PETITION FOR LISTING
ON
NATIONAL LIST OF APPROVED AND PROHIBITED
SUBSTANCES
SEC. 2118. [7 U.S.C. 6517] NATIONAL LIST

Petitioner name: Aquaculture Working Group, % George S. Lockwood, Chair
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Carmel Valley, CA 93924

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Email address: GeorgeSLockwood@aol.com

Date of petition: June 26, 2012

Check applicable:

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

○ § 205.610 Nonsynthetic substances prohibited for use in organic aquatic *plant* production

○ § 205.611 Synthetic substances allowed for use in organic aquatic *animal* production.

○ § 205.612 Nonsynthetic substances prohibited for use in organic aquatic *animal* production.

Send to: National List Coordinator, National Organic Program,
USDA/AMS/TM/ NOP, Room 2646–So., Ag Stop 0268,
1400 Independence Ave., SW,
Washington, DC 20250-0268

Summary of request:

Previous actions by NOSB and NOP allow lignin sulfonate in the organic production of crops under:

"§ 205.601 Synthetic substances allowed for use in organic crop production
(j) As plant or soil amendments
(4) Lignin sulfonate—chelating agent, dust suppressant, floatation agent.

This petition is a request for NOSB and NOP to allow lignin sulfonate in the organic production of aquatic plants in:

§ 205.609 Synthetic substances allowed in organic aquatic plant production
(x) Lignin sulfonate—chelating agent.

Lignin sulfonate is a chelating agent for micronutrients in the culture of aquatic plants that is necessary to prevent micronutrients from precipitating out of the growing media solution where they would be unavailable to the plants being cultured.

Lignan sulfonate was favorably reviewed initially by a Technical Advisory Panel in 1995 when this substance was first listed. It was again reviewed in 2011 when it was recommended for relisting on the National List under crops, as a plant or soil amendment in 205.601 (j) (4) "as a chelating agent."

1. The substance's chemical or material common names.

Lignin sulfonate,
lignosulfonate
lignosulfuric acid
lignosulfonic acid
LST 7
Ligninsulonic acid
Poly(lignosulfonic acid)
Protectol W
Sulfite lignin
(NLM, 2011a)
There are also various salts of lignin sulfonate listed in the CAS Numbers section.

Trade Names:
Lignosite® – Georgia-Pacific (Georgia-Pacific 20 West, Inc., 2000)
BorrePlex – LignoTech USA, Inc. (OMRI, 2010)
Marasperse -LignoTech USA, Inc.
Phyto-Plus® Plant Stimulator – Baicor L.C. 23 (OMRI, 2010)
SHADOW – LignoTech USA, Inc. (OMRI, 2010)
Orzan – ITT Rayonnier (Sugar and Spotts, 1986)

2. The manufacturer's or producer's name, address and telephone number and other contact information of the manufacturer/producer of the substance listed in the petition.

LignoTech USA, Inc.
100 Grand Ave.
Rothschild, WI 54474
Contact: Stu Lebo
Phone: 715-359-6544
http://www.ltus.com

Agconnect
http://www.agconnect-ca.com
js.agconnect@sbcglobal.net
Contact: James Sorenson
Phone: 805-226-8023
Fax: 805-226-8023

PO Box 56
Oakdale, CA 95361

Baicor, L.C.
http://www.baicor.com
mik@baicor.com
Contact: Mike Miller
Phone: 435-752-2475
Fax: 435-752-8336
1895 North 600 West
Logan, UT 84321

Legnochem
http://legnochem.com
northway@cablevision.qc.ca
Contact: Andree Major
Phone: 819-627-1160
Fax: 866-358-8358
1119 Evansville Drive
Sturgeon-Falls, Ontario P2B 2K6
Canada

3. The intended or current use of the substance such as use as a pesticide, animal feed additive, processing aid, nonagricultural ingredient, sanitizer or disinfectant. If the substance is an agricultural ingredient, the petition must provide a list of the types of product(s) (*e.g.*, cereals, salad dressings) for which the substance will be used and a description of the substance's function in the product(s) (*e.g.*, ingredient, flavoring agent, emulsifier, processing aid).

Chelating agent for micronutrients in the culture of aquatic plants. Lignin sulfonates are dissolved in growing media for aquatic plans in very dilute solutions ranging from 2.0 milligrams per liter to 5.0 milligrams per liter. Media and plant cultures are in containers, such as on-shore tanks and ponds.

