

**National Organic Standards Board
Livestock Subcommittee
Petitioned Material Proposal
Chlorine Materials in Aquatic Plant Production**

†February 18, 2014

Summary of Proposed Action:

Chlorine Materials are petitioned for use in aquatic plant production, to be added to 205.609 - *Synthetic substances allowed for use in organic aquatic plant production* as follows:

§ 205.609 Synthetic substances allowed for use in organic aquatic plant production.

(a) As disinfectants and sanitizers.

(x) Chlorine materials— Except, That, residual chlorine levels in water shall not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act

- (i) Calcium hypochlorite
- (ii) Chlorine dioxide
- (iii) Sodium hypochlorite

Chlorine materials are widely used for their disinfectant properties, and are currently approved for such uses in crop, livestock and processed organic product production. The annotations on the National List for livestock and handling limit the use of chlorine materials to disinfection and sanitation, and require that residual chlorine levels be consistent with Safe Drinking Water Act levels. The current listing for use in crops at 205.601(a) states:

(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.
- (ii) Chlorine dioxide.
- (iii) Sodium hypochlorite.

The NOP has also clarified the use of chlorine in production and handling in a guidance document, [NOP 5026](#).

The Livestock and Crops Subcommittees have received a petition for the use of Chlorine Materials in aquatic livestock and plant production. This checklist and proposal relate to the proposed use in aquatic *plant* production; a separate checklist evaluates the petitioned use in aquatic animal production. These materials are used in aquatic plant production for the disinfecting hard surfaces and culture water in nurseries, growout operations with tanks, harvest equipment, and in processing facilities. Because the petitioned uses of chlorine are identical for aquatic plants and animals, this checklist follows the same logic as the Livestock Subcommittee's proposal for chlorine in aquatic animal production. Given that the materials' use in aquaculture applications is identical to existing uses in other production categories, the Livestock committee did not requested a new Technical Evaluation Report for the petitioned use in aquatic animal production, but instead relied upon recent TR's developed for Handling and Crops uses of this group of materials. The crops committee did request a TR for chlorine as part of the 2012 sunset review of the material, and that 2011 TR has be utilized in the preparation of this checklist.

During the subcommittee discussion and vote, several members raised concerns as to whether the petition and technical review adequately address the question of whether this material is essential in aquatic plant production, or whether functional and commercially viable alternative disinfectants and sanitizers exist. The subcommittee specifically requests public comment from any knowledgeable stakeholders in this particular area.

It should also be noted that at the time of drafting this proposal there are no federal standards promulgated for aquatic plant or animal production and this proposal is based on the NOSB Recommendations of standards voted in 2007, 2008 and 2009.

Evaluation Criteria

(Applicability noted for each category; Documentation attached)

1. Impact on Humans and Environment
2. Essential & Availability Criteria
3. Compatibility & Consistency
as Organic (only for § 205.606)

Criteria Satisfied?

| | | |
|-------|-----------------------------|------------------------------|
| X Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| X Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| X Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |

Proposed Annotation (if any): see listing motion below

Basis for annotation: X To meet criteria above Other regulatory criteria Citation

Notes: This annotation is consistent with other listings of Chlorine on the NL, and ensures that any environmental impact is effectively mitigated.

Recommended Subcommittee Action & Vote, including classification recommendation (state actual motion):

Classification Motion: Chlorine Materials (Calcium hypochlorite, chlorine dioxide, sodium hypochlorite) are synthetic.

Motion by: Joe Dickson

Seconded by: Colehour Bondera

Yes: 7 No: 0 Absent: 0 Abstain: 0 Recuse: 0

Listing Motion: Motion to list chlorine materials (Calcium hypochlorite, chlorine dioxide, sodium hypochlorite) at §205.609 with the following annotation: 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.

Motion by: Joe Dickson

Seconded by: Jean Richardson

Yes: 6 No: 1 Abstain: 0 Absent: 0 Recuse: 0

Minority Opinion: see end of document

Approved by Tracy Favre, Subcommittee Chair, to Transmit to NOSB February 23, 2014

