NOP on inert substances as a whole.

Questions to our Stakeholders

None

Justification for Vote

The Subcommittee finds EPA List 3—Inerts of unknown toxicity **compliant** with the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove EPA List 3—Inerts of unknown toxicity from the National List

Motioned by: Nate Lewis

Seconded by: Franklin Quarcoo

Yes: 0 No: 5 Abstain: 0 Recuse: 0 Absent: 0

Calcium chloride

Reference: § 205.602(c) Calcium chloride, brine process is natural and prohibited for use except as a foliar spray to treat a physiological disorder associated with calcium uptake.

Technical Report: [2001 TAP](#); [2021 TR](#)

Petition(s): [2005](#); [2015](#)

Past NOSB Actions: [09/1996 minutes and vote](#); [11/2006 annotation change \(failed\)](#); [11/2007 sunset recommendation](#); [12/2011 sunset recommendation](#); [10/2016 sunset recommendation](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: National List amended 10/31/2003 ([68 FR 61987](#)); Sunset renewal notice effective 11/03/2013 ([78 FR 61154](#)); Sunset renewal notice effective 05/29/2018 ([83 FR 14347](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Calcium chloride is used to manage almost three dozen physiological disorders on crops. These include reduction of cork spot on pears, bitter pit in apples, fruit cracking on developing figs, rain cracking in cherries, blossom end rot on tomatoes, and tipburn on Chinese cabbage [2001 TAP, lines 156-175]. Application of foliar calcium sprays relieves calcium physiological disorders because these are local deficiencies due to calcium transport problems. Local availability of calcium in new shoots and fruits can help solve the problem [2001 TAP, lines 197-198]. Application of nonsynthetic calcium chloride in organic crop production is limited to foliar sprays to treat a physiological disorder associated with calcium uptake.

Manufacture

According to the 2001 TAP, calcium chloride can be produced from a number of sources by various methods. Some of these are naturally occurring, some require extraction and beneficiation that is not considered by most reviewers to be a chemical reaction, and some are entirely synthetic. Calcium chloride extracted from brine is generally considered nonsynthetic, although certain steps to purify the brine may be considered synthetic [2001 TAP, lines 8-11]. The TAP goes on to explain that calcium chloride can be obtained by extraction of nonsynthetic brines. When calcium chloride is extracted from a nonsynthetic source, its molecular structure is not changed during extraction and thus should be classified nonsynthetic. However, Dow (a major supplier) and other producers use synthetic chemicals during the purification of the brine [2001 TAP, lines 62-64]. Industrial production of calcium chloride occurs mainly through 1) the hydrochloric acid method, 2) the Solvay process, and 3) the Dow process. Productions by the Solvay process and by reaction of a calcium source with hydrochloric acid are both clearly synthetic [2001 TAP, lines 11-12].

Calcium chloride from naturally occurring brine is nonsynthetic as long as there are no manufacturing steps (see [NOP 5033](#): 4.6 Extraction of Nonorganic Materials) that change the classification to synthetic.

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- **Calcium chloride** derived from naturally occurring brines and not chemically treated is permitted (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).
- Sodium chloride, **calcium chloride** or potassium chloride; shall be mined or derived from sources of natural brine. The effluent from ion exchange water softener regeneration may be used. For pest control (Table 4.2 - Substances for crop production, CAN/CGSB-32.311-2020).

- Minerals, trace minerals, and elements are permitted with the following origin/usage conditions: non-synthetic chelated or sulphated minerals. Examples include oyster shell, **calcium chloride** and magnesium oxide. Synthetic nutrient minerals may be used if non-synthetic sources are not commercially available. Minerals from any source are permitted for medical use (Table 5.3 - Health care products and production aids, CAN/CGSB-32.311-2020).
- **Calcium chloride** is permitted for: a) milk products; b) fat products; c) soybean products; and d) fruits and vegetables (Table 6.3 - Ingredients classified as food additives, CAN/CGSB-32.311-2020).

European Economic Community (EEC) Council Regulation, EC No. [2018/848](#) and [2021/1165](#)

- **Calcium chloride** solution is permitted only for foliar treatment of apple trees, to prevent deficit of calcium (Annex II: Authorised fertilisers, soil conditioners and nutrients, EC No. 2021/1165).
- **Calcium chloride** is permitted for addition to milk-based products as a coagulation agent (Annex V: Authorised products and substances for use in the production of processed organic food and of yeast used as food or feed, EC No. 2021/1165).
- **Calcium chloride** is only authorised for the processing of products of plant origin and sausages based on meat as a coagulation agent (Annex V: Authorised products and substances for use in the production of processed organic food and of yeast used as food or feed, EC No. 2021/1165).
- **Calcium chloride** is permitted as a processing aid in primary yeast (Annex V: Authorised products and substances for use in the production of processed organic food and of yeast used as food or feed, EC No. 2021/1165).

[CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods \(CXG 32-1999\)](#)

- **Calcium chloride solutions** are permitted for leaf treatment in case of proven calcium deficiency (Table 1 - Substances for use in soil fertilizing and conditioning, CXG 32-1999).
- **Calcium chloride** is permitted for use in foods of plant origin (fruits and vegetables including mushrooms and fungi, roots and tubers, pulses and legumes, and aloe vera; seaweeds; nuts and seeds; soybean products excluding soybean products of food category 12.9 and fermented soybean products of food category 12.10; soybean protein products; fermented soybean products) and foods of animal origin (dairy products and analogues excluding products of food category 02.008.2; processed meat, poultry, and game products in whole pieces or cuts; processed comminuted meat, poultry and game products; edible casings (e.g., sausage casings)) (Table 3 - Ingredients of non-agricultural origin, CXG 32-1999).
- **Calcium chloride** is permitted for use in plant products as a coagulation agent (Table 4 - Processing aids which may be used for the preparation of products of agricultural origin, CXG 32-1999).
- **Calcium chloride** is permitted for use in livestock and bee products as a firming, coagulation agent in cheese making (For livestock and bee products, CXG 32-1999).

[International Federation of Organic Agriculture Movements \(IFOAM\) Norms](#)

- Limestone, gypsum, marl, maerl, chalk, sugar beet lime, **calcium chloride** are permitted as calcareous and magnesium amendments of mineral origin (Appendix 2: Fertilizers and soil conditioners, IFOAM NORMS 2014).
- Chloride of lime (**calcium chloride**) is permitted (Appendix 3: Crop protectants and growth regulators, IFOAM NORMS 2014).
- **Calcium chloride** is permitted as an additive and as a processing and post-harvest handling aid (Appendix 4, Table 1: List of approved additives and processing/postharvest handling aids, IFOAM NORMS 2014).

- Chloride of lime (calcium oxychloride, **calcium chloride**, and calcium hydroxide) is permitted (Appendix 4, Table 2: Indicative list of equipment cleansers and equipment disinfectants, IFOAM NORMS 2014).

Japan Agricultural Standard (JAS) for Organic Production

- **Calcium chloride** is permitted (Table A.1 - Fertilizers and soil improvement substances, JAS 1605 Organic Products of Plant Origin).
- **Calcium chloride** is permitted with the following criteria: limited to the use in processed products of plant origin (as a coagulant) and in cheesemaking (as a coagulant), or the use in edible fats & oils, processed vegetable products, processed fruit products, prepared legumes/beans, dairy products, or processed meat products (Table A.1 - Additives for organic processed foods excluding organic alcohol beverages, JAS 1606 Organic Processed Foods).
- **Calcium chloride** is permitted (Table B.1 - Additives for alcohol beverages, JAS 1606 Organic Processed Foods).

Human Health and Environmental Issues

The 2001 TAP describes that, when used as a foliar spray, calcium chloride probably has low potential for interaction or interference with other materials used in organic farming [2001 TAP, lines 295-296]. It has a low toxicity to mammals, though it can be a skin, eye, and breathing irritant. When used in foliar applications, it should not affect beneficial insects. It should not persist on foliage and any amount not absorbed by the plant should be washed off with rain. Calcium chloride is extremely soluble in water, and low concentrations from foliar use should not build up in soil, unless it is used in low rainfall areas with minimal irrigation. Any water-soluble calcium chloride not absorbed by plant roots would drain into surface waters or be leached into groundwater [2001 TAP, lines 300-308]. Additionally, during manufacture from brines, the liquid brines are pumped out from underground, and do not present the kind of problem usually seen with strip mining. The only toxic chemicals involved are chlorine and bromine, and they are handled so that environmental contamination is low. The chlorine is recycled, and bromine is isolated as bromide or bromine and is sold as a chemical product. Excess lime added in processing is isolated as part of the final calcium chloride. The magnesium hydroxide produced is used to prepare other magnesium salts and magnesium metal by electrolysis. It is not dumped into the environment. The sodium chloride isolated in the process is sold as table salt or for chemical production. Spent solutions are recycled and pumped back underground to isolate a new concentrated brine [2001 TAP, lines 311-319]. Finally, calcium chloride obtained from natural salt brines has a significant amount of sodium chloride, usually about 3-4%. Sodium chloride has a high salt index and should not be applied to soil. Application to soil could lead to chloride phytotoxicity [2001 TAP, lines 355-358].