4. A list of the crop, livestock or handling activities for which the substance will be used. If used for crops or livestock, the substance's rate and method of application must be described. If used for handling (including processing), the substance's mode of action must be described.

In aquaculture, there are a wide range of aquatic plants grown under different conditions from microscopic microalgae to large kelp macroalgae. Chelated micronutrients are maintained at levels of microgram moles per liter (parts per billion).

Growing media containing chelated micronutrients that may be released into the environment would have a positive impact. There are no known harmful environmental impacts from chelated micronutrients when used in the prescribed amounts. None are toxic at these levels. Any residual chelated trace minerals re-

leased into the environment would be at extremely low concentrations below any physiologically significant level, and are rapidly absorbed by microorganisms.

5. The source of the substance and a detailed description of its manufacturing or processing procedures from the basic component(s) to the final product. Petitioners with concerns for confidential business information may follow the guidelines in the Instructions for Submitting CBI listed in #13.

Lignin or lignen is a complex chemical compound most commonly derived from wood, and an integral part of the secondary cell walls of plants and some red algae.

The following excerpts are from the National Organic Program National List webpage at:
http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateJ&page=NOPNationalList Lignin sulfonates, Technical Evaluation Report (2011((PDF).

Lignin is a constituent of woody plants that functions as a strengthening element. Lignin sulfonate is a derivative of lignin, where the lignin has been sulfonated in a wood pulping process (Zhor and Bremner, 1999). Lignin sulfonate has the chemical formula $C_{20}H_{26}O_{10}S_2$ (NLM, 2011b). However, lignin sulfonate may be composed of a variety of sulfonated aromatic alcohols which make up lignin polymers, including *p*-coumaryl alcohol, sinapyl alcohol, and coniferyl alcohol (FAO, 2008). The lignin molecule is complex and not well understood in spite of its prevalence (Pure Lignin, 2010). The sulfonate complex may be in association with calcium, magnesium, ammonium, or sodium (U.S. EPA, 2010b).

The National List of Allowed and Prohibited Substances (hereafter referred to as the National List) identifies lignin sulfonate as a synthetic substance allowed for use in organic production (7 CFR 205.601). Because the lignin sulfonate molecule is negatively charged, it typically complexes with various cations to form lignin sulfonate salts. Four specific lignin sulfonate salts are included in the Generic Materials List published by the Organic Materials Review Institute (OMRI): sodium lignosulfonate, magnesium lignosulfonate, ammonium lignosulfonate, and calcium lignosulfonate (OMRI, 2010). These salts are not specifically named in the National List.

Lignin sulfonate is currently included on the National List as a synthetic substance allowed for use in organic production (7 CFR 205.601). Lignin sulfonate may be used in organic crop production as a plant or soil amendment (dust suppressant, chelating agent, or floatation agent) or a flotation agent in postharvest handling (see 7 CFR 205.601(j)(4) and 7 CFR 205.601(l)(1)). The OMRI generic materials list includes the following lignin sulfonate salts: sodium lignosulfonate, magnesium lignosulfonate, ammonium lignosulfonate, and calcium lignosulfonate (OMRI, 2010). These lignosulfonate salts are not specifically identified on the National List.

Lignin sulfonate has been investigated for its potential as a chelating agent in the environmental remediation of heavy metals and in the remediation of food processing wastes (Garcia-Valls et al., 2001; USDA, 1969). Lignin sulfonate also has been used as an encapsulating agent for vitamins and other ingredients in food products (Toledo and Kuznesof, 2008).

Lignin sulfonates are produced from the process of sulfite chemical pulping. Sulfite pulping involves cooking softwood chips under pressure in sulfur dioxide-containing cooking liquors. When the cooking process is complete, sulfonated lignin is collected as a liquid by-product in the spent liquor, while the pulp is used for paper production. The lignin sulfonates that result from the spent liquor of the sulfite pulping process must be further purified to remove excess sugars. This is done by fermentation of the liquor, followed by heating to remove the alcohol generated. The resulting lignin sulfonate polymers can have high molecular weights ranging from less than 1,000 to more than 100,000 daltons (Zhor and Bremner, 1999; Westvaco Corp., 1987).

Lignin sulfonates may also be obtained from the Kraft pulping process; these are referred to as Kraft lignins. Kraft pulping is similar to sulfite pulping, but involves treating the wood at high temperature and pressure in a water solution containing sodium sulfide and sodium hydroxide. This process dissolves lignin into a soluble salt which dissolves in the pulping liquor. The lignin is removed by precipitation from the liquor using carbon dioxide (CO_2). The Kraft lignins must then be sulfonated after extraction by reacting the material with bisulfate or a sulfite compound (Gundersen and Sjoblom, 1999; U.S. EPA, 1990).

