

**National Organic Standards Board**  
**Crops Subcommittee**  
**Petitioned Material Proposal**  
**Potassium Hypochlorite**  
**July 16, 2019**

**Summary of Petition**

[<https://www.ams.usda.gov/sites/default/files/media/PotassiumHypochloriteRevisedPetition03262019.pdf>]:

The petitioner is requesting potassium hypochlorite solution be included on the National List as follows: § 205.601 Synthetic substances allowed for use in organic crop production: (2) Chlorine materials - For pre-harvest use, residual chlorine levels in the water in direct crop contact or as water from cleaning irrigation systems applied to soil must not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act, except that chlorine products may be used in edible sprout production according to EPA label directions.

Potassium hypochlorite is produced by the reaction of [chlorine](#) with a solution of [potassium hydroxide](#):



Potassium hypochlorite (KOCl) is registered by EPA and is FDA approved. This material is approved for use in many agricultural applications. This product can address needs for irrigation equipment maintenance and to meet Food Safety Modernization Act (FSMA) requirements to provide sanitation to pre-harvest water for irrigation. The material can also incidentally provide a source of potassium for plants.

As described in the petition, potassium hypochlorite shares similar chemistry and uses as sodium hypochlorite (bleach), except for the replacement of sodium for potassium, potentially reducing issues with salinization of soils. At the request of the petitioner, the FDA reviewed this product in comparison to NaOCl. FDA found the substitution of potassium ions for sodium, in such applications as NaOCl solutions, would not raise new safety concerns. They also stated that a Food Contact Notification (FCN) would not be required to use KOCl in the same manner that NaOCl is permitted. KOCl is exempt from requirements for a food tolerance (<https://www.federalregister.gov/documents/2011/03/02/2011-4534/potassium-hypochlorite-exemption-from-the-requirement-of-a-tolerance>)

Like bleach and other chlorine sanitizing compounds currently on the National List, KOCl is a strong oxidant and can pose serious risks to human health if acute high exposure occurs or from chronic lower level exposures. It is a dermal, respiratory, ocular, and mucous membrane irritant. Bleach is a known asthmagen, and, given the similar chemistries and mechanism of action, KOCl is also likely to cause or exacerbate asthma. KOCl is toxic to fish and other aquatic organisms. Like bleach and other chlorine compounds, strict adherence to the label is required. Use of chlorine compounds in organic crop production, including calcium hypochlorite, sodium hypochlorite, and chlorine dioxide, were reviewed in a 2011 Technical Report (TR) (<https://www.ams.usda.gov/sites/default/files/media/Chlorine%20%20TR%202011.pdf>). Information in this TR is transferable to the KOCl.

Given the nearly identical chemistry and human and environmental risks to sodium and calcium hypochlorite, currently listed under (§ 205.601(2)), and the potential benefit of avoiding application of

sodium to soils, the Crops Subcommittee recommends listing of KOCl for the treatment of irrigation water not to exceed the maximum residual disinfectant limit under the Safe Drinking Water Act.

### Summary of Review:

#### Category 1: Classification

1. For CROP use: Is the substance \_\_\_\_\_ **Non-synthetic** or \_\_\_**X**\_\_\_ **Synthetic**?  
Is the substance formulated or manufactured by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral sources? [OFPA § 6502(21)] If so, describe, using NOP 5033-1 as a guide.
2. Reference to appropriate OFPA category:  
Is the substance used in production, and does it contain an active synthetic ingredient in the following categories: [§ 6517(c)(1)(B)(i)]; copper and sulfur compounds; toxins derived from bacteria; pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals; livestock parasiticides and medicines and production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleansers; or (ii) is used in production and contains synthetic inert ingredients that are not classified by the Administrator of the Environmental Protection Agency as inerts of toxicological concern?

No.

#### Category 2: Adverse Impacts

1. What is the potential for the substance to have detrimental chemical interactions with other materials used in organic farming systems? [§ 6518(m)(1)]

When used in irrigation water and compliant with maximum residual disinfectant limit under the Safe Drinking Water Act [4 ppm free chlorine], the substance is unlikely to have detrimental chemical interactions with other materials used in organic farming systems.

