Formal Recommendation
From: National Organic Standards Board (NOSB)
To: the National Organic Program (NOP)

Date: November 18, 2016

Subject: Petitioned Material - Acid Activated Bentonite

NOSB Chair: Tracy Favre

The NOSB hereby recommends to the NOP the following:

Rulemaking Action:

Guidance Statement:

Other: X

Statement of the Recommendation:
The NOSB voted to classify acid activated bentonite as synthetic. The NOSB vote to add acid activated bentonite as petitioned to §205.603 failed based on the availability of alternatives.

Rationale Supporting Recommendation (including consistency with OFPA and Organic Regulations):
Although acid activated bentonite was found to be compatible with a system of sustainable agriculture, the Board determined that there are alternatives currently in use, including management practices such as proper air exchange in barns, removing caked areas and keeping litter areas dry. Therefore the NOSB does not support listing a synthetic poultry litter amendment.

NOSB Vote:

Classification Motion:
Motion to classify acid activated bentonite, as petitioned, as synthetic
Motion by: Ashley Swaffar
Seconded by: Tracy Favre
Yes: 14 No: 0 Abstain: 0 Absent: 1 Recuse: 0

Motion Passed

Listing Motion:
Motion to add acid activated bentonite as petitioned at §205.603
Motion by: Ashley Swaffar
Seconded by: Tracy Favre
Yes: 0 No: 14 Abstain: 0 Absent: 1 Recuse: 0

Motion Failed

National Organic Standards Board
Livestock Subcommittee
Petitioned Material Proposal
Acid Activated Bentonite
June 21, 2016

Summary of Petition:
In April 2015 the NOP received a petition to add acid-activated bentonite to the National List of synthetic substances allowed for use in organic livestock production 7 CFR 205.603 as a poultry litter treatment.

Summary of Review:
Manufacture and Uses of the Substance:
The primary use of acid-activated bentonite is to reduce the level of ammonia generated by certain urease producing bacteria commonly found in poultry litter. Additionally, it has been found to reduce populations of darkling beetles and pathogens in poultry litter, but no claims for these properties are being made in the present petition. In its finished form the acid-activated bentonite described here is composed of odorless, virtually dustless, free flowing granular particles which are spread over poultry litter by means of manually operated or tractor propelled broadcast spreaders.

The finished product of the present petition (acid-activated bentonite, CAS# 98561-46-7) is prepared by treating naturally occurring bentonite clay with sulfuric acid. The product is manufactured by spraying 46 weight percent concentrated sulfuric acid (CAS# 7664-93-9) onto a pre-weighed bed of bentonite clay granules (CAS# 1302-78-9) as they are tumbled in a Munsen mixer. After a short period of mixing, the acid-activated granules are transferred to a bagging line where 50 lb. aliquots are loaded into high melt-temperature plastic bags and heat sealed. The petitioner notes that small amounts of crystalline quartz (CAS# 14808-60-7) occur naturally in the bentonite clay used to make the finished product.

The rate of addition to a poultry house is typically about 100 lbs/1000 ft2 of litter surface area, but can range up to 200 lbs/1000 ft2 depending on age and depth of litter. The product is added to the poultry litter only once at the beginning of each new grow out cycle. Application is typically done three days prior to bird placement in the house, but can be done up to the day of placement. The product can also be applied to bare ground after old litter is removed and before new litter is added at a rate of 100 lbs/1000 ft2. New litter would then be added directly on top of the acid-activated bentonite. The TR also states (Lines 107-113), "The petitioner also describes reapplication methods in cases where ammonia levels exceed 25 ppm. The reapplication is intended to occur while birds are present at an application rate of 100 lbs/1,000 ft2, as indicated by the petitioner. Use instructions for Poultry Guard® do not address the need for reapplication, but do state that the product will be effective to reduce ammonia for several weeks. Broilers are grown out to 6 or more weeks, while other poultry such as laying hens and turkeys have longer grow out periods. If litter treatment loses effectiveness while birds are still in the poultry house, it is likely that reapplication or other ammonia mitigation measures may need to occur."

Discussion:
The intended use of the petitioned substance is to reduce ammonia levels in poultry houses, which effectively improves the air quality and thus the living conditions of poultry. With reduced ammonia concentration in poultry houses, birds are at lower risk of respiratory damage, infectious disease, and other negative effects of ammonia, including mortality (Shah, Westerman, and Parsons 2006). One study associated the use of acid-activated bentonite as a poultry litter treatment with reduced instances of breast blisters, foot-pat dermatitis, and air-sac lesions in poultry (McWard and Taylor 2000). Use of acid-activated bentonite litter treatments is also associated with reductions in salmonella levels in litter (Watkins, Southerland and Hunt 2002) and darkling beetles (McWard and Taylor 2000).