Discussion

This is a unique § 205.602 substance in that, while not completely prohibited for use, is restricted via an annotation. Since it is only allowed for a very specific use (foliar application to treat a calcium uptake disorder), material review organizations list it with the restriction to reflect the very narrow permitted use. Certifiers are responsible for verifying that growers use it in a manner consistent with the restriction.

In 1996, the NOSB originally voted to allow calcium chloride for use to control bitter pit in apples and as an emergency defoliant for cotton; the substance was categorized as nonsynthetic and was not included at § 205.601 or § 205.602. In 2003, calcium chloride was subsequently added to the National List at § 205.602 as a non-synthetic substance prohibited for use in organic crop production with the current annotation: “brine process is natural and prohibited for use except as a foliar spray to treat a physiological disorder associated with calcium uptake.” In 2005, the NOSB rejected a petition to remove the prohibition for use as a soil-applied non-synthetic substance due to high chloride and solubility concerns. The Board received another

petition in 2015 to remove the prohibition on direct soil applications but determined it to be ineligible as no new substantive information was presented to warrant reconsideration of the petition.

The NOSB has consistently concluded that brine process calcium chloride is a mined substance of high solubility, and, as such, its use is subject to the conditions established on the National List of non-synthetic substances prohibited for crop production. The foundational principle for placing high solubility substances such as calcium chloride on the prohibited non-synthetic substance list is described in § 205.203(d) – Soil fertility and crop nutrient management practice standard: A producer may manage crop nutrients...in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients. The NOSB has established that the potential for overuse of this natural substance resulting in subsoil, surface water, and ground water contamination warrant continued limitation through the annotation restrictions.

Relisting calcium chloride as a restricted non-synthetic material was widely supported in previous public comments. Calcium chloride is needed to combat physiological disorders of many commodities that typically cannot be resolved with other calcium products. Many previous commenters stated that calcium chloride is necessary to ensure quality of many crops and significant losses would occur if the substance were not relisted. The current annotation restricting the use to foliar sprays to treat a physiological disorder associated with calcium uptake is also supported to prevent soil buildup of chloride.

Questions to our Stakeholders

None

Justification for Vote

The Subcommittee finds that calcium chloride continues to meet criteria for prohibiting a nonsynthetic substance under the Organic Foods Production Act (OFPA) (7 U.S.C. 6518(m) and 6517) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List:

Subcommittee Vote

Motion to remove calcium chloride from the National List

Motioned by: Corie Pierce

Seconded by: Dilip Nandwani

Yes: 0 No: 4 Abstain: 0 Recuse: 0 Absent: 1

Rotenone

Reference: § 205.602(f) Rotenone (CAS # 83-79-4).

Technical Report(s): N/A

Petition(s): N/A

Past NOSB Actions: [10/2012 NOSB recommendation to add](#); [10/2021 sunset recommendation](#)

Recent Regulatory Background: Added to NL 12/27/2018 ([83 FR 66559](#)); Sunset renewal notice 04/14/2023 ([88 FR 22893](#))

Sunset Date: 05/29/2028

Subcommittee Review

Use

Rotenone is a potent non-synthetic botanical pesticide that is also used as a piscicide. Historically, farmers have used this extract as a foliar spray to control pests on vegetables, berries, tree fruit, nuts, and forage crops.

Manufacture

Rotenone is commonly derived from the roots of various tropical plants native to Southeast Asia, South America, and East Africa.

International Acceptance

[Canadian General Standards Board Allowed Substances List \(CAN/CGSB 32.311-2020\)](#)

- **Rotenone** is not explicitly mentioned in the regulations.

[European Economic Community \(EEC\) Council Regulation, EC No. 2018/848 and 2021/1165](#)

- **Rotenone** is not explicitly mentioned in the regulations.

[CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods \(CXG 32-1999\)](#)

- Preparations of **rotenone** from *Derris elliptica*, *Lonchocarpus*, and *Thephrosia* spp. are permitted with the following conditions for use: Need recognized by the certification body or authority. The substance should be used in such a way as to prevent its flowing into waterways (Table 2 - Substances for plant pest and disease control, CXG 32-1999).

[International Federation of Organic Agriculture Movements \(IFOAM\) Norms](#)

- **Rotenone** (*Derris elliptica*, *Lonchocarpus* spp. *Tephrosia* spp.) is permitted with the following conditions for use: not near waterways. Subject to approval by the CB (Appendix 3: Crop protectants and growth regulators, IFOAM NORMS 2014).

[Japan Agricultural Standard \(JAS\) for Organic Production](#)

- **Rotenone** is not explicitly mentioned in the regulations.

Human Health and Environmental Issues

Adverse health effects from rotenone have been well documented since the NOSB reviewed botanicals in 1994. In 2004, the EPA required an inhalation neurotoxicity study to investigate the possibility of rotenone leading to Parkinson's Disease-like symptoms at high-dose exposure in animals. Instead, the companies distributing and selling rotenone products voluntarily cancelled all food-use registrations, except for piscicidal uses.

Discussion

Rotenone is found to have adverse environmental and health impacts, a lack of essentiality, and an incompatibility with organic principles. Therefore, the NOSB unanimously passed a recommendation in October 2012 to add rotenone to the National List at § 205.602 as a non-synthetic substance prohibited for use in organic crop production.

During the last sunset review of rotenone, public commenters also supported the continued listing as a prohibited natural substance in organic crop production. The Board unanimously voted to maintain the rotenone listing at § 205.602. The Spring 2026 public comments mirrored the previous sunset review decision. Stakeholders stated that keeping rotenone explicitly prohibited helps clarify organic standards, especially for imported products.

Questions to our Stakeholders

None

Justification for Vote

The Subcommittee finds that rotenone continues to meet criteria for prohibiting a nonsynthetic substance under the Organic Foods Production Act (OFPA) ([7 U.S.C. 6518\(m\) and 6517](#)) and the USDA organic regulations (7 CFR 205.600) and is not proposing removal from the National List.

Subcommittee Vote

Motion to remove rotenone from the National List

Motioned by: Amanda Felder

Seconded by: Dilip Nandwani

Yes: 0 No: 3 Abstain: 0 Recuse: 0 Absent: 2

National Organic Standards Board (NOSB)
Certification, Accreditation, & Compliance Subcommittee (CACS)
Consistency in Organic Seed Use Discussion Document
Fall 2026

Introduction

The Certification, Accreditation, & Compliance Subcommittee (CACS) seeks to identify strategies for increasing the amount and variety of organic seed that is commercially available and used in organic production, as well as reducing barriers to achieving that progress. It is clear that these tools and barriers vary significantly across the organic sector.

Background

The Organic Foods Production Act (OFPA) and National Organic Program (NOP) regulations require use of organic seed unless it is not commercially available (7 U.S.C. 6508; 7 CFR 205.204) (see Appendix B for relevant text). Together, this rule and exception recognize that organic seed availability may lag behind the potential for organic crop production and allow continued crop innovation and experimentation on organic farms.

In August 2005 and November 2008, the NOSB made recommendations on implementation of the commercial availability requirement, and in 2013, the NOP issued Guidance 5029, which outlines procedures for verifying compliance with the commercial availability requirement. Guidance 5029 recognizes that the NOSB “emphasized that utilizing organic seed is a fundamental part of supporting a healthy, viable organic seed industry” (Guidance 5029, section 3). The Guidance “describes practices for certified operations to demonstrate their proactive efforts to procure all organic seeds, annual seedlings, and planting stock in support of their organic system plan (OSP)” (Guidance 5029, section 1).

It was expected that after some years after OFPA’s adoption, most seed used in organic production would be organic. Instead, organic seed use has stagnated.

2018-2019

The NOSB made additional recommendations for rulemaking and strengthening Guidance 5029 in 2018 and 2019, respectively. The 2018 recommendation proposed adding language to 7 CFR 205.204 requiring improvement in searching, sourcing, and use of organic seed/planting stock every year, with the goal of using only organic seed and planting stock. It also proposed changes to guidance on screening for genetic engineering contamination, use of trials, documentation of desired characteristics, more robust commercial availability searches, and buyer-sourced seed. The 2019 recommendation included additional changes to guidance to address the granularity of the commercial availability search, criteria for buyer-selected seed and planting stock, and what could prompt a noncompliance. The 2018 and 2019 recommendations were summarized in Appendix B to the Fall 2024 Discussion Document. These recommendations have not been implemented by the NOP.

2024

In Fall 2024, the NOSB sought public input on a number of questions, to guide next steps in its work to improve consistency in organic seed use. Questions addressed whether there is ongoing support for the 2018 and 2019 recommendations, factors that influence organic seed use, access to information and research, and comparisons to other regulatory schemes.

Commenters unanimously supported moving ahead with the 2018 recommendation. Comments were mixed on the 2019 recommendation, with some supporting and others noting that circumstances have changed and more work is needed.

Commenters noted that the heaviest burdens of commercial availability searches tend to fall on smaller, diversified operations, and that those also tend to be the operations with the highest organic seed use. It was noted that the current regulation does not have strong enough teeth to make meaningful enforcement worthwhile.

Overall, comments indicated that organic seed is often available to those who actively seek it out, and benefits to using seed adapted to organic cropping systems, but that use is lower than it could be. Commenters noted that stricter limits on nonorganic seed use could expand organic options because having a guaranteed market could cause more seed suppliers to offer organic seed. Commenters flagged that high levels of nonorganic seed use is a consumer confidence risk, because consumers expect that organic crops are grown from organic seed. There are also ongoing concerns about drift and contamination from genetically engineered crops and how to identify seed produced using newer technologies that may be excluded methods. However, significant financial and planning barriers limit expanded use of organic seed.