A third pulping process, acid sulfite pulping, is similar to Kraft pulping, but different chemicals are used. Sulfurous acid, used in place of sodium hydroxide, is combined with sodium, magnesium, calcium, or ammonium bisulfite. After the cooking is complete, the pulp is separated from the spent liquor, which may then be treated to obtain various chemical materials (U.S. EPA, 1990).

Lignin exists naturally in all woody plants as a structural and strengthening component. Because lignin is integrated into the plant cell wall, there are no natural processes that liberate lignin other than natural decomposition of wood by microorganisms. Lignin sulfonates are produced from the application of pressure and heat to wood in the presence of sulfur dioxide or by the addition of alkali and various acids and sulfates, as described under Evaluation Question #2. These are not naturally-occurring processes. Therefore, lignin sulfonates are synthetic (U.S. EPA, 1990; Gundersen and Sjoblom, 1999).

6. A summary of any available previous reviews by State or private certification programs or other organizations of the petitioned substance. If this information is not available, the petitioner should state so in the petition.

In crops:

§ 205.601 Synthetic substances allowed for use in organic crop production
(j) As plant or soil amendments
(4) Lignin sulfonate—chelating agent, dust suppressant, floatation agent.

Organic Materials Review Institute

Chelates
Status: Allowed
Class: Crop Fertilizers and Soil Amendments, Crop Management Tools and Production Aids
Origin: Nonsynthetic
Description:
Nonsynthetic chelates (including, but not limited to: nonsynthetic amino acids, citric acid, tartaric acid, and other di- and tri- acid chelates) and synthetic lignin sulfonate are allowed. See also AMINO ACIDS – NONSYNTHETIC, the other CHELATES listing, HUMIC ACIDS listings, and LIGNIN SULFONATES. See Glossary for definition of "chelates."
NOP Rule: 205.105

Lignin Sulfonates
Status: Allowed with Restrictions
Class: Crop Management Tools and Production Aids
Origin: Synthetic
Description:
Includes these lignosulfonic acids: ammonium lignosulfonate, calcium lignosulfonate, magnesium lignosulfonate, and sodium lignosulfonate. May be used as a chelating agent, dust suppressant, flotation agent, and some may be used as inert ingredients in pesticide formulations. See also INERTS – LIST 4 and INERTS – LIST 3. Synthetic lignin sulfonates are prohibited for use as fertilizers. For example, ammonium lignosulfonate is prohibited for use as a nitrogen fertilizer. Formulated products with ammonium lignosulfonate are subject to two criteria: (1) no nitrogen claims are made on the label and/or (2) the nitrogen contribution of the ammonium lignosulfonate to the formulated product is less than 1%.
NOP Rule: 205.601(j)(4) & 205.601(l)(1) As plant or soil amendments… Lignin sulfonate—chelating agent, dust suppressant, floatation agent. As floating agents in postharvest handling… Lignin sulfonate.

7. Information regarding EPA, FDA, and State regulatory authority registrations, including registration numbers. If this information does not exist, the petitioner should state so in the petition.

There are few international organizations with organic aquaculture standards, particularly aquatic plant standards. It appears that some await the lead of USDA in placing the 2009 recommendations of NOSB into the Final Rule.

Canadian draft aquaculture standards consider trace minerals used in aquaculture the same as trace minerals used in livestock and provide:

> Minerals, Trace Minerals, Elements - Non-synthetic chelated or sulphated minerals such as but not limited to calcium chloride. Synthetic nutrient minerals may be used when non-synthetic sources are not commercially available. Minerals may not be used to stimulate growth or production.

In the United Kingdom, Soil Association Organic Standards June 2011 include standards for finfish and shellfish, but do not include aquatic plants.

In the recent EC standards trace minerals and vitamins in aquatic plant production are unregulated.

8. The Chemical Abstract Service (CAS) number or other product numbers of the substance and labels of products that contains the petitioned substance. If the substance does not have an assigned product number, the petitioner should state so in the petition.

CAS Number : 9009-75-0, 8062-15-5, 8061-51-6
IUPAC Name: (2R)-3-(2-hydroxy
Chemical Formula: $C_{20}H_{26}O_{10}S_2$ or $C_9H_{10}O_2$, $C_{10}H_{12}O_3$, $C_{11}H_{14}O_4$.