According to the TR, since acid-activated bentonite is a highly acidic substance and handlers of the substance are required to prevent direct contact, it is reasonable to expect that direct contact of the substance with poultry, either on their feet or through incidental ingestion, would also pose health risks. The potential for direct contact depends on the structure of the poultry house. In some houses, the birds are placed on raised slatted flooring on top of the litter, in which case the birds would not have direct contact with the litter or litter treatments. Houses without raised flooring would allow birds to peck and scratch through the litter, posing a higher risk of direct contact with the litter treatment. Data is not available in the literature to quantify the amount of litter containing acid-activated bentonite that may be ingested by birds. It is unlikely that significant amounts would be ingested unless there was a shortage of suitable feed. (Lines 383-391.)

Because the petitioned substance is applied to poultry litter, the subsequent use of the spent poultry litter must be considered in assessing the total impact of the petitioned substance on the agro-ecosystem. Spent poultry litter is typically intended for application to agricultural land for the purpose of improving soil fertility and organic matter content. Environmental concerns that arise from the land application of poultry manure include nitrogen leaching, phosphorus contamination of surface waters, and heavy metal buildup in soils (Bolan, et al. 2010). Ammonium sulfate is produced as a result of the reaction between gaseous ammonia in the poultry house and the sulfate ions of the sulfuric acid-activated bentonite. Ammonium sulfate is a common water-soluble inorganic fertilizer used in conventional crop production. Ammonium sulfate has little to no surface volatilization loss when applied to most soils and is effective as a starter nitrogen source. Compared to other forms of soil nitrogen, the ammonium ion is less subject to leaching from clay since its positive charge keeps it held by the clay's negatively charged sites (Vitosh, Johnson and Mengel 1995). However, increased loss of nitrogen through leaching has been associated with greater application rates of ammonium sulfate fertilizer (Olson 1979). Another study reported that while nitrogen derived from ammonium sulfate is more readily taken up by plants than nitrogen from leguminous nitrogen–fixing plants, it is also lost from the soil more readily in the first year after application (Harris, et al. 1993).

During the Spring 2016 in-person public comment session at the National Organic Standards Board meeting in Washington, DC, the Board received one public comment that stated that there are OMRI listed poultry litter amendments currently in use. The Board was provided information from a manufacturer of a poultry litter amendment product, which is currently OMRI listed, that expressed concerns they had with the TR. The commenter felt that the board should not approve synthetic poultry litter amendments when there are already effective OMRI listed products being used in the marketplace.

Category 1: Classification

1. **Substance is used for:** Livestock

2. **For LIVESTOCK use:**
   a. Is the substance Agricultural or non-agricultural? This substance is non-agricultural

   b. If the substance is non-agricultural, is the substance: non-synthetic or synthetic. This substance is synthetic

      The finished product of the present petition (acid-activated bentonite, (CAS# 98561-46-7) is prepared by treating naturally occurring bentonite clay with sulfuric acid. The product is manufactured by spraying 46 weight percent concentrated sulfuric acid (CAS # 7664-93-9) onto a pre-weighed bed of bentonite clay granules (CAS# 1302-78-9) as they are tumbled in a Munsen mixer. After a short period of mixing, the acid-activated granules are transferred to a bagging line where 50 lb. aliquots are loaded into high melt-temperature plastic bags and heat sealed. The petitioner notes that small amounts of crystalline quartz (CAS# 14808-60-7) occur naturally in the bentonite clay used to make the finished product.

3. **For LIVESTOCK:** This product would be listed at 205.603 Livestock Production-Synthetic. The substance contains sulfur compounds (sulfuric acid). The substance is not an inert ingredient.

Category 2: Adverse Impacts

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

   The literature does not indicate that the petitioned substance would have chemical interactions with other substances used in organic livestock production, other than the mode of action of the petitioned substance with poultry litter.

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)]**

   According to the TR, the by-products of acid-activated bentonite used as a poultry litter treatment are ammonium sulfate ((NH4)2SO4) and spent clay. Ammonium sulfate is produced as a result of the reaction between gaseous ammonia in the poultry house and the sulfate ions of the sulfuric acid-activated bentonite.