Some commenters provided specific information about crops that do or do not have organic seed options readily available:

Available: cabbage; head lettuce; corn (but buyers of food grade corn recommend conventional untreated seed)

Maybe available: soybean (not there currently but could be); corn, soybeans, wheat, oats, alfalfa, barley, and clovers (conflicting)

Unavailable: specialty varieties, including radicchio; alfalfa; carrots; spinach; wheat (economic challenges); food grade, white, and blue corn; pasture-grass species, including brome grass and timothy; clovers; sorghum; sudangrass; certain cover crops; dry edible beans; chickpeas; oil-sunflower; open-pollinated grain and pulse; cotton

Commenters also noted that lack of dedicated organic seed storage capacity is a challenge. There was also a strong interest in more organic seed research, transparency on seed availability (i.e., a database), and training and education for inspectors and certifiers. Commenters requested creation of a seed working group.

Commenters were mixed on whether handlers that drive or require certain seed use should have a role in the commercial availability assessment. Commenters raised concerns about the feasibility of enforcement, as well as the unlikelihood that requiring more information from handlers about seed would result in meaningful changes in organic seed use. On the other hand, commenters raised concerns about the burdens on farmers when handlers are actually making the seed use decisions and farmers have limited power to select different seed.

The Board discussed potential impacts of changes to the commercial availability requirements on farmers and how to get more farmer input. The Board also discussed quality concerns and the specificity of need and performance linked to certain varieties.

2025

In a Fall/Winter 2025 discussion document, the NOSB identified barriers to organic seed production and potential approaches to lowering these barriers and again sought public input.

Commenters noted that the organic seed sector is at a tipping point - if organic seed use doesn't continue to grow with the organic market, it may cease to be available. There are general challenges with the complexity and variability of the market, lack of updates to the regulations and guidance on organic seed use, and the lack of reliable data on organic seed need and use that could provide market signals to the seed sector. It was noted that when the exception to allow nonorganic hops was removed from the National List at 205.606, the organic supply materialized; the same could happen for seed.

Specific organic seed production barriers identified in comments included pest pressure, weed management, and isolation distances needed. Commenters asked if organic crop producers could also become organic seed producers.

Commenters suggested requiring more documentation and transparency from certifiers around what is being planted. There was also support for more robust commercial availability searches, including requiring trials or use of other varieties, and requiring year-over-year improvement/increase in organic seed use.

Commenters supported guidance to address the situation where a grower does not have control over what seed is selected for a particular buyer.

2026

At the Spring 2026 Board meeting, an expert panel discussed seed. The panelists highlighted the significant time that it takes to bring a new product to market, and the challenges in getting noticed by farmers. Testing networks used to exist to trial crops like corn, but those have disappeared, so the trial burden falls to farmers. Panelists also noted that conventionally bred varieties may not meet the unique needs of organic growers. On the other hand, there may be performance benefits from using organic seed bred for organic farming systems; without those performance improvements, farmers may feel like

they're paying more without a clear return. However, it's hard to tell if a seed is organically bred versus conventionally bred and then propagated organically.

The Board discussed the opportunities and challenges with a continuous improvement framework for organic seed and ways that handlers/buyers could play a role and share the burdens. There is a need to send a firm regulatory signal to advance market rewards for organic breeding, as well as a need for more transparency and information available to growers.

Relevant areas in the Regulation or OFPA

Organic producers are generally required to use organically grown seeds (7 U.S.C. 6508(a); 7 CFR 205.204). Nonorganically produced, untreated seeds may only be used "when an equivalent organically produced variety is not commercially available" (7 CFR 205.204(a)(1)). "Commercially available" is defined as "The ability to obtain a production input in an appropriate form, quality, or quantity to fulfill an essential function in a system of organic production or handling, as determined by the certifying agent in the course of reviewing the organic plan" (7 CFR 205.2). The price of seed cannot be a consideration for determination of commercial availability (Guidance 5029, 4.1.2.b).

NOP Guidance 5029 section 4.1.2 states that for the purposes of the commercial availability exception, an "equivalent variety" is a variety of the same "type" (e.g., head lettuce types versus leaf lettuce types) or has similar agronomic or marketing characteristics needed to meet site specific requirements for an operation. These characteristics may include, but are not limited to: number of days until harvest; color, flavor, moisture, chemical, or nutrient profiles of the variety of the harvested crop; vigor or yield of harvested crop; regional adaptation, disease and pest resistance, or the plant's utility in a crop rotation.

Discussion

It was clear from feedback the NOSB received from stakeholders in Fall 2024 and Fall 2025 that the availability and use of organic seed varies significantly, based on crop, location, and operation-specific factors. Further, ongoing concerns about fair competition, continued innovation, and meeting consumer demand factor into producer decisions. Although financial factors are not a permitted justification for sourcing nonorganic seed (Guidance 5029, section 4.1.2.b), cost does appear to have a significant influence on organic seed use (or lack thereof) - both for seed purchasing decisions and for seed producers deciding whether to produce organic seed. When there is no guarantee that producers will purchase organic seed that is available, seed producers see significant risk in increasing production.

Organic seed may not be commercially available when producers trial a new variety or respond to consumer demand for a specific product. Availability of an appropriate quantity can also be a barrier to purchasing organic seed, in both directions. A smaller producer may not be able to purchase a small amount of seed or entice production of organic seed. A larger producer may not be able to find enough organic seed to meet their needs.

For similar reasons, it may not be possible for an operation to add more organic seed to their operation each year - there may be advances and then setbacks as operations add or remove products from their

offerings, deal with new pest or disease pressure, and add or remove parcels from their Organic System Plan. The factors described above make it unlikely, and not necessarily expected, that all organic producers will eventually use 100% organic seed. Nonetheless, CACS believes the allowance for nonorganic seed use is a temporary, narrow exception to the requirement that organic seed must be used, and the expectation is that organic producers will make progress toward compliance over time. The commercial availability requirement anticipates that organic seed will become more and more available and more widely used, not less.

Four changes, which align with the emphasis on increasing organic seed use in previous NOSB recommendations, stand out as readily actionable and impactful under the existing regulatory framework. These changes could provide more assurance to organic seed producers that they will have reliable buyers and better engage the full organic supply chain's cooperation in advancing compliance with the organic seed requirement. These changes are described below, and Appendix A includes suggested text.

First, to determine that organic seed is not commercially available, organic producers must search for organic options. Guidance 5029 section 4.2.1.b.1 indicates that producers should maintain records of outreach to at least three suppliers as part of their search for organic seed, but it does not describe the specific documentation that should be maintained regarding the insufficiency of the form, quality, or quantity discovered in the search, such as lack of particular crop characteristics or inadequate quantity available. Without this documentation, inspectors and certifiers have limited ability to assess the rigor of the search and assess the potential for future progress and alternative search approaches. The search documentation guidance in section 4.2.1 should be updated to indicate that the specific form, quality, or quantity that could not be secured organically should be recorded.

Second, a rigorous search for organic seed may need to be ongoing and adjusted based on findings. However, Guidance 5029 section 4.2.1.b.1 is silent on the time horizon for seed searches. The Guidance should be updated to request information about what producers are doing to increase the likelihood of finding organic seed in the future (e.g., contracting ahead, requesting seed at different times of year, variety trials, shared orders with other growers).

Third, contract production, where a buyer plays an active role in driving production of a particular crop variety, has been identified as a significant challenge for organic seed use. The producer is filling a market need, but has little or no control over the variety and seed selection, and seed use is not addressed in the buyer's Organic System Plan (OSP). Guidance 5029 should be updated to clarify that where a buyer contracts for or otherwise specifically seeks a particular crop variety, the buyer's OSP should address use of organic seed and commercial availability.

Fourth, the strengthening organic enforcement (SOE) rule has improved oversight and communication throughout the supply chain, with potential benefits for the rigor of organic seed searches. Under SOE, certifying agents must exchange information that is credibly needed to determine an operation's compliance with the USDA organic regulations (7 CFR 205.501(a)(10)(ii)). For example, if an organic producer tells a certifier that the buyer determines seed use, that certifier should verify with the buyer's

certifier that a compliant commercial availability search has been completed. However, these expectations about communication between certifiers regarding compliance with the organic seed requirement are not yet reflected in Guidance 5029. Guidance 5029 should be updated to state that certifiers must exchange information as needed to verify compliance with the organic seed use and commercial availability requirements.

While these changes alone will not be adequate to dramatically or immediately increase organic seed use, they will ensure that the full organic supply chain continues to make progress toward maximizing use of organic seed in the long-term.

In addition, CACS notes that communication about organic seed breeding is needed between programs within the U.S. Department of Agriculture, including the NOP, National Institute of Food and Agriculture, and the Agricultural Research Service, . CACS does not currently support setting a sunset date for use of nonorganic seed, as has been done in the European Union, because organic growers should have the opportunity to try and transition new varieties (developed using non-excluded methods), into organic production. However, in the absence of a strong regulatory signal, more must be done to continue to develop a robust and reliable market for organic seed in the United States.