NOSB Evaluation Criteria for Substances Added To the National List: Crops

Category 1. Adverse impacts on humans or the environment? Chlorine Materials

| Question | Yes | No | N/A | Comments/Documentation (TAP; petition; regulatory agency; other) |
|--|-----|----|-----|--|
| 1. Is there a probability of environmental contamination during use or misuse? [§6518(m)(3)] | | X | | 2006 Crops TR lines 212-266. The TR identifies several areas of potential environmental impact, but notes that existing EPA regulations and the annotation restricting effluent to the levels of the Safe Drinking Water Act are sufficient to mitigate any environmental impact. The petitioner and a number of producers have confirmed that chlorine materials are not used in direct contact with the environment (e.g. ponds and net pens) and the restrictive annotation would prohibit such uses regardless. The 2011 Crops TR (lines 225-306) is consistent with the 2006 TR. |
| 2. Is there a probability of environmental contamination during, manufacture or disposal? [§6518(m)(3)] | | X | | See Question 1 |
| 3. Does the substance contain inerts classified by EPA as 'inerts of toxicological concern'? [§6517(c)(1)(B)(ii)] | | X | | No. [2006 Crops TR; 2011 Crops TR] |
| 4. Is there potential for detrimental chemical interaction with other materials used in organic farming systems? [§6518(m)(1)] | | X | | The annotation restricts use to levels no greater than those determined by the Safe Drinking Water Act, so the potential for detrimental chemical interaction is similar to that posed by municipal tap water. |
| 5. Is there a toxic or other adverse action of the material or its breakdown products? [§6518(m)(2)] | | X | | The annotation restricts use to levels no greater than those determined by the Safe Drinking Water Act, so the potential for detrimental chemical interaction is similar to that posed by municipal tap water. Any presence of the substance in the overall agroecosystem would be required by the annotation to meet the requirements of the Safe Drinking Water Act, ensuring presence below 4 ppm. |

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|--|--|---|--|--|
| 6. Is there persistence or concentration of the material or breakdown products in the environment? [§6518(m)(2)] | | X | | No. The substance degrades rapidly to naturally occurring compounds in the presence of air and sunlight [2006 Crops TR 417-432] This TR also confirms (in lines 384 –402) that these materials are not persistent in the environment in general, and that in water and soil, sodium and calcium hypochlorite separate into sodium, calcium and hypochlorite ions. Chlorine dioxide is also reactive and breaks down quickly. While the TER does not directly address its fate in aquatic environments, again, the annotation would limit the extent to which any chlorine material could be discharged into sea water or any other part of the environment. The 2011 Crops TR (lines 381-390) is consistent with the 2006 TR. |
| 7. Would the use of the substance be harmful to human health or the environment? [§6517 (c)(1)(A)(i); §6517 (c)(2)(A)(i); §6518(m)(4)] | | X | | See Q # 1 |
| 8. Are there adverse biological and chemical interactions in the agroecosystem, including biodiversity? [§6518(m)(5)] | | X | | Any presence of the substance in the overall agroecosystem would be required by the annotation to meet the requirements of the Safe Drinking Water Act, ensuring presence below 4 ppm. |
| 9. Are there detrimental physiological effects on soil organisms, crops, or livestock? [§6518(m)(5)] | | X | | The substance is not used in direct contact with soil or terrestrial livestock. It is only used in contact with hard surfaces and equipment, or culture water. [2006 Crops TR 322-327, petition] |

Category 2. Is the Substance Essential for Organic Production? Chlorine Materials

| Question | Yes | No | N/A | Comments/Documentation (TAP; petition; regulatory agency; other) |
|---|-----|----|-----|---|
| 1. Is the substance agricultural? [§6502(1)] | | X | | |
| 2. Is the substance formulated or manufactured by a chemical process? [§6502(21)] | X | | | Yes. 2006 TR Lines 149-171. 2011 TR Lines 183-211. |
| 3. Is the substance formulated or manufactured by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral sources? [§6502(21)] | | | X | This process does not involve the chemical transformation of a natural substance; the starting materials are synthetic. 2006 TR Lines 177-178. 2011 TR Lines 216-217. |

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|---|--|---|---|--|
| 4. Is the substance created by naturally occurring biological processes? [§6502(21)] | | X | | 2006 TR Lines 183-184. 2011 TR Lines 222-223. |
| 5. Is there a natural source of the substance? [§ 205.600(b)(1)] | | | X | 2006 TR Lines 183-184. 2011 TR Lines 222-223. |
| 6. Is there an organic substitute? [§205.600(b)(1)] | | | X | 2006 TR Lines 183-184. 2011 TR Lines 222-223. |
| 7. Is there a wholly natural substitute product? [§6517(c)(1)(A)(ii)] | | X | | While the 2011 TR does list a number of potential alternatives (lines 519-530), the petition (pages 7-8) describes compelling limitations of the alternatives. |
| 8. Are there any alternative substances? [§6518(m)(6)] | | X | | See #7 |
| 9. Are there other practices that would make the substance unnecessary? [§6518(m)(6)] | | X | | 2011 TR Lines 611-628. None of the alternatives are effective for cleaning irrigations systems. |

