National Organic Standards Board
Livestock Subcommittee
Petitioned Material Discussion Document
Chlorine Materials
Fall 2025

Summary of Petition

In September 2024, the National Organic Program received a petition from the Organic Materials Review Institute (OMRI) requesting an amendment to the annotation for Chlorine materials at § 205.603(a)(10) to clarify whether they are allowed for direct treatment of livestock drinking water. The petitioner stated that some entities in the organic industry have established policies that are based on the belief that the National List at § 205.603(a)(10) allows for direct livestock drinking water treatments as long as the final drinking water meets Safe Drinking Water Act (SDWA) standards. Other entities in the industry interpret the § 205.603(a)(10) annotation as one that limits the use of chlorine materials to disinfection of facilities and equipment.

The historical background of Chlorine materials is that they appeared on the original National List and have been renewed every five years except in 2005 and 2010 when sunset votes were deferred to afford the NOSB additional time to receive additional technical assistance on these materials. The petition noted that four synthetic "chlorine materials" are listed on the National List at § 205.603(a)(10); these are (a) Calcium hypochlorite, (b) Chlorine dioxide, (c) Hypochlorous acid, and (d) Sodium hypochlorite. The petition seeks clarification on whether § 205.603(a)(10) allows for direct livestock drinking water treatments with chlorine materials.

Intended or Current Use of Chlorine Materials

There is no disagreement about the fact that the § 205.603(a)(10) annotation states that chlorine materials are allowed in organic livestock production for disinfecting and sanitizing facilities and equipment. The focus of disagreement is the specification that "residual chlorine levels in the water shall not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act." This is the specification in the annotation that is the source of the two divergent interpretations. The petition cited NOP Guidance 5026 which further clarifies that, "Residual chlorine levels in the water in direct food or animal contact (for example, drinking water) should not exceed the maximum residual disinfection level." According to the petitioning organization, it is unclear if this reference to "drinking water" is an attempt to add, clarify or limit the use of chlorine as a livestock drinking water treatment.

The petitioning organization cited the following NOP guidance documents and/or notices to support its request for an annotation to clarify whether chlorine materials can be used in direct treatment of livestock drinking water. It cited *NOP Guidance 5026: The Use of Chlorine Materials in Organic Production and Handling (*2011, updated 2024) and *NOP Notice 11-7: Issuance of Final Guidance and Response to Comments* (2011, updated 2024). Both documents are published in the NOP's Program Handbook.

NOP 5023 defines facility as "A structure or site where production, handling, processing, packaging, or storage of organic products occurs. A facility could include packing lines, wash lines, storage units, coolers, freezing plants, feed mills, milk houses, production structures such as housing for livestock, greenhouses, and mushroom buildings. It, however, remains unclear whether this definition should be used when considering the 205.603(a)(10) use restriction under current discussion. It is important to note that NOP 5023 was published long after the term "facility" was included in annotation language for the 205.603(a)(10) "Chlorine materials" entry.

NOP Notice 11-7 introduces the term "direct use" which is a different from the terms "equipment" and "facility" which are used in the 205.603(a)(10) "Chlorine materials" annotation. In *NOP Notice 11-7,* drinking water treatment is identified as a "direct use" and dairy pipelines would be a "facility use." The notice, however, does not go further to clarify whether drinking water treatment is an "equipment" use or a "facility" use or both.

Regulatory Authority

The regulatory authority over chlorine is not limited to a single government agency. The U.S. Food and Drug Administration (FDA) exercises a substantial amount of regulatory authority over chlorine use in livestock production. The U.S. Environmental Protection Agency (EPA) also exercises regulatory authority over chlorine materials. The Pasteurized Milk Ordinance (PMO) is also an important authority on the use of chlorine materials in livestock production even though it is not a "regulatory authority." Both the FDA and U.S. Department of Health and Human Services endorse the PMO as the minimum standard which many local and state regulators use when establishing standards for dairy producers. The PMO includes requirements for chlorine use in dairies; it gives instructions for direct water sanitization measures such as "well shocking."