Summary

Based on multiple rounds of public comment, as well as NOSB recommendations from 2018 and 2019, CACS recommends updates to Guidance 5029 to address gaps in detail, timeframe, and supply chain in current commercial availability searches. These updates will ensure certifiers have specific information to inform compliance review and advance continuous improvement in organic seed sourcing.

Questions for Stakeholders

1. Are there any other updates to Guidance 5029 that the NOSB should consider at this stage?
2. For producers: How have you increased organic seed use? How can you document this progress?
3. For handlers: How have you supported producers that use organic seed? If you source seed for your producers, how have you increased seed use? How can you document this?
4. How could increased organic seed use be measured or tracked?
5. How does licensing of varieties limit availability of or access to organic seed?
6. Are there crops/product categories and/or regions where organic seed use and/or availability is increasing? Why?

Subcommittee Vote

Motion to accept the discussion document on Consistency in Organic Seed Use

Motion by: Allison Johnson

Seconded by: Cat McCluskey

Yes: 4 No: 0 Abstain: 0 Recuse: 0 Absent: 0

Guidance
Seeds, Annual Seedlings, and Planting Stock in Organic Crop Production

1. Purpose

This guidance describes practices for certified operations to demonstrate their proactive efforts to procure all organic seeds, annual seedlings, and planting stock in support of their organic system plan (OSP). This guidance clarifies “equivalent variety” and also describes the form, quality, or quantity criteria that need to be met before seeds or planting stock can be categorized as commercially unavailable as organic. Further, this guidance outlines considerations regarding the inputs and substances routinely used during crop production.

2. Scope

This guidance applies to all National Organic Program (NOP) certifying agents, certified and exempt organic crop producers, and suppliers of seeds, annual seedlings, and planting stock.

3. Background

The USDA organic regulations at 7 CFR § 205.204 require that organic producers use organic seeds, annual seedlings, and planting stock. The regulations allow producers to utilize non-organic seeds and planting stock when equivalent organic varieties are not commercially available.

In August 2005 and November 2008, the National Organic Standards Board (NOSB) provided recommendations that outlined specific concepts and procedures for determining commercial availability of organic seeds and planting stock. These recommendations also identified the responsibilities of the NOP, certifying agents, and operations for promoting and sourcing organic seeds and planting stock and emphasized that utilizing organic seed is a fundamental part of supporting a healthy, viable organic seed industry. Considerable public comment at NOSB meetings has supported these goals. This guidance represents NOP’s current thinking on this topic.

4. Policy

Producers should develop and follow procedures for procuring organic seeds, annual seedlings, and planting stock and maintain adequate records as evidence of these practices in their organic system plan (OSP). Producers must also provide clear documentation regarding the inputs and materials used during crop production (as required at § 205.201(a)(2)). Certifying agents must assess procedures and documentation of certified production and handling operations as they source seeds, annual seedlings, and planting stock on an annual basis. Each of these concepts is described in more detail below.

4.1 Sourcing of Seeds, Annual Seedlings, and Planting Stock

- 4.1.1 Certified operations must use organic seed, annual seedlings, and planting stock in accordance with the requirements at § 205.204.
- 4.1.2 Certified operations may use non-organic seed and planting stock only if equivalent organically produced varieties of organic seeds and planting stock are not commercially available.
 - a. Commercial availability is defined at § 205.2 and refers to the ability to obtain a production input, in this case seed or planting stock, in an appropriate form, quality, or quantity to fulfill an essential function in organic production. For the purposes of this exception, an “equivalent variety” is a variety of the same “type” (e.g. head lettuce types versus leaf lettuce types) or has similar agronomic or marketing characteristics needed to meet site specific requirements for an operation. These characteristics may include, but are not limited to: number of days until harvest; color, flavor, moisture, chemical, or nutrient profiles of the variety of the harvested crop; vigor or yield of harvested crop; regional adaptation, disease and pest resistance, or the plant’s utility in a crop rotation.
 - b. Price cannot be a consideration for determination of commercial availability.
- 4.1.3 The following considerations could be acceptable to justify use of non-organic seeds and planting stock as not commercially available. These considerations must be described by the operation in their organic system plan (OSP), pursuant to § 205.201(a)(2), and approved by the certifying agent.
 - a. Form Considerations: Examples of forms may include, but are not limited to, treated or non-treated seeds or planting stock, use of pelleted seed, or use of bare root nursery stock or container plants.
 - b. Quality Considerations: Examples may include, but are not limited to, germination rate of the seed; presence of weed seeds in the seed mix; shelf life and stability of the seeds; and disease and pest resistance.
 - c. Quantity Considerations: Producers may provide evidence that quantities are not available in sufficiently large or small amounts given the scale of the operation.
- 4.1.4 For certified operations producing edible sprouts, there is no exception to the requirement to use organic seed, as stated at § 205.204(a)(1).
- 4.1.5 Certified operations may use non-organic annual seedlings to produce an organic crop only when a temporary variance has been granted by the AMS Administrator in accordance with §

205.290(a)(2) due to an extreme weather event or business disruption beyond the control of the producer (§ 205.204(a)(3)).¹

- 4.1.6 Use of non-organic planting stock to produce organic crops is subject to commercial availability as per § 205.204(a)(1). If planting stock is from a non-organic source and is used to produce perennial crops, then that *planting stock* may be sold, labeled or represented as organic planting stock after 12 months of organic management (§ 205.204(a)(4)).

4.2 Recordkeeping for Organic Producers & Handlers

4.2.1 The following records should be maintained by organic producers:

- a. A list of all seed and planting stock, indicating any non-organic seeds or stock used, and the justification for their use including lack of equivalent variety, form, quality or quantity considerations. Records describing on-farm trials of organic seed and planting stock can be used to demonstrate lack of equivalent varieties for site specific conditions.
- b. The search and procurement methods used to source organic seed and planting stock varieties, including:
 1. Evidence of efforts made to source organic seed, including documentation of contact with three or more seed or planting stock sources to ascertain the availability of equivalent organic seed or planting stock, **and the specific form, quality, or quantity consideration(s) with each source**. Sources should include companies that offer organic seeds and planting stock.
 2. Records may include, but are not limited to: letters, faxes, email correspondence, and phone logs from seed suppliers and companies; seed catalogs; searches of organic seed databases; receipts; receiving documents, invoices, and inventory control documents.
- c. **For any producer whose list includes non-organic seed or planting stock, a plan for increasing use of organic seed and planting stock in the future. Strategies in plans may include, but are not limited to, advance contracting for organic seed, earlier seed searches, and new variety trials.**

4.2.2. **The following records should be maintained by organic handlers that contract directly with a producer for specific organic products and influence or decide which specific seed is used:**

¹ Please see procedures for requesting a temporary variance in the NOP *Program Handbook: Guidance and Instructions for Accredited Certifying Agents and Certified Operation, NOP 2606 – Processing Requests for Temporary Variances*.

- a. A list of any specific product(s) sourced, for which an equivalent organic seed or planting stock is not commercially available.
- b. The search and procurement methods used to attempt to source the product(s) grown from organic seed and planting stock varieties and comparison to potentially equivalent varieties that can be grown from organic seed or planting stock.

4.2.3. Failure to demonstrate thorough and complete commercial availability searches over time may result in additional source searches being required or additional steps taken.

4.3 Inputs Used for Treatment of Seeds or Planting Stock

4.3.1 Substances used in the treatment of seed and planting stock need to be described in the OSP. Allowed treatments include:

- a. Peracetic acid is specifically allowed for use in disinfecting seed per § 205.601(a)(6).
- b. Hydrogen chloride is specifically allowed for delinting cotton seed for planting per § 205.601(n).
- c. Chlorine materials may be used per § 205.601(a)(2). Use of chlorine products in handling of seeds on-farm can be considered a production use that is not in direct contact with the crop, provided the treatment is followed by immediate rinsing with potable water that does not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act.²
- d. Other synthetic substances listed for appropriate uses in § 205.601 (e.g. for pest or disease control, or as a soil or plant amendment).
- e. Nonsynthetic substances that are not prohibited are allowed as seed or planting stock treatments.

4.3.2 Examples of types of treatments that should be reviewed by the certifying agent:

- a. Pesticides, including fungicides, herbicides and insecticides: All pesticides used as seed treatments must be compliant for organic production, including inert and active ingredients. Botanical or biological preparations cannot be genetically modified per prohibition for excluded methods as defined by § 205.105(e) and § 205.2.
- b. Pelleting: A clay coating applied to seed to increase its size and modify its shape into a more uniform ball. Pelleting allows for more even and efficient direct seeding of fields or containers either by hand or mechanically with the use of seeding equipment calibrated to the specific

² Please see *NOP 5026 - The Use of Chlorine Materials in Organic Production and Handling*.

sizes and shapes of the pelleted seed. Ingredients used in pelleting must be nonsynthetic or included on the National List at § 205.601 for an appropriate use.

- c. Inoculants: Bacteria that fix nitrogen from the air and soil that are commercially prepared for use with legumes during seeding. The materials used in Rhizobium or other microbial preparations cannot be genetically modified per the prohibition of excluded methods as defined by § 205.105(e) and § 205.2.

- 4.3.3 Substances used by a seed or planting stock purveyor prior to the harvest of their non-organic seeds or non-organic planting stock for sale and use in organic production are not considered “treatment”. Substances that are used by a seed or planting stock purveyor for seed cleaning and preparation (e.g. trisodium phosphate and chlorine solutions) after they harvest their non-organic seeds for sale in organic production are also not considered “treatment”, since they do not remain on the seed when it is planted. These substances do not need to be described in the OSP by the certified operation and do not require review by the certifying agent.