Category 3. Is the substance compatible with organic production practices? Chlorine Materials

| Question | Yes | No | N/A | Comments/Documentation (TAP; petition; regulatory agency; other) |
|--|-----|----|-----|---|
| 1. Is the substance consistent with organic farming and handling? [§6517(c)(1)(A)(iii); 6517(c)(2)(A)(ii)] | X | | | The evaluation criteria above shows that the material is essential in organic aquatic plant production and, as petitioned, does not present adverse effects on humans or the environment. |
| 2. Is the substance compatible with a system of sustainable agriculture? [§6518(m)(7)] | X | | | See #1 |
| 3. If used in livestock feed or pet food, Is the nutritional quality of the food maintained with the substance? [§205.600(b)(3)] | | | X | |
| 4. If used in livestock feed or pet food, Is the primary use as a preservative? [§205.600(b)(4)] | | | X | |
| 5. If used in livestock feed or pet food, Is the primary use to recreate or improve flavors, colors, textures, or nutritive value lost in processing (except when required by law)? [§205.600(b)(4)] | | | X | |

| | | | | |
|--|--|--|---|--|
| 6. 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 | | | X | |
| toxins derived from bacteria | | | X | |
| pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals | | | X | |
| livestock parasiticides and medicines | | | X | |
| production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleansers | | | X | |

**Minority Opinion - Chlorine Materials in Aquatic Plant Production
February 20, 2014**

A minority of the subcommittee suggested that the subcommittee adopt an annotation motion for chlorine use in aquaculture for plants that set a 5-year expiration date on the listing, with a justification explaining that the specific time frame for an expiration date allows the Board to monitor the use of the material, update its scientific and essentiality review, incentivize alternatives and continuous improvement, and vote on the continuation of use pending the receipt of a petition requesting that use be extended.

Support for the annotation motion is based on the following justification: Since the petition for chlorine use in aquaculture certified organic is being considered in the absence of regulations defining acceptable defined practices in organic aquaculture, essentiality in particular cannot be judged at this time. Therefore, the NOSB needs to reconsider the approval in five years at the least. Current consideration of the material has raised issues relating to health or environmental impacts, especially relating to chlorine manufacture; alternatives under consideration by EPA’s Design for the Environment and the Toxics Use Reduction Institute; and compatibility with organic and sustainable agriculture. The review in 5 years provides an opportunity for the Board to reevaluate and vote for the continued or modified use of the material under the same standard of review that is used to approve the material during its petition review.

In addition, the minority makes the following comments and additions to the majority checklist, which it believes does not provide a full assessment of environmental and health standards review required under the Organic Foods Production Act (OFPA): There are two separate uses covered by the petition – (1) disinfection of hard surfaces, and (2) disinfection of culture water. These two uses are distinct, and the distinction is blurred by the motion of the subcommittee.

The use for disinfecting hard surfaces is similar to the allowed use in terrestrial crop production. It is specifically mentioned as a use included as a “production aid” in OFPA. Such use results in limited effluent, and the major difference between it and the current §601 listing is that aquaculture facilities are likely to be closer to water that could be contaminated by effluent. The use for disinfecting culture water, on the other hand, involves much greater quantities of water,

potentially larger discharges, and the possibility for spills into waterbodies. It is not a “production aid” use. The Technical Review (TR) does not address hazards associated with such a use in questions #4-8. Alternatives for the water disinfection use are not discussed in questions #12-14. We cannot be sure what such a use would be in the aquaculture setting until we have aquaculture standards (for example, what is the agro-ecosystem in question?)

With regard to alternatives, there are now resources associated with “Green Chemistry” programs, such as the Toxics Use Reduction Institute at the University of Massachusetts in Lowell, and the Design for the Environment program at EPA that address chemical alternatives to chlorine as a disinfectant when such nonchemical approaches as steam are not appropriate. These need to be considered in evaluating alternatives. See, for example, the following websites: [The Presidential Green Chemistry Challenge Awards Program](#) p. 30 (p. 34 of pdf); [Overview of Design for the Environment](#), disinfectants p. 20; [Green Product Certification and Labeling: Quick Reference](#).

Further, the petitioner has indicated that all materials petitioned for use in organic production of aquatic plants would be used only in closed systems. Therefore, an annotation should be added restricting the use of chlorine to closed systems with no discharge into natural waterbodies.