   Ammonium sulfate is a common water-soluble inorganic fertilizer used in conventional crop production. Ammonium sulfate has little to no surface volatilization loss when applied to most soils and is effective as a starter nitrogen source. Compared to other forms of soil nitrogen, the ammonium ion is less subject to leaching from clay since its positive charge keeps it held by the clay's negatively charged sites (Vitosh, Johnson and Mengel 1995). However, increased loss of nitrogen through leaching has been associated with greater application rates of ammonium

sulfate fertilizer (Olson 1979). Another study reported that while nitrogen derived from ammonium sulfate is more readily taken up by plants than nitrogen from leguminous nitrogen–fixing plants, it is also lost from the soil more readily in the first year after application (Harris, et al. 1993). (TR Lines 299-312)

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

TR Lines 339-360

Manufacturing – Bentonite, the starting material, is sourced by quarry mining. Mining usually has negative environmental impacts that can include release of heavy metals to soil and water, and generation of the air pollutants sulfur and nitrogen dioxide, residual waste tailings, slag and acid drainage. The manufacturing of the acid treatment sulfuric acid generates sulfuric acid emissions into the air which, if not otherwise neutralized, result in dilute acid solutions that may contribute to acid rain. The activation of bentonite with sulfuric acid as described in the petition does not appear to add additional negative environmental impacts beyond the manufacturing of its ingredients.

Use and Handling – The U.S. Department of Transportation regulates the shipping of acid-activated bentonite as a "corrosive material" (Hazard Class 8) due to the sulfuric acid content. This class of materials is defined at 49 CFR 173.136 as a liquid or solid that causes full thickness destruction of human skin at the site of contact within a specified period of time. Care must be taken to ensure that incompatible corrosive materials are not mixed. The Material Safety Data Sheet for the petitioned acid-activated bentonite indicates that it does not emit any volatile organic compounds. Applying water directly to the material must be avoided; aqueous runoff is acidic and corrosive.

Misuse – Since the substance is a granular solid material, spills are relatively manageable to contain and clean up. The Material Safety Data Sheet for the petitioned acid-activated bentonite indicates that spills greater than 2,000 lbs must be reported to the National Resources Center.

Disposal – Use instructions for Poultry Guard® state that the product can be neutralized with household ammonia or baking soda.

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

Handlers of acid-activated bentonite must take care to protect themselves from direct contact with the substance. Direct exposure to the substance may cause skin irritation or burns. The petitioned product contains crystalline silica which is naturally occurring in the bentonite starting material, a small fraction (0.00064% by weight) of which is in the respirable range. Inhalation of excessive concentrations of the substance may lead to lung injury. Applicators should wear protective clothing, impervious gloves, goggles, and a dust mask.

Use of the substance as petitioned is not likely to have negative effects on human health because the substance decreases ammonia concentration in the atmosphere of poultry houses, which has a positive impact on both the health of the birds and the health of the handlers.

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)]

According to the TR (Lines 376-403): The intended use of the petitioned substance is to reduce ammonia volatilization in poultry houses, which effectively improves the air quality and thus the living conditions of poultry. With reduced ammonia concentration in poultry houses, birds are at lower risk of respiratory damage, infectious disease, and other negative effects of ammonia, including mortality (Shah, Westerman and Parsons 2006). One study associated the use of acid-activated bentonite as a poultry litter treatment with reduced instances of breast blisters, foot-pat dermatitis, and air-sac lesions in poultry (McWard and Taylor 2000).

Since acid-activated bentonite is a highly acidic substance and handlers of the substance are required to prevent direct contact, it is reasonable to expect that direct contact of the substance with poultry, either on their feet or through incidental ingestion, would also pose health risks. The potential for direct contact depends on the structure of the poultry house. In some houses, the birds are placed on raised slatted flooring overtop of the litter, in which case the birds would not have direct contact with the litter or litter treatments. Houses without raised flooring would allow birds to peck and scratch through the litter, posing a higher risk of direct contact with the litter treatment. Data is not available in the literature to quantify the amount of litter containing acid-activated bentonite that may be ingested by birds. It is unlikely that significant amounts would be ingested unless there was a shortage of suitable feed.

The acidifying function of litter treatments can inhibit growth and survival of pathogenic and nonpathogenic bacteria in litter (Choi, Kim and Kwon 2008). Use of acid-activated bentonite litter treatments is also associated with reductions in salmonella levels in litter (Watkins, Southerland and Hunt 2002) and darkling beetles (McWard and Taylor 2000).