4.4 Role of Certifying Agents

- 4.4.1 Certifying agents must verify the procedures that certified operations utilize to obtain and plant organic varieties suitable for their operations as part of their annual review of the OSP.
- 4.4.2 Certifying agents must review substances and inputs used to treat seeds and planting stock for compliance with the USDA organic regulations.
- 4.4.3 Certifying agents shall verify the commercial availability requirements on an annual basis, in their review of the OSP, pursuant to § 205.402(a)(1), **including, as needed, exchanging compliance-related information with other certifiers, pursuant to § 205.501(a)(10)(ii).**
- 4.4.4 Certifying agents should review an operation’s progress in obtaining organic seeds, planting stock and transplants by comparing current source information to previous years **and the plan for increasing organic sourcing.**

5. References

5.1 USDA Organic Regulations

§ 205.2 Terms defined.

Annual seedling. A plant grown from seed that will complete its life cycle or produce a harvestable yield within the same crop year or season in which it was planted.

Commercial availability. The ability to obtain a production input in an appropriate form, quality, or quantity to fulfill an essential function in a system of organic production or handling, as determined by the certifying agent in the course of reviewing the organic plan.

Excluded methods. A variety of methods used to genetically modify organisms or influence their growth and development by means that are not possible under natural conditions or processes and are not considered compatible with organic production. Such methods include cell fusion, microencapsulation and macroencapsulation, and recombinant DNA technology (including gene deletion, gene doubling, introducing a foreign gene, and changing the positions of genes when achieved by recombinant DNA technology). Such methods do not include the use of traditional breeding, conjugation, fermentation, hybridization, in vitro fertilization, or tissue culture.

Planting stock. Any plant or plant tissue other than annual seedlings but including rhizomes, shoots, leaf or stem cuttings, roots, or tubers, used in plant production or propagation.

Transplant. A seedling which has been removed from its original place of production, transported, and replanted.

§ 205.204 Seeds and planting stock practice standard.

5.2 NOP Program Handbook

NOP 2606 – Processing Requests for Temporary Variances

NOP 5026 – The Use of Chlorine Materials in Organic Production and Handling

Appendix B - Relevant Statutory and Regulatory Text

Organic Foods Production Act

7 U.S.C. 6508. Prohibited crop production practices and materials

(a) Seed, seedlings and planting practices

For a farm to be certified under this chapter, producers on such farm shall not apply materials to, or engage in practices on, seeds or seedlings that are contrary to, or inconsistent with, the applicable organic certification program.

NOP Regulations

7 CFR 205.2 Terms Defined.

Commercially available. The ability to obtain a production input in an appropriate form, quality, or quantity to fulfill an essential function in a system of organic production or handling, as determined by the certifying agent in the course of reviewing the organic plan.

7 CFR 205.204 Seeds and planting stock practice standard.

- (a) The producer must use organically grown seeds, annual seedlings, and planting stock: Except, That,
- (1) Nonorganically produced, untreated seeds and planting stock may be used to produce an organic crop when an equivalent organically produced variety is not commercially available: Except, That, organically produced seed must be used for the production of edible sprouts;
 - (2) Nonorganically produced seeds and planting stock that have been treated with a substance included on the National List of synthetic substances allowed for use in organic crop production may be used to produce an organic crop when an equivalent organically produced or untreated variety is not commercially available;
 - (3) Nonorganically produced annual seedlings may be used to produce an organic crop when a temporary variance has been granted in accordance with § 205.290(a)(2);
 - (4) Nonorganically produced planting stock to be used to produce a perennial crop may be sold, labeled, or represented as organically produced only after the planting stock has been maintained under a system of organic management for a period of no less than 1 year; and
 - (5) Seeds, annual seedlings, and planting stock treated with prohibited substances may be used to produce an organic crop when the application of the materials is a requirement of Federal or State phytosanitary regulations.

National Organic Standards Board (NOSB)
Certification, Accreditation, and Compliance Subcommittee (CACS)
Residue Testing for a Global Supply Chain: Regulation Review (§ 205.670 & UREC)
Proposal
Fall 2026

Executive Summary

This proposal recommends updates to various aspects of § 205.670: Inspection and testing of agricultural products to be sold or labeled as “100 percent organic,” “organic,” or “made with organic (specified ingredients or food group(s)). These include:

1. Mandated testing of a minimum of 5% of operations annually by certifiers

- a. Recommendation to update the regulatory text to require certifiers to include risk-based and random selection when determining which operations will be tested as part of the 5% of operations tested annually.

2. Certifiers conducting all testing at their own expense

- a. Recommendation to update the regulatory text to allow certifiers to charge operations tested only when the:
 - test is being conducted as part of a credible complaint or investigation; and
 - contamination is determined to be caused by an intentional application or failure of an operation to adhere to their OSP (i.e. results in a noncompliance or adverse action).

3. Public access to results

- a. Recommendation to link (§ 205.504(b)(5)(iii) and § 205.670(f)) together.
- b. Encouragement of industry partners to continue to develop a centralized database (e.g., ORG-Tracker) and incentivize certifiers to participate.

This proposal also identifies residue testing issues that do not currently require rulemaking but are already addressed in past recommendations and/or existing law:

4. Unavoidable residual environmental contamination (UREC)

- a. Encourage NOP to implement NOSB’s 2025 Spring Final Recommendation to update NOP 2613 guidance to provide certifiers with clearer direction for evaluating residue findings when:
 - residues are detected without an established EPA tolerance or FDA action level; and
 - contamination is the result of indirect, unintentional applications of unknown origin (e.g., volatile drift events), rather than intentional application or failure of an operation’s Organic System Plan.

5. Downstream Notification to Supply Chain Partners of Non-Compliant Inputs for Fraud Prevention Purposes

- a. Best-practices and fraud prevention plans call for communication of confirmed fraud, willful violations, or significant noncompliance to affected downstream supply chain partners. The intent is to enhance transparency, traceability, and fraud prevention.

Discussion

1. Mandated testing of a minimum of 5% of operations annually by certifiers

The current testing requirements in the rule related to operation selection are minimal and focus on the quantity (5%), but not necessarily the type of operation or reason to test. This was intentional in the 2012 Periodic Residue Testing final rule to allow certifiers flexibility. However, now that we are over a decade into implementing this rule, along with other factors currently impacting the organic sector (e.g., fraud), it appears that there is an opportunity to shift from the mindset of using testing as a tool for verifying an operation's compliance on their operation to more of a verification tool for fraud detection. With this shift, it seems necessary to indicate that the 5% of operations tested must include a portion selected based on risk criteria, while also maintaining the allowance for random selection as this is an important deterrent.

What does the Organic Foods Production Act (OFPA) and the regulations state?

- OFPA (7 U.S.C. 6506(a)(6))¹: Requires certifiers to conduct periodic residue testing to determine the presence of prohibited substances and report violations (as appropriate).
- 7 CFR 205.670(d)²: Requires certifiers to conduct sampling and testing from a minimum of 5% of the operations it certifies, annually.

Background and Discussion

The mandated 5% of operation testing by certifiers annually was added to the regulations as a result of the 2012 Periodic Residue Testing final rule, which became effective on January 1, 2013. This was in response to an audit of the NOP, which was conducted in March 2010 by the USDA Office of Inspector General (OIG), in which OIG found “that none of the four certifying agents visited conducted periodic residue testing. The OIG indicated that these certifying agents noted that they considered residue testing to be required by the regulations only under certain circumstances.”³

The stated purpose of the 2012 Periodic Residue Testing final rule is to “implement the requirements of the OFPA (section 6506) for periodic residue testing by certifying agents. Residue testing plays an important role in organic certification by providing a means for monitoring compliance with the NOP regulations and by discouraging the mislabeling of agricultural products.” Section 6506(a)(6) of OFPA states:

“A program established under this chapter shall require periodic residue testing by certifying agents of agricultural products that have been produced on certified organic farms and handled through certified organic handling operations to determine whether such products contain any pesticide or other nonorganic residue or natural toxicants and to require certifying agents, to the extent that such agents are aware of a violation of applicable laws relating to food safety, to report such violation to the appropriate health agencies.”

AMS stated that its primary objective was to align the NOP regulations with the requirements for testing under OFPA.

¹ [Organic Foods Production Act of 1990, Section 6506](#)

² [7 CFR 205.670\(d\)](#)

³ [2012 Periodic Residue Testing Final Rule](#) (77 FR 67239, November 9, 2012)

The final rule explains the various options considered by AMS to ensure that certifiers are conducting a minimum level of residue testing, ranging from the status quo to testing upwards of 25% of operations annually.

Additionally, the final rule explained that all types of testing would be eligible to be counted toward the 5% mandate, including testing at operations chosen at random. Furthermore, the final rule stated, “certifying agents have the discretion to select operations for residue testing based on criteria such as size of operation, quantity of products produced, previous compliance issues, or other risk factors. Certifying agents are knowledgeable about the risk factors affecting the operations they certify; therefore, it is appropriate for a certifying agent to determine what operations should be tested under this action.”