Other Codes:
705707 (USEPA PC Code [U.S. EPA 2010b])
160226 (EPA Reference ID)
705705, 705708–705714 (U.S. EPA PC Code [U.S. EPA, 2010b], various lignosulfonate salts)
1522 (CODEX Alimentarius Commission INS Number, calcium lignosulfonate)

9. The substance's physical properties and chemical mode of action including (a) Chemical interactions with other substances, especially substances used in organic production; (b) toxicity and environmental persistence; (c) environmental impacts from its use and/ or manufacture; (d) effects on human health; and, (e) effects on soil organisms, crops, or livestock.

Lignin sulfonates are used to chelate microminerals in the culture of aquatic plants. There are no other chemical interactions known. Please see prior petitions for micro-mineral additives in crops.

10. Safety information about the substance including a Material Safety Data Sheet (MSDS) and a substance report from the National Institute of Environmental Health Studies. If this information does not exist, the petitioner should state so in the petition.

MSDA information is available at:
http://www.rtvanderbilt.com/documents/MSDS/US/14004.pdf .

11. Research information about the substance which includes comprehensive substance research reviews and research bibliographies, including reviews and bibliographies which present contrasting positions to those presented by the petitioner in supporting the substance's inclusion on or removal from the National List. For petitions to include non-organic agricultural substances onto the National List, this information item should include research concerning why the substance should be permitted in the production or handling of an organic product, including the availability of organic alternatives. Commercial availability does not depend upon geographic location or local market conditions. If research information does not exist for the petitioned substance, the petitioner should state so in the petition.

In conventional culture of aquatic plants as described in the references cited below, micro-minerals are chelated using EDTA and other commercial synthetic substances. These substances have not been approved for use in organic production of crops. However, lignin sulphonate is allowed as a chelating agent for crops.

The two leading papers that develop the necessity of chelated micronutrients for aquatic plants are:

Provasoli, L., J. J. A. McLaughlin and M. R. Droop (1957)
The Development of Artificial Media for Marine Algae
Biomedical and Life Sciences, Archives of Microbiology
Volume 25, Number 4, 392-428, DOI: 10.1007/BF00446694

Guillard, R.L. 1975. Culture of phytoplankton for feeding marine invertebrates, p. 29 - 60. In: P.B. Smith (ed) Culture of Marine Invertebrates. Plenum Press, New York.

Other papers on this subject include:

Dupuy, J.L., N.T. Windsor and C.E. Sutton. 1977. Manual for Design and Operation of an Oyster Seed Hatchery for the American Oyster, Special Report No. 142 in Applied Marine Science and Ocean Engineering of the Virginia Institute of Marine Science, Gloucester Point, Virginia

Richmond, Amos ed., Handbook of Microalgal Culture: Biotechnology and Applied Phycology. 2008, John Wiley and Sons

Stein, J.R.. 1973 Handbook of Phycological Methods, Cambridge University Press, Cambridge, England.

United Nations Food and Agriculture Organization
The hatchery culture of bivalves: a practical manual... Part 3 Hatchery operation: culture of algae Table 3**:** Guillard's F/2 media used for culturing algae in bivalve hatcheries from Guillard (1975).
http://www.fao.org/docrep/007/y5720e/y5720e08.htm

There are no contrasting positions regarding the essentiality of micronutrients in the culture of aquatic plants.

12. A ''Petition Justification Statement'' which provides justification for any of the following actions requested in the petition:

A. Inclusion of a Synthetic on the National List, §§ 205.609 and 205.611

• Explain why the synthetic substance is necessary for the production or handling of an organic product.

Micronutrients are essential nutrients for all forms of plant life to maintain normal functions, such as growth, maturation and resistance to disease. Micronutrients must be chelated to become available for aquatic plants. If they are not chelated, micronutrients precipate out of solution. Mineral deficiencies resulting from inadequate intake cause well-defined clinical

plant diseases and well as general signs of illness including poor growth. Micronutrients will not remain in solution if not chelated but instead precipitate out of solution and are unavailable to the aquatic plants.

It is a well established organic principle that it is preferable to provide healthy living conditions that foster wellness of plants. It is well established that adequate trace mineral intake is essential to the good health of aquatic plants. If micronutrients are not supplemented to aquaculture growth media, signs of deficiency result, demonstrating that levels of micronutrients are insufficient. Trace minerals must be chelated if they are to be available to aquatic plants.

• Describe any non-synthetic substances, synthetic substances on the National List or alternative cultural methods that could be used in place of the petitioned synthetic substance.

There are no known natural alternatives for chelating micronutrients in aquaculture systems. As mentioned above, raw water used for algae growth media do not necessarily contain sufficient levels of minerals to supply the physiological requirements, making it necessary to supplement growth media to prevent mineral deficiency conditions.

• Describe the beneficial effects to the environment, human health, or farm ecosystem from use of the synthetic substance that support its use instead of the use of a non-synthetic substance or alternative cultural methods.

Properly used, these substance can positively effect the health of aquatic plants, health of animals that eat these plants, as well as the health of humans who eat these plants and animals. There are no substitute substances, nor alternative culture methods.

13. A "Confidential Business Information Statement" that describes the specific required information contained in the petition that is considered to be confidential business information or confidential commercial information and the basis for that determination.

This petition does not contain any confidential business information.

Conclusions

Chelated micronutrients are essential for the healthy production of aquatic plants. Lignin sulfonates are effective chelating agents for micronutrients in growing aquatic plants. They are already allowed in terrestrial crops for an identical use, are safe, and provide no environmental risks. There are no natural alternatives.

Previous actions by NOSB and NOP have determined that lignin sulphonates are allowed as plant or soil amendments in crops and are included in the National List for Crops as:

"§ 205.601 Synthetic substances allowed for use in organic crop production
(j) As plant or soil amendments

(4) Lignin sulfonate—chelating agent, dust suppressant, floatation agent."

Lignan sulfonate was favorably reviewed initially by a Technical Advisory Panel in 1995 when this substance was first listed. It was again reviewed in 2011 when it was recommended for relisting on the National List in 205.601 (j) (4) "as a chelating agent."

This petition is a request for NOSB and NOP to allow lignin sulfonate in the organic production of aquatic plants in:

§ 205.609 Synthetic substances allowed in organic aquatic plant production
(x) Lignin sulfonate—chelating agent.

Lignin sulfonate is a chelating agent for micronutrients in the culture of aquatic plants that is necessary to prevent micronutrients from precipitating out of solution where they would be unavailable to the plants being cultured.

This petition seeks a similar allowance with a similar annotation for lignin sulphonate for growing aquatic plants as for the allowance of lignin sulfonate in growing crops.

Aquaculture Working Group
George S. Lockwood, Chair

Appendix A

Label for Lignin Sulfonate

Borregaard LignoTech

BorrePlex NA (Powder)

OMRI Listed

LignoTech USA, Inc.
100 Grand Avenue
Rothschild, WI 54474
Tel: (715) 359-6544
Fax: (715) 355-3674

GENERAL INFORMATION:

BorrePlex NA is a sodium lignosulfonate.

BorrePlex NA is a chelating agent for micronutrients. Use of **BorrePlex NA** may increase the uptake of micronutrients.

Notice: The statements made on this label are believed to be true and accurate but because of conditions of use which are beyond our control LignoTech USA does not authorize any agent or representative to make any warranty, guarantee or representation, expressed or implied, concerning this material or the use thereof, except in conformity with the statements on this label. Neither LignoTech USA nor the seller shall be responsible in any manner for any property damage or personal injury resulting from the use of this material not in accordance with directions. The buyer assumes all risk and liability resulting from improper handling, storage or use and accepts and uses this material on these conditions.

Information regarding the contents and levels of metals in this product is available on the internet at http://www.aapfco.org/metals.htm.

GUARANTEED ANALYSIS

Sulfur (S).....5.0%

Derived from sodium lignosulfonate.

Contact your LignoTech Sales Representative for additional information.

BorrePlex NA is a nuisance dust.

- Avoid high concentrations
- Minimize contact with eyes, skin and clothing
- Keep away from heat, sparks and open flame

Always consult Material Safety Data Sheet for instructions on proper handling.

Net Contents: 50 lbs. (22.7 K)

GUIDELINES FOR USE:

BorrePlex NA is a chelating agent for micronutrients.

Use rates generally range from 1 to 2 pounds BorrePlex NA per pound of chelated metal.

Micronutrients formulations prepared from **BorrePlex NA** should be applied alone. They should be applied foliarly. Application rates should be determined from a soil analysis.

Follow label rates as well as the recommendations of your field person and LignoTech representative.

Always consult Material Safety Data Sheet for instructions on proper handling.

Lot Number _____