Sunset 2028
Meeting 1 - Request for Public Comment
Livestock Substances § 205.603 & § 205.604
Spring 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
While the NOSB will not complete its review and any recommendations on these substances until the Fall 2024 public meeting, the NOP requests that the public provide comments about these substances to the NOSB as part of the Spring 2025 public meeting. 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 overdosage 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 2021 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.

Questions to our Stakeholders

1. Are any ancillary ingredients used in veterinary activated charcoal products?
2. Is activated charcoal used in organic animal feed mixes?

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
This substance 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. One certifier commented that the listing is redundant, another 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, 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?

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 Spring 2026 meeting regarding these previous comments.

Questions to our Stakeholders
1. Is this listing redundant with electrolytes and nutritive supplements?

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 (Na_2CO_3). Chlorine dioxide is formed by reacting sodium chlorate ($NaClO_3$) and sulfuric acid (H_2SO_4) 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 [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 hydrochlorite 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 969-698]. 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. The LS at the time 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, (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].

Questions to our Stakeholders

1. Additional information and perspectives are needed from various stakeholders on the stated health and environmental impact of chlorine materials.
2. Are there specific procedural or processing steps that reduce the health and environmental risks associated with the use of chlorine materials in livestock production?

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

Under §6509 of OFPA "Animal production practices and materials", Section (d) "Health care" states:

(1) Prohibited practices

For a farm to be certified under this chapter as an organic farm with respect to the livestock produced by such farm, producers on such farm shall not—

(A) use subtherapeutic doses of antibiotics;

(B) use synthetic internal parasiticides on a routine basis; or

(C) administer medication, other than vaccinations, in the absence of illness.

To the degree to which kaolin pectin is used to address actual livestock illnesses in the context of organic livestock production, its allowance is consistent with OFPA Section 6509.

Public comment during the 2021 review overwhelmingly supported the relisting of kaolin pectin; it is a vital tool used for gastrointestinal disorders in livestock production. Kaolin pectin does not seem to be overused, but rather being used on an as-needed basis. The TAP on kaolin pectin is from 2002, and the Livestock Subcommittee requested a new TR in 2021.

Questions to our Stakeholders

None

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-boar 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
During the 2015 sunset review of mineral oil listed at § 205.603(b)(6), producers noted that untreated omasal impaction can lead to invasive surgery. Because mineral oil products are considered unapproved animal drugs by FDA, they must carry the disclaimer that they are not proven safe or effective.

Good management—adequate water, balanced nutrition, and proper roughage—can reduce the risk of impaction, though it may still occur even under strong management, especially in wintering pregnant cattle or when low-quality forage is fed.

In 2021, public commenters and NOSB members were uniformly supportive of relisting. Mineral oil is used infrequently but is considered essential. Commenters emphasized that no natural oil works as an effective substitute. Without access to mineral oil, serious animal welfare impacts could occur. A veterinarian testified that mineral oil is "indispensable". Commenters also noted confusion among certifiers about how mineral oil may be administered, though all agreed on its therapeutic necessity. Mineral oil is permitted under several international organic standards.

Questions to our Stakeholders
None

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 homoeopathic 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. 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.

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?

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.

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?

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., Na_2O_2 or an alkaline solution of hydrogen peroxide, H_2O_2) 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.

Questions to our Stakeholders
Is lactic acid in use as a teat dip by livestock producers.

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.

Questions for stakeholders

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