Environmental and Health Impacts of Chlorine Materials

According to the petition, when chlorine dioxide is used as a disinfecting agent, it breaks down primarily into chlorite. Chlorite in water may move into groundwater but reactions with soil and sediments may reduce the amount of chlorite reaching groundwater. The toxic action of chlorite is primarily in the form of oxidative damage to red blood cells at doses as low as 10mg/kg of body weight. Toxic reaction products are not known to occur when chlorite is mixed with organic materials. The Environmental Protection Agency (EPA) has set the maximum contaminant level (MCL) of 0.8mg/L for chlorine dioxide in drinking water and 1mg/L for chlorite (EPA, 2002). It is important to note that chlorine dioxide contamination in water is difficult to identify because it is intentionally added to drinking water as a disinfectant in some municipal water treatment systems. In compliance/furtherance of the Information Collection Rule (ICR), levels of chlorite ion were sampled from drinking water distribution systems of publicly owned treatment works (POTW) facilities that utilized chlorine dioxide in the United States. The resulting data revealed that approximately 16 percent of these facilities had levels of chlorite ion over the MCL of 1 mg/L (ATSDR, 2004b)."

According to the petitioning organization, even though it is known that elevated levels of water chlorination may be applicable and even necessary in organic livestock situations, research

acknowledges that excess chlorine may have different impacts depending on the class of animals. While elevated levels of chlorine in water may affect the efficiency of the rumen microbial population and thereby impair rumen function in ruminant livestock, a net positive effect is likely for monogastric livestock. This is partly because of a less susceptible form of digestion in non-ruminants and the fact that they are more affected by pathogens in drinking water. A risk-benefit analysis would suggest that more aggressive water disinfection may be beneficial to non-ruminant livestock in situations where risk of bacterial contamination is high. The petitioning organization stated the need for more research to determine appropriate levels of chlorine for different types of livestock.

The petitioning organization cited a few publications including an extension publication that stated that a 3-ppm concentration of chlorine in water is safe for cattle to drink and helps control algal and bacterial growth in the water. The publication went on to state that use of bleach at a greater concentration could risk creating high chlorine contamination levels and deter cattle from drinking.

Disinfection of water for livestock is highly recommended if microbial contamination is a concern. One of the publications included an unpublished observation that poultry has an elevated level of tolerance for sodium hypochlorite which is described as the most common product used for water sanitation. The observer stated that even considerable overdosing can be well tolerated by poultry over a short period, with minimal or no effects on production. Even though accidental application of 50 ppm (i.e.,10-fold recommended dose) was reported to result in just a slight transient decline in water consumption, the authors proscribed long term exposure to elevated levels of sodium hypochlorite in water.

One of the publications included in the petition stated that several compounds, known as Disinfection By-Products (DBPs), are formed through the interaction of chlorine molecules with naturally occurring residual organic compounds. These organic compounds include humic and fulvic acids that are very commonly found in most water sources. The authors also highlighted the fact that residual organic matter is present in many livestock water sources, especially in surface waters. They also noted that DBPs generated from chlorination of organic compounds may be a source of contaminants that pose risks to both human and animal health. The researchers stated that although direct adverse effects associated with sodium hypochlorite disinfectants are very unlikely, application of these products in water containing organic matter may lead to synthesis of DBPs which can be toxic. The authors called for the treatment of potential adverse effects associated with DBPs as a water quality issue. Filtration and coagulation are two methods used to remove organic materials from water prior to chlorination.

The petition included a publication that cited information from Health Canada (1995) and WHO (1996) who recognized the health hazard associated with DBP in humans and contrasted that with the lack of adequate corrective measures when it comes to water quality for livestock. The researchers listed three main classes of DBPs in drinking water that pose potential risks to livestock: (1) chlorophenols, (2) trihalomethanes (THMs), and (3) haloacetic acids (HAAs). Chlorophenols occur in drinking water because of the chlorination of phenols. Several phenolic DBPs produced during chlorination have been shown to cause lymphomas, leukemia, and hepatic tumors in rats. THMs have been closely linked to an increased

incidence of bladder cancer and possible increases in rectal and colon cancer in humans (Mills et al., 1999).