2. What is the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment? [§ 6518(m)(2)]

Like bleach and other chlorine sanitizing compounds currently on the National List, KOCl is a strong oxidant and can pose serious risks to human health if acute high exposure occurs or from chronic lower level exposures. It is a dermal, respiratory, ocular, and mucous membrane irritant. Bleach is a known asthmagen, and, given the similar chemistries and mechanism of action, KOCl is also likely to cause or exacerbate asthma. KOCl is toxic to fish and other aquatic organisms. Like bleach and other chlorine compounds, strict adherence to the label is required.

According to the petition, "...hypochlorite salts break down rapidly in to non-toxic compounds when exposed to sunlight. In seawater, chlorine levels decline rapidly: however, hypobromite (which is acutely toxic to aquatic organisms) is formed. Due to the presence of 65 ppm of bromide ion in seawater, hypochlorite salts form hypobromite salts. Hypobromite salts are very unstable to photolysis and rapidly break down back to bromide ion under the influence of ultra violet light [sunlight].

3. Describe the probability of environmental contamination during manufacture, use, misuse or disposal of such substance? [§ 6518(m)(3)]

If the material is used according to label requirements, the probability of adverse environmental contamination is low. The petitioned use is in irrigation water, so the material will be directly released to the environment. The levels, generally 1-2 ppm and not to exceed 4 ppm, are consistent with drinking water standards and unlikely to pose a threat to human health or the environment. KOCl is not persistent. The major environmental risks are due to accidental releases of concentrated precursor material during manufacture (Cl<sub>2</sub>) or transport of finished product before dilution for irrigation purposes.

4. Discuss the effect of the substance on human health. [§ 6517(c)(1)(A)(i); § 6517(c)(2)(A)(i); § 6518(m)(4)].

Like bleach and other chlorine sanitizing compounds currently on the National List, KOCl is a strong oxidant and can pose serious risks to human health if acute high exposure occurs or from chronic lower level exposures. It is a dermal, respiratory, ocular, and mucous membrane irritant. Bleach is a known asthmagen, and, given the similar chemistries and mechanism of action, KOCl is also likely to cause or exacerbate asthma. The threshold or duration of exposures that might result in long-term respiratory problems is unknown. Short low level term exposures may result in transitory respiratory and eye irritation. Like bleach and other chlorine compounds, strict adherence to the label is required and care must be taken to protect workers diluting material for irrigation use.

5. Discuss any effects the substance may have on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock. [§ 6518(m)(5)]

The application rate of 1-2 ppm, not to exceed free chlorine of 4 ppm, is consistent with drinking water standards for human. Use at this level in irrigation water is unlikely to have adverse biological and chemical interactions in the agroecosystem. Because KOCl substitutes potassium for sodium, it will not increase soil salinization.

6. Are there any adverse impacts on biodiversity? (§ 205.200)

Unlikely.

### **Category 3: Alternatives/Compatibility**

1. Are there alternatives to using the substance? Evaluate alternative practices as well as non-synthetic and synthetic available materials. [§ 6518(m)(6)]

Sodium and calcium hypochlorite can be used for the same purposes as the petitioned material. KOCl has the distinct benefit over NaOCl because it does not contain sodium and potassium and is a plant nutrient.

2. In balancing the responses to the criteria above, is the substance compatible with a system of sustainable agriculture? [§ 6518(m)(7)]

Overall, yes. Like other chlorine compounds, KOCl poses human health and environmental concerns, reviewed in part in the chlorine materials 2011 TR. However, FSMA requires that irrigation water used during certain growing activities have an acceptable microbial water quality profile (MWQP) and KOCL can meet this need and can also reduce fouling of irrigation equipment. These purposes are consistent with allowed uses of other chlorine materials. KOCl provides another tool to meet these requirements, and avoids application of sodium to soils.

**Classification Motion:**

Motion to classify potassium hypochlorite as synthetic

Motion by: Steve Ela

Seconded by: Dan Seitz

Yes: 7 No: 0 Abstain: 0 Absent: 1 Recuse: 0

**National List Motion:**

Motion to add potassium hypochlorite at § 205.601(2): Chlorine materials - For use in water for irrigation purposes, residual chlorine levels in the water in direct crop contact or as water from cleaning irrigation systems applied to soil must not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act.

Motion by: Steve Ela

Seconded by: Rick Greenwood

Yes: 7 No: 0 Abstain: 0 Absent: 1 Recuse: 0