With regard to checklist Category 1, Adverse Impacts on Humans and the Environment, the minority believes the following need to be considered:

- Effluent standards are set under the Clean Water Act (CWA), so there is a disconnect between allowances under the SDWA and impacts on wildlife under the CWA. The SDWA standard of 4 mg/L is 363 times as high as the aquatic life protection criterion of 11 ug/L set under the CWA.¹ Neither, however, equates to the OFPA criterion of “no harm” and the fact that aquaculture systems are closer to water that could be contaminated by effluent than terrestrial agricultural systems raises unique concerns that require close scrutiny and not reliance on other standards for terrestrial production.
- Misuse can kill plants and soil organisms and raise soil pH and kill fish and invertebrates (2011 Crops TR lines 386-390; 270-271)
- TRI data includes 5.7 million pounds of chlorine per year released by facilities making and using chlorine. (ATSDR Tox Profile p. 162)
- When mixed with organic materials (e.g., algae, dirt), hypochlorite produces trihalomethanes (THMs), which are carcinogenic. Currently, the maximum contaminant level (MCL) for total THMs is 0.080 mg/L (EPA 2009). (2011 Crops TR lines 277-280) Depending on the source of water, this could result in the presence of THMs in culture water and its concentration in algae when used to disinfect water. (Chloroform MSDS <http://datasheets.scbt.com/sc-239527.pdf>)
- Due to high reactivity, the petitioned substances do not persist in the environment. But many products are possible from reactions, and some may be persistent. This is particularly an issue for water disinfection. (2011 Crops TR lines 476-491)
- Human health effects of chlorine include burning, pain, inflammation, irritation to respiratory system, etc. (2011 Crops TR lines 496-514)
- Chlorine may harm the beneficials inherent in an aquaculture system when used to disinfect water, or when discharged. (2011 Crops TR, lines 270-271)
- Chlorine compounds are used to kill algae, an important part of the aquatic ecosystem. (2011 Crops TR, lines 62, 87)

¹ EPA Ambient Water Quality Criteria for Chlorine, http://water.epa.gov/scitech/swguidance/standards/upload/2001_10_12_criteria_ambientwqc_chlorine1984.pdf

With regard to checklist Category 2, Essentiality, the minority believes the following need to be considered:

- “[T]he following non-synthetic materials are allowed as drip irrigation cleaners and could be used on hard surfaces: acetic acid, vinegar, citric acid, and other naturally occurring acids.” (2011 Crops TR 519-520)
- The petition does not describe any limitations of alternative substances. It simply states that the alternatives are not used. The petition also does not distinguish between the disinfection of equipment and water. Some alternatives may be useful for one and some the other.
- Other alternative substances are hydrogen peroxide, electrolyzed water, alcohols, peracetic acid, copper sulfate, and soap algaecides for hard surfaces. Ozone for water disinfection (2011 Crops TR 535-606) See EPA Green Chemistry award for alternatives.²
- For other practices, see Toxics Use Reduction Institute CleanerSolutions Database.³

Under Category 3, Compatibility, the minority points out the following:

- Chlorine does not enhance water life and properties; is not from renewable resources; and has negative impacts on biodiversity. (2011 Crops TR 270-271, 278-279, 349-352).
- Natural alternatives exist. (2011 Crops TR 270-271, 278-279, 349-352, 519-530)
- The use for culture water disinfection is not included in any of the OFPA categories of §6517(c)(1)(B)(i).

² The Presidential Green Chemistry Challenge Awards Program Summary of 2005 Award Entries and Recipients, p. 30. http://www.epa.gov/greenchemistry/pubs/docs/award_entries_and_recipients2005.pdf Almost all traditional, widely used disinfecting and sanitizing products contain ingredients that are toxic or potentially toxic, are environmentally hazardous, or have a high potential for accidents. For example, oxidizing chemicals, such as hypochlorite, peracetic acid, hydrogen peroxide, ozone, and chlorine dioxide, kill microorganisms by indiscriminate oxidation of organic matter, potentially destroying antioxidants, nutrients, and vitamins while forming unknown or toxic byproducts, including cancer-causing free radicals. The non-oxidizing microbicidal quaternary ammonium compounds (QACs; other traditional disinfectants) inhibit butyl cholinesterase in blood plasma, liver, pancreas, and the white matter and are unsafe for use on fruits and vegetables because they leave large residues.

Microcide uses ingredients listed by the FDA and EPA in volumes 21 and 40 of the Code of Federal Regulations (CFR) as biodegradable, generally recognized as safe (GRAS), food additives, safe, and/or nonpolluting. With these ingredients, Microcide develops broad-spectrum microbicidal products as alternatives to toxic and oxidizing chemicals for the food processing, personal care, and health industries. Their products use surface-active agents at low pH. Raising the pH diminishes the microbicidal properties, allowing safe environmental disposal and biodegradation of the products after use. These products selectively kill microorganisms on food-contact surfaces, on fresh fruits and vegetables, and on body parts (including mucosal and skin surfaces) without covalent chemical reactions. The technology presents alternative products safe for manufacturing, transportation, and use without accident potential. Two of Microcide’s products, PRO-SAN and PRO-SAN L, are EPA-registered pesticides.

³ http://www.turi.org/Our_Work/Cleaning_Laboratory/Does_It_Clean/CleanerSolutions_Database