It is important to note that cancer is infrequent, and carcinogens are usually not an issue for livestock due to their short productive life. According to the authors of one of the publications included in the petition, the carcinogenic characteristics of DBP could potentially present a health hazard in livestock used for breeding and milk production which have longer life spans relative to animals used for meat. It, however, deemed the practical aspect of such problems to be negligible. The authors, however, noted chronic adverse effects of DBPs on reproductive parameters. It cited the findings of Linder et al. (1997) that dichloroacetic acid causes alterations in spermiation, sperm morphology, and sperm motility. It also reported the research of Veeramachaneni (2000) who reported that DBPs can be associated with deteriorating trends observed in male reproduction.

Performance of Alternative Water Disinfectants

Hydrogen peroxide is another common disinfectant used for drinking water treatment. It appears on the National List with no annotation and is an oxidizer like chlorine. According to the petitioning organization, unlike other chemical substances, hydrogen peroxide does not produce residues or gases. High concentrations of this chemical are however required for disinfection. Additionally, hydrogen peroxide reacts with numerous substances and slowly decomposes into water and oxygen.

Iodine also appears on the National List with no annotation. Like chlorine, it kills most disease-causing organisms and requires short to moderate contact times. It is, however, not very effective against biofilms. Harmful effects of excess ingestion and the physiologically active nature of Iodine make them unsuitable for long-term continuous disinfection.

Ultraviolet (UV) radiation effectively destroys bacteria and viruses but lack residual activity against microorganisms. A secondary disinfectant is therefore needed to prevent the regrowth of these organisms. The petitioning organization also stated that UV radiation can be attractive as a primary disinfectant for small systems because (a) it is readily available (b) produces no known toxic residuals (c) requires short contact times and (e) the application equipment is easy to operate and maintain.

Summary of Review

The LS discussed relevant regulations and regulatory agencies, the current and intended use, as well as the health and environmental impacts of the use of chlorine in livestock drinking water. The subcommittee is seeking additional information on factors affecting the formation of disinfectant by-products in livestock drinking water and any additional input on the correct interpretation of the §205.603(a)(10) annotation.

Subcommittee Next Steps

The CS subcommittee continues its deliberations on chlorine materials through the presentation of this discussion document at the Fall 2025 meeting. A subsequent proposal will factor in public comments received as well as relevant information contained in a recent request for a limited scope Technical

Report on chlorine materials. Information requested in the TR includes differences in chemical activity of chlorite, chlorate, chlorine dioxide, and chloride compounds.

Questions for Stakeholders

The LS has the following specific questions for stakeholders and, as always, welcomes any additional perspectives, solutions, and information related to chlorine materials used in livestock drinking water.

1. Are there any health and environmental concerns pertaining to the use of chlorine materials in livestock drinking water that the LS needs to consider?
2. What is the environmental fate of the breakdown products when livestock metabolize chlorine materials in drinking water?
3. Is there information on the effect of Chlorine concentration and other factors on the formation of toxic disinfection by-products such as Trihalomethanes (THMs)?
4. Is it standard operation procedure to employ filtration and/or coagulation methods to remove organic material from (surface) water prior to chlorination and use as livestock drinking water?
5. If chlorine is not allowed to be used for direct treatment of livestock drinking water, will it result in adverse impacts on dairy farms?
6. How do certifiers and livestock producers interpret the § 205.603(a)(10) annotation and *NOP Guidance 5026?*

Subcommittee Vote

Motion to accept the discussion document.
Motion by: Franklin Quarcoo
Seconded by: Brian Caldwell
Yes: 5 No:0 Abstain:0 Recuse:0 Absent: 2