Because the petitioned substance is applied to poultry litter, the subsequent use of the spent poultry litter must be considered in assessing the total impact of the petitioned substance on the agro-ecosystem. There are many environmental considerations if the poultry litter is applied to agricultural land. Some considerations are addressed in Evaluation Question #5. See Technical Reports for aluminum sulfate (OMRI 2015a) and sodium bisulfate (OMRI 2015b) for additional information regarding the reuse of treated poultry litter for fertility purposes.

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

Because the petitioned substance is applied to poultry litter, the subsequent use of the spent poultry litter must be considered in assessing the total impact of the petitioned substance on the agro-ecosystem. Spent poultry litter is typically intended for application to agricultural land for the purpose of improving soil fertility and organic matter content. Environmental concerns that arise from the land application of poultry manure include nitrogen leaching, phosphorus contamination of surface waters, and heavy metal buildup in soils (Bolan, et al. 2010).

Ammonium sulfate is produced as a result of the reaction between gaseous ammonia in the poultry house and the sulfate ions of the sulfuric acid-activated bentonite. Ammonium sulfate is a common water-soluble inorganic fertilizer used in conventional crop production. Ammonium sulfate has little to no surface volatilization loss when applied to most soils and is effective as a starter nitrogen source. Compared to other forms of soil nitrogen, the ammonium ion is less subject to leaching from clay since its positive charge keeps it held by the clay's negatively charged sites (Vitosh, Johnson and Mengel 1995). However, ammonium sulfate has a neutral charge and so would not be held to clay in the same way. Increased loss of nitrogen through leaching has been associated with greater application rates of ammonium sulfate fertilizer (Olson 1979). Another study reported that while nitrogen derived from ammonium sulfate is more readily taken up by plants than nitrogen from leguminous nitrogen–fixing plants, it is also lost from the soil more readily in the first year after application (Harris, et al. 1993).

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)]**

   Alternatives to litter amendments include management practices such as proper air exchange in barns, removing caked areas and keeping litter areas dry.

   TR LINES 435-449

   Clay-based adsorbents can be used to bind NH3 to the surface of the clay, and they also decrease NH3 volatilization by absorbing moisture (McCrory and Hobbs 2001). Nonsynthetic forms of these substances include naturally occurring zeolite, diatomaceous earth, and montmorillonite (non-activated bentonite). Peat (*Sphagnum facum*) has physical and chemical properties that result in effective ammonia management. Peat can adsorb 2.5 times its weight in NH3 and absorb up to 20 times its weight in water (McCrory and Hobbs 2001). Clay and peat are both nonhazardous materials. At the time of this report, there are several products that are OMRI Listed® for this use, such as Barn Fresh Natural Ammonia Control manufactured by Absorbent Products Ltd, which is listed in the "diatomaceous earth" category (OMRI 2015). Another product, Litter Life manufactured by Southland Organics, is a liquid poultry litter treatment that is approved under the U.S. EPA Design for the Environment program (Southland Organics 2015).

   Microbial and enzymatic treatments can be used to inhibit microbial growth and urease production through competitive exclusion and enzyme inhibition (Ritz, Fairchild and Lacy 2014). These types of products are generally not practical or economical for growers due to the rapid breakdown of the product, and they are more expensive than other alternatives (McCrory and Hobbs 2001).

   During the Spring 2016 in-person public comment session at the National Organic Standards Board meeting in Washington, DC, the board received one public comment that stated there are OMRI listed poultry litter amendments currently in use. The Board was provided information from a manufacturer of a poultry litter amendment product, which is currently OMRI listed, that expressed concerns they had with the TR. The commenter felt that the board should not

approve synthetic poultry litter amendments when there are already OMRI certified listed being used in the marketplace.

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

   Yes, but it is unclear if this substance is needed in organic agriculture as alternatives exist. The Subcommittee would like to pose the following questions:

   1. Are there alternatives available to reduce ammonia in poultry barns?
   2. Do the alternatives work in the area of reducing or eliminating Salmonella that could be present in barns?

Classification Motion:
Move to classify acid activated bentonite, as petitioned, as synthetic
Motion by: Ashley Swaffar
Seconded by: Tracy Favre
Yes: 7 No: 0 Abstain: 0 Absent: 1 Recuse: 0

Listing Motion:
Move to add acid activated bentonite as petitioned at §205.603
Motion by: Ashley Swaffar
Seconded by: Tracy Favre
Yes: 0 No: 7 Abstain: 0 Absent: 1 Recuse: 0