Public Comment Summary

During the review of the 2026 Spring proposal, stakeholders demonstrated strong alignment in their consensus that retaining the 5% minimum residue testing requirement for operations is essential for program integrity. A significant majority of commenters advocated for certifiers to adopt a balanced, dual-pronged strategy, integrating both risk-based criteria and random selection into their annual testing programs. This combined approach is viewed as the most effective method for not only verifying ongoing compliance with the Organic System Plan (OSP) but also for proactively identifying and deterring fraudulent activity. While public comments consistently supported a minimum residue-testing mandate as a critical mechanism to ensure consistency and enhance oversight throughout the organic supply chain, many participants also emphasized the necessity of embedding this mandate within a more comprehensive risk-management framework. Stakeholders stressed that testing resources must be strategically allocated to operations, commodities, and supply chains that demonstrate the highest potential risk to organic integrity. Conversely, some commenters offered a note of caution, suggesting that relying solely on a fixed percentage could incentivize a mechanical, compliance-focused mindset that might fail to capture the highest-risk issues or deliver the most meaningful regulatory outcomes.

Conclusion

The Certification, Accreditation, and Compliance Subcommittee (CACS) recommends that NOP revise § 205.670(d) to include language that certifiers must select operations, as part of their testing program, using a combination of risk-based criteria (e.g., more likely to have residues, high risk assessment score, complaint, investigation) as well as random selection (e.g., location convenience, using a random selection generator), that aligns with their client make up. Meaning if a certifier certifies many high risk operations or is the recipient of several complaints and investigations, we’d expect that a larger portion of their 5% would have been selected due to risk vs a certifier that has lower risk operation and is not fielding many complaints or investigations. CACS does not want a certifier to only select operations due to risk nor does it want a certifier to select operations only at random. CACS also doesn’t want a certifier to select only 1 operation due to risk and then the rest randomly when they have many high risk operations. The Subcommittee discussed specifying a certain percentage of the 5% needed to be selected due to risk but ultimately did not. Lastly, CACS acknowledges that the regulations state that when a certifier certifies fewer than thirty operations then they must test from at least one operation annually. CACS recommends that this one operation be selected based on risk.

2. Certifiers conducting all testing at their own expense

Since the original publication of the NOP regulations, the cost of testing has been required to be absorbed by the certifier. This was reinforced in the 2012 Periodic Residue Testing final rule. While this is technically

true, in practice, many certifiers offset the costs of testing across their client base by including this in their base certification fees. This means that operations that are not tested are subsidizing those that are being tested.

What do OFPA and the Regulations State?

- § 205.670(b) & (c)⁴: Requires that residue testing be conducted by the certifier at their own expense.

Background and Discussion

Due to the regulatory reference above, certifiers are required to absorb the costs of the testing described in §205.670(c). This requirement dates back to the original publication of NOP regulations. In the preamble of the December 21, 2000, final rule (65 FR 80548), it states in the Residue Testing section, “The cost of such testing will be borne by the applicable certifying agent and is considered a cost of doing business. Accordingly, certifying agents should make provisions for the cost of preharvest or postharvest residue testing when structuring certification fees.”

Certifiers have expressed feeling constrained by this requirement. Costs affect the overall number of tests performed and which operations are selected for certifiers to maximize this line item in their budget.

Suppose certifiers could pass the costs of testing along to specific certified operations tested as part of increased oversight activities deemed necessary (e.g., complaint, investigation, high-risk operation). In that case, certifiers may increase the number of samples collected, or at least the selection of operations would be less impacted by cost implications. Also, it should be noted that in the current system, certifiers are likely still “charging” certified operations for testing conducted indirectly, meaning general certification fees paid for by all operations incorporate the amount to be spent on residue testing. This change to how testing fees are assessed could alleviate certification fees unnecessarily billed to low-risk operations.

Additionally, it is our understanding that the certifiers are implementing this requirement inconsistently. Some pass along the cost to operations for complaints and investigations, and do not count this towards their 5%, which appears compliant (haven’t received noncompliance). In contrast, others have received a noncompliance for passing the costs along in the same situations.

Public Comment Summary:

In the Fall 2025 discussion document, comments on testing costs were mixed. Some stakeholders supported maintaining the current approach and viewed the minimum testing requirement as a standard cost of certification that should not be passed on to certified operations. These commenters noted concerns regarding fairness, particularly when an operation subject to testing may not be responsible for the contamination and highlighted the difficulty operations may have budgeting for unpredictable complaint- or investigation-driven testing. Others supported allowing certifiers to recover testing costs associated with complaints or investigations, particularly when an investigation results in a noncompliance or adverse action and demonstrates that contamination was caused by intentional actions or a failure to follow the operation's organic system plan. Comments on tiered fee structures were similarly mixed, with some noting that existing regulations already provide certifiers flexibility to establish higher fees for higher-risk operations. Additional comments included recommendations that testing be conducted by USDA or

⁴ [7 CFR 205.670\(c\)](#)

state agencies, concerns regarding potential conflicts of interest when certifiers test their own clients, and suggestions that USDA offset testing costs through accreditation fee adjustments

Comments received in response to the Spring 2026 proposal reflected continued concern regarding the financial burden associated with certifier-funded testing. While some commenters viewed residue testing as a fundamental component of certifier oversight responsibilities, many expressed concern that requiring certifiers to bear all testing costs could increase certification fees and create resource challenges, particularly as testing requirements expand. Several commenters supported mechanisms that would allow certifiers to recover testing costs in limited circumstances, especially when testing identifies fraud, willful violations, or other non-compliances. Others suggested that additional financial support, cost-sharing mechanisms, or alternative funding approaches should be considered to ensure robust testing programs can be maintained without creating undue burdens on either certifiers or certified operations. Overall, commenters generally supported strong residue-testing programs but sought greater flexibility regarding how testing costs are allocated and recovered.

Conclusion

The CACS recommends that NOP revise the regulatory text at § 205.670(b) & (c) to allow certifiers to charge operations tested only when the:

- test is being conducted as part of a credible complaint or investigation; and
- contamination is determined to be caused by an intentional application or failure of an operation to adhere to their OSP (i.e. results in a noncompliance or adverse action).

3. Public access to results

There are two mentions of public access to results in the regulations. However, they are not aligned. Additionally, as the NOSB has been discussing the topic of residue testing, the idea of a database of results has been brought up, as a project is currently under development.

What do OFPA and the regulations state?

- OFPA (7 USC 6506(a)(9))⁵: Requires public access to certification documents and laboratory analyses that pertain to certification
- § 205.670(f)⁶: Requires that the results of all residue testing be available for public access, unless part of an ongoing investigation
- § 205.504(b)(5)(iii)⁷: Requires that certifiers have procedures in place that, upon request, the results of residue testing conducted during the current and three preceding calendar years be made available.

⁵ [OFPA 6506\(a\)\(9\)](#)

⁶ [7 CFR 205.670\(f\)](#)

⁷ [7 CFR 205.504\(b\)\(5\)\(iii\)](#)

Background and Discussion

Since the two regulatory citations listed above are not tied together, it is unclear what the intent of § 205.670(f) is/was. Is the intent of § 205.670(f) to make available results in accordance with § 205.504(b)(5)(iii), or was § 205.670(f) intended to make these results available in some other manner?

Additionally, the idea of a database (e.g., ORG-Tracker by Heartland Health Research Alliance) to compile and analyze residue test result data has been brought up by public comments, as industry stakeholders are currently developing such a project. The idea of a database was addressed in the 2012 Periodic Residue Testing final rule. At the time, AMS stated, “It is not AMS' intent to assemble data and draw conclusions based on statistical sampling techniques, as the sampling performed by certifying agents will vary considerably due to the worldwide diversity of operations which are certified to the NOP. Certifying agents have the discretion to sample from higher-risk operations, which may yield results that are not representative of all organic operations.” This does not appear to be the current reality of testing, as many certifiers conduct random sampling rather than sampling based on known risks.

Additionally, from the proposed rule to the final rule, AMS amended the reporting requirements under section § 205.670 “to reduce the reporting burden on certifying agents.” AMS stated, “This rule eliminates the requirement that certifying agents must submit all residue testing results to the Administrator or the State organic program's governing State official. AMS does not intend to consolidate residue testing data from certifying agents and does not need reporting of residue testing results as the mechanism to ensure that certifying agents are meeting the requirement of periodic residue testing.”

Based on the previous stance from NOP, it is unclear whether the landscape has changed to make the compilation of data more beneficial than it was in 2013, following the implementation of the Periodic Residue Testing final rule.

In this proposal, CACS is recommending that NOP update the requirement that 5% of operations be selected based on either risk or randomly selected. 5% annual minimal testing conducted by each certifier doesn't equal many operations, however, if the information can be aggregated and shared across all certifiers - there can be meaningful data and learnings to extract to continuously improve testing programs.

Public comment summary

Public comments generally supported increased transparency regarding residue-testing results and recognized the value of making testing data more accessible to strengthen confidence in organic certification, support fraud prevention efforts, and improve understanding of contamination trends across the organic supply chain. Many commenters favored broader access to testing data and encouraged the development of centralized reporting or data-sharing systems that could be used to identify recurring contaminants, emerging risks, supply-chain vulnerabilities, and areas where additional oversight may be warranted.

At the same time, commenters raised several concerns regarding implementation. These included confidentiality and business-sensitive information, the potential for consumers or buyers to misinterpret residue findings without sufficient context, and the possibility that operations could be unfairly harmed by publication of residue results that are ultimately determined to be attributable to unavoidable residual environmental contamination (UREC) or other circumstances that do not result in a noncompliance. Commenters also noted the importance of establishing clear parameters regarding what information would be made public, whether reporting should be operation-specific or aggregated, how testing data would be

maintained and governed, and how appropriate context would be provided to distinguish contamination events from intentional misuse of prohibited substances. Overall, commenters generally supported greater transparency but emphasized the need to balance public access with fairness, confidentiality, and accurate interpretation of testing results.

Conclusion

CACS recommends that the two regulatory requirements to make results available to the public (§205.504(b)(5)(iii) and § 205.670(f)) be linked together. By adding a reference to 205.504(b)(5)(iii) at § 205.670(f) it makes it more clear to members of the public the way in which results will be made public - by the procedures required of certifiers in 205.504(b)(5)(iii) and not some other manner.

For example (red text is proposed text):

§ 205.670(f): “Results of all analyses and tests performed under this section will be available for public access, unless the testing is part of an ongoing compliance investigation, **pursuant to § 205.504(b)(5)(iii).**”

Additionally, while it doesn’t seem viable that NOP be responsible for maintaining a residue test result database at this time, CACS encourages industry partners (e.g. ORG-Tracker, certifiers, ACA, etc.) to continue to develop a centralized database of residue results and incentive certifiers to participate.

4. Unavoidable residual environmental contamination (UREC) Definition (§ 205.2)

Organic certification is built on a process-based standard, grounded in transparency and accountability. While many consumers associate organic products with the absence of synthetic residues, trace contamination—often from environmental sources outside a farmer’s control—can occur despite rigorous compliance with organic practices. As detection technologies improve, even the smallest residues can be identified, prompting the need for clearer, scientifically based policy to distinguish between unavoidable residual environmental contamination (UREC).

Certifiers use EPA/FDA thresholds to assess pesticide residue levels. Still, in cases where no tolerance exists, a default of 0.01 ppm is applied to the pesticide, as instructed in NOP 2613: Responding to Results from Pesticide Residue Testing⁸. This has placed an undue burden on producers who operate in good faith yet face contamination from environmental factors. CACS explored updating regulatory text to ensure compliance evaluations align with modern agricultural realities—balancing certification integrity with environmental unpredictability.

What do OFPA, regulations, and other references state?

- OFPA § 6511(c)(2)(B)⁹: Recognizes the inevitability of minimal residues not resulting from an operation’s practices.

⁸ [NOP 2613: Responding to Results from Pesticide Residue Testing, Section 5.3.3](#)

⁹ [Organic Foods Production Act of 1990, Section 6511](#)

- Senate Report (1990)¹⁰: Clarifies intent to allow minor contamination not stemming from organic practices, suggesting tolerance levels between 1-10% of EPA levels.
- NOP Final Rule Preamble¹¹: Commits to developing science-based UREC thresholds. Until such standards are formalized, FDA action levels apply for defining permissible contamination thresholds.
- 7 CFR 205.2¹²: Defines unavoidable residual environmental contamination (UREC) and drift

These references underscore the importance of protecting organic integrity without penalizing producers for truly unavoidable contamination.

Background and Discussion

The current § 205.2 definition of unavoidable residual environmental contamination (UREC) is:

“Background levels of naturally occurring or synthetic chemicals present in the soil or in organically produced agricultural products below established tolerances.”

During the Spring 2025 NOSB meeting, CACS proposed a revised UREC definition to reflect the modern agricultural environment. While stakeholders acknowledged the intent, many felt the draft required refinement.

To reiterate, a major driver for CACS is to explore options to provide better guidance to certifiers on how to evaluate residues that are seemingly low-level and are present despite the operation carrying out reasonable and required prevention measures as reflected in their Organic System Plan. These often occur where no EPA tolerance exists, triggering default actions that may unfairly penalize compliant producers.

Is it reasonable to consider contamination due to atmospheric drift (i.e., contaminated rainwater) or other types of contamination that are outside of the operation’s control, even when they’ve implemented contamination prevention strategies, such as UREC? Should this be defined as something else, and then a process be established to address these types of contamination events?

Examples of Contamination Events

Inadvertent – indirect – unavoidable - contamination refers to the unintended introduction of a prohibited substance onto a certified organic operation due to environmental movement—such as wind, water, or volatilization—from a source not under the control of the certified operator.

- This may include cases where the origin cannot be traced or proven, such as dicamba or 2,4-D drift, and where all mitigation strategies were followed.

¹⁰ Senate Report July 1990, S. 2830, pp 299-301

¹¹ [Preamble to the Final Rule](#), pg. 155

¹² [7 CFR 205.2](#)

CACS also explored revising and modernizing the definition of drift. Still, the definition appears to be adequate to capture drift events, which are also unavoidable and indirect, such as atmospheric drift due to dicamba.

Drift. The physical movement of prohibited substances from the intended target site onto an organic operation or portion thereof. (§ 205.2)

CACS determined that even if the definitions for UREC or Drift were revised, the challenge remains in the pathway to evaluation since many of these instances involve substances that the FDA and EPA tables do not contain thresholds for the crops that they are found on; therefore, the default is .01ppm for pesticides. With this in mind, CACS aims to elevate some of the recommendations from the 2025 Spring Proposal: Residue Testing for a Global Supply Chain: Guidance Documents on solutions to update the gaps that exist. Gaps in the EPA and FDA tables will continue to exist; therefore, CACS wants to elevate the need for the change to occur in how certifiers are evaluating and responding to results per the instructions in NOP 2613 (see appendix at end of this document for an excerpt in the spring 2025 proposal on guidance updates for 2613).

Public Comment Summary

Comments regarding UREC from the Spring 2026 proposal were largely focused on the need to distinguish environmental contamination from intentional use of prohibited substances. Many commenters requested clearer guidance and more consistent evaluation of residue findings that may result from unavoidable environmental sources. Commenters generally supported ensuring that residue-testing results are interpreted within the broader context of an investigation and that UREC considerations are incorporated into compliance determinations and enforcement decisions.

Conclusion

Stakeholder feedback highlighted the need for clarity around contamination scenarios that fall outside the certified operation's control—especially those involving atmospheric drift.

Based on stakeholder comments, the majority of stakeholders favored preserving the UREC definition while creating a new, well-defined framework for evaluating inadvertent indirect drift. This approach offers clarity and fairness without altering the foundational regulatory language of UREC. It allows the organic community to acknowledge the reality of unavoidable environmental contamination while still enforcing rigorous standards for prevention and compliance.

CACS urges the NOP to implement the Board's previous recommendation to improve NOP 2613 instruction for responding to results when no tolerance exists for a particular crop to assist certifiers in further working with organic producers who experienced inadvertent indirect contamination due to modernized drift (e.g., atmospheric drift).

Additionally, stakeholders overwhelmingly supported updating NOP 2613 with the NOSB 2025 Spring Recommendation. Updates should emphasize:

- When noncompliances should not be issued for confirmed UREC or drift events involving trace residues below 0.01 ppm and without EPA tolerances

- How certifiers should distinguish between trace UREC or drift contamination and noncompliance due to operational negligence
- The continued requirement for operators to implement robust contamination prevention strategies
- Consideration of regionally specific environmental factors when determining what constitutes “unavoidable” contamination

By modernizing the guidance, NOP can provide certifiers with clear, science-based tools to handle UREC and drift events consistently while supporting both integrity and fairness within the organic program.

CACS re-emphasises their recommendation to update NOP 2613 guidance, consistent with the NOSB Spring 2025 recommendation, to provide certifiers with clearer direction for evaluating residue findings when:

1. residues are detected without an established EPA tolerance or FDA action level; and
2. contamination is the result of indirect, unintentional applications of unknown origin (e.g., volatile drift events), rather than intentional application or failure of an operation’s Organic System Plan.

5. Downstream Notification to Supply Chain Partners of Non-Compliant Inputs for Fraud Prevention Purposes

Transparency and traceability are foundational principles of the organic program and have become increasingly important following implementation of the Strengthening Organic Enforcement (SOE) rule. As organic supply chains become more complex, stakeholders have raised questions regarding whether certifiers and certified operations should have access to voluntary mechanisms for communicating confirmed organic integrity concerns to affected supply chain partners. This discussion focuses on best-practices and complete and effective fraud prevention plans, rather than the establishment of a regulatory notification program.

What Do OFPA and the Regulations State?

The Organic Foods Production Act (OFPA) and the USDA organic regulations provide authorities related to residue testing, certification, enforcement, compliance actions, and supply chain traceability.

Relevant authorities include:

- **OFPA § 6503**, which authorizes the Secretary to establish rules necessary to ensure organic integrity.
- **OFPA § 6505**, which provides authority related to certification actions, including suspension and revocation.
- **OFPA § 6511**, which authorizes residue testing and addresses products containing residues above regulatory thresholds.
- **7 CFR 205.501(a)(13), 205.501(a)(21), and 205.504(b)(7)**, which require certain information-sharing activities among certifiers and implementation of supply chain traceability audits under SOE.
- **7 CFR 205.662-205.668**, which establish enforcement and compliance procedures.

Background and Discussion

Current organic regulations contain robust requirements for traceability, recordkeeping, residue testing, and enforcement. However, there is no established framework for communicating confirmed organic integrity concerns to downstream operations that may have received affected products. This can create situations where downstream operations are expected to maintain effective fraud prevention systems but may not have access to information regarding significant compliance issues identified earlier in the supply chain.

Stakeholders have increasingly discussed whether voluntary communication may serve as a useful best practice in limited circumstances involving confirmed fraud, willful violations, or residue findings that materially impact organic status. Under such an approach, a certifier or certified operation could choose to communicate relevant information to affected supply chain partners to support traceability reviews, supplier evaluations, risk assessments, testing programs, and updates to fraud prevention plans. The purpose would be to increase awareness of confirmed organic integrity concerns rather than direct any specific action by the recipient.

Importantly, this concept is distinct from a recall, stop-sale order, mandatory reporting requirement, or product disposition program. Receipt of a voluntary communication would not create new regulatory obligations and would not require a downstream operation to hold product, remove product from commerce, relabel product, or take any particular corrective action. Rather, the communication would provide information that a recipient could consider as part of its own risk-based decision-making and due diligence activities.

At the same time, stakeholders have identified potential challenges that would need to be considered, including confidentiality concerns, potential liability, business disruption, lack of standardized communication procedures, and the need to distinguish confirmed noncompliance from instances involving unresolved investigations or unavoidable residual environmental contamination (UREC). These concerns underscore the importance of any future framework being voluntary, narrowly tailored, and focused on confirmed threats to organic integrity.

Public Comment Summary

Comments received on the Spring 2026 proposal generally supported increased transparency and information-sharing when significant organic integrity concerns have been confirmed. Many commenters viewed communication with downstream supply chain partners as a useful tool for improving traceability, strengthening fraud prevention efforts, and helping operations make informed sourcing and supplier management decisions.

At the same time, commenters consistently recommended that any communication mechanism be limited to significant situations, such as confirmed fraud, willful violations, or residue findings that exceed established action thresholds. Commenters generally did not support broad communication requirements for trace-level detections, unresolved investigations, technical noncompliances, or potential UREC cases because of concerns regarding fairness, confusion, and unnecessary market disruption.

Many commenters also emphasized the importance of maintaining flexibility and avoiding the creation of a new regulatory notification program. Stakeholders frequently noted that communication should support risk-based decision-making and fraud prevention rather than function as an enforcement tool. Several commenters requested clear guidance regarding when communication would be appropriate, who may

receive information, and how confidentiality concerns should be addressed. Overall, public comments reflected support for targeted information-sharing while cautioning against approaches that could create new regulatory obligations or unintended consequences for compliant operations.

Conclusion

The organic regulations currently provide significant authorities related to traceability, residue testing, compliance, and enforcement. Public comments generally support greater transparency in situations involving confirmed threats to organic integrity while also emphasizing the need to avoid creating a mandatory notification system, recall authority, or additional enforcement mechanism.

Best practices and complete and effective fraud prevention plans support supply chain awareness, strengthen fraud prevention efforts, and enhance traceability objectives under SOE, and are consistent with existing regulatory authorities. Certified operations and certifiers should focus on providing relevant information to affected supply chain partners in limited circumstances involving confirmed noncompliance, allowing operations to make informed, risk-based decisions without creating new regulatory obligations or imposing mandatory actions on recipients.

Overall Document Conclusion

Mandatory testing of 5% of operations

- **Challenge:** Some certifiers report that their current testing programs are not finding many positives. However, this is likely due to the types of operations being selected by certifiers to test, which can currently include anyone (i.e., does not need to be based on risk), as well as the types of tests being performed.
- **Proposal:** Revise the regulatory language to require that the mandated 5% of testing of operations be selected based on risk as well as randomly.

Cost of testing

- **Challenge:** Certifiers must bear the cost of all residue testing. If the selection requirements change to require that a portion of operations be selected based on risk, this is likely to increase costs. Without the ability to directly pass costs of testing on to operations, certifiers are likely to increase the certification costs for all of their certified operations, which is not equitable.
- **Proposal:** Revise the regulatory language to allow certifiers to pass along the cost of residue testing in certain circumstances (e.g., credible complaints or investigations) and when the contamination is determined to be caused by an intentional application or failure of an operation to adhere to their OSP (i.e. results in a noncompliance or adverse action)

Public access to results

- **Challenge:** Two regulatory sections address public access to results, but they are not aligned.
- **Proposal:** Revise the regulatory language to link the two sections of the regulations together.

UREC

- **Challenge:** The current framework that certifiers and organic farmers must use to respond to the presence of pesticide residues in some situations negatively impacts organic farmers who have implemented and followed the contamination prevention strategies in their OSP, and residues are still present. This is often due to atmospheric drift and the fact that certifiers must default to 0.01ppm when assessing the residue, as there is no EPA tolerance for that crop.
- **Proposal:** Revise NOP 2613 as previously recommended to include a different framework for certifiers to evaluate and respond to the presence of residues when there isn't an EPA tolerance for the crop that yielded positive results, as 0.01ppm doesn't seem to work or be fair in some circumstances.

Downstream Notification to Supply Chain Partners of Non-Compliant Inputs for Fraud Prevention Purposes

- **Challenge:** Supply chain partners may have limited visibility into significant fraud, willful violations, or confirmed noncompliance occurring earlier in the supply chain, which can reduce opportunities to strengthen supplier oversight, fraud prevention plans, and risk-based due diligence activities.
- **Proposal:** Certified operations and certifiers should follow best practices and fraud prevention plans to share information regarding confirmed organic integrity concerns with affected downstream supply chain partners. These practices support transparency, traceability, and risk-based decision-making by providing downstream operations with information that may assist in supplier oversight, traceability reviews, and updates to fraud prevention systems.

Subcommittee Vote

Motion to accept the proposal on Residue Testing for a Global Supply Chain: Regulation Review (§ 205.670 & UREC)

Motion by: Kathryn Deschenes

Seconded by: Amanda Felder

Yes: 4 No: 0 Abstain: 0 Recuse: 0 Absent: 0

Appendix A: Excerpt from Spring 2025 proposal: Residue Testing for a Global Supply Chain – Guidance Documents 2613

We expand on the issues identified above and propose solutions below.

Issue: Detection without Tolerance Level – When detected pesticides are not registered for the crop on which they are found at any level above 0.01 ppm, the current guidance indicates that certifiers should exclude the crop from the organic marketplace and alert the appropriate authorities, including the EPA and FDA. This approach assumes that any detection of a prohibited pesticide when there is no established tolerance indicates that the product no longer qualifies for organic status and that there is a human health and safety concern. This approach is problematic in the following circumstances:

Drift or Inadvertent contamination: The current guidance does not allow certifiers to factor drift or inadvertent contamination events versus fraudulent activities into their assessment if there is a positive detection but no EPA tolerance or FDA action level. The current guidance also does not provide clarification to certifiers for evaluating whether the presence of a residue is due to unavoidable residual environmental contamination (UREC). Certifiers are assumed to equate this to less than 5% of EPA tolerances. This approach is problematic when there is no EPA tolerance.

For example, §180.129 o-Phenylphenol lists the tolerance for cucumbers at 10 ppm. This means that tests could show residues of up to 0.5 ppm ($5\% \times 10 \text{ ppm} = 0.5 \text{ ppm}$) for cucumbers, and they'd still be allowed to be sold as organic. However, broccoli is not listed in this table, so if a test came back positive for broccoli for o-Phenylphenol, it could not exceed .01 ppm. This is seemingly unfair to an organic operation in an inadvertent drift scenario, in that produce that might be in very close proximity (no difference in the operation's buffers, etc.) could have very different outcomes by having to rely solely on the inclusion of crops in the EPA tables.

NOSB further explores UREC in our "Residue Testing for a Global Supply Chain: Regulation Review Discussion Document," which includes revising the current definition.

Solutions: NOSB proposes that NOP explore the following policy solution options:

- A. Utilize 40 CFR Subpart 180 paragraph (d) "Indirect or inadvertent residues":
 - a. Recognize the values in 40 CFR Subpart 180 paragraph (d) "Indirect or inadvertent residues" as equivalent to 5% of EPA Tolerance for the purpose of responding to residue tests to determine organic compliance (i.e., 5% of the tolerance listed in (d) should not be taken given that these are already at inadvertent levels; evaluate compliance directly against values as they appear in (d)); and,
 - b. Provide guidance to stakeholders for the process of requesting EPA to establish tolerances in paragraph (d) in cases where there isn't a current tolerance listed in paragraph (d) for that substance.
- B. Utilize crop group structure: NOSB requests that NOP provide guidance to certifiers on how to utilize the crop group structure for the purpose of determining organic compliance including but not limited to:
 - a. Adding additional crops (that are missing) to crop groups with like characteristics.

- b. State that if a crop is listed for a particular substance, all the crops in the corresponding crop group would have the same tolerance (e.g., for o-phenylphenol, cucumbers have a tolerance of 10 ppm). Since cucumbers are part of crop group 9 - cucurbit vegetables, all crops listed in crop group 9 would have the same tolerance as cucumbers).
- C. Explore if other reliable data sets could be used to set action and inaction thresholds as an alternative to .01 ppm. These may include, but are not limited to, the USDA Pesticide Data Program or the Dietary Risk Index.