Petition to National Organic Standards Board (NOSB) for Removal of Amended Sunset Date for Streptomycin

Petitioners: **Washington State Horticultural Association**
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Item A:

This petition applies to streptomycin sulfate (streptomycin), an exempt synthetic substance currently authorized for control of fire blight on apples and pears under §205.601(i)(10) of the National List of Approved and Prohibited Substances (National List).

Item B-1: Chemical name

D-Streptamine, O-2-deoxy-2-(methylamino)-alpha-L-glucopyranosyl-(1->2)-O-5-deoxy-3-C- formyl-alpha-L-lyxofuranosyl-(1->4)-N,N'-bis(aminomethyl)-D-Streptamine, O-2-deoxy-2-(methylamino)-alpha-L-glucopyranosyl-(1->2)-O-5-deoxy-3-C- formyl-alpha-L-lyxofuranosyl-(1->4)-N,N'-bis(aminoiminomethyl)-,sulfate (2:3) (salt)

Common Names: Streptomycin sulfate, Streptomycin A, Streptomycin sesquisulfate

Item B-2: Manufacturer Information

Currently there are six registrants approved by the U.S. EPA to manufacture streptomycin sulfate as a formulated, end-use product for use in plant agriculture or home horticulture.

Amvac Chemical Corporation 4695 MacArthur Court, Suite 1200 Newport Beach, CA 92660 949-221-6109	Nufarm Americas, Inc. – USA 150 Harvester Drive, Suite 200 Burr Ridge, IL 60527 630-455-2000
AgroSource, Inc. P.O. Box 1341 Mountainside, NJ 07092 908-931-9001	Repar Corporation 8070 Georgia Ave., Suite 209 Silver Spring, MD 20910 301-562-7330
Makhteshim Agan of North America, Inc. 3120 Highwoods Blvd, Suite 100 Raleigh, NC 27604 919-256-9300	Voluntary Purchasing Group, Inc. 230 FM 87 Bonham, TX 75418 903-583-5501

Item B-3: Current and intended use

Streptomycin is used as a pesticide (fungicide) for control of fire blight in apples and pears. Streptomycin is currently included on the National List of Allowed and Prohibited Substances as a synthetic substance allowed in organic crop production for fire blight control in apples and pears only. Fire blight is a destructive bacterial disease affecting certain species in the *Rosaceae* family. Fire blight is caused by the bacterium *Erwinia amylovora*, and is capable of infecting blossoms, fruits, vegetative shoots, woody tissues, and rootstock crowns.

Item B-4: Specific Use Information

Crop	Use Rate (spray concentration)	Method of Application
Pears (CA, OR, and WA only)	0.30 lb./Acre (60 ppm)	Apply as a foliar spray beginning at 10% bloom Repeat at 5-day intervals until all late bloom is over. Continue to spray at 5 to 7-day intervals to control shoot and fruit infections. Do not make more than 15 additional after blossom spray applications. Do not apply within 30 days of harvest.
Pears (All other areas)	0.25 – 0.5 lb./Acre (50 – 100 ppm)	Apply as a foliar spray beginning at 20 – 30% bloom. Spray trees every 3-4 days during blossom time. Apply sprays after petal fall every 10-14 days to control twig blight. Do not make more than 8 additional after blossom spray applications. Do not apply within 30 days of harvest.
Apples (CA, OR, and WA only)	0.30 lb./Acre (60 ppm)	Apply as a foliar spray. Apply at petal fall and late secondary bloom. Repeat at 5 to 7-day intervals Do not apply within 50 days of harvest.
Apples (All other areas)	0.25 – 0.5 lb./Acre (50 – 100 ppm)	Apply as a foliar spray beginning at 20 – 30% bloom. Spray trees every 3-4 days during blossom time. Apply sprays after petal fall every 10-14 days to control twig blight. Do not make more than 8 additional after blossom spray applications. Do not apply within 30 days of harvest.

Items B-5: Source and manufacturing procedure

There are four U.S. EPA approved registrants for streptomycin sulfate technical grade active ingredient (TGAI). These are:

Geo Logic Corporation
P.O. Box 1341
Mountainside, NJ 07092

Nufarm Americas, Inc.
150 Harvester Drive, Suite 200
Burr Ridge, IL 60527

Makhteshim Agan of North America (MANA)
3120 Highwoods Blvd, Suite 100
Raleigh NC 27604

Repar Corporation
8070 Georgia Ave., Suite 209
Silver Spring, MD 20910

Information following SECTION is identified as
CONFIDENTIAL BUSINESS INFORMATION (CBI).

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END OF CONFIDENTIAL BUSINESS INFORMATION (CBI)

Item B-6: Reviews by state or private certification programs

Streptomycin sulfate, as commercial formulations, has been extensively tested by independent state extension and university research personnel on apples and pears for control of fire blight. Results of these trials have been published in various formats and presented to grower groups on numerous occasions. Fire blight research trials using commercially formulated streptomycin products applied at label recommended rates have been conducted in Washington state (Tim Smith, Washington State University), Oregon (Ken Johnson, Oregon State University), California (Jim Adaskaveg, Univ. California, Riverside), Michigan (George Sundin, Michigan State University), Virginia (Keith Yoder, Virginia Tech University) and elsewhere by other professional horticulturalists and pomologists since the 1990s and even earlier. Results from virtually hundreds of replicated research trials throughout apple and pear growing regions of the U.S. have demonstrated the efficacy of streptomycin to control fire blight, usually revealing streptomycin to be the most effective control against fire blight of all treatments evaluated.

Item B-7: U.S. EPA Registrations (application to apples/pears highlighted)

US EPA REG NO.	COMPANY	PRODUCT NAME	ACTIVE INGREDIENT	% BY WT	USE SITES APPROVED
5481-512	AMVAC	STREPTOMYCIN 17	STREPTYMYCIN SULFATE	22.4	ROSES (CUT PLANT MATERIAL) POTATOES (SEED PIECE TREATMENT-CUT) TOBACCO (FOLIAR TREATMENT) ROSES (FOLIAR TREATMENT) TOMATOES (FOLIAR TREATMENT) PYRACANTHA (FOLIAR TREATMENT) CELERY (FOLIAR TREATMENT) ROSES (CUTTINGS) PEPPERS (FOLIAR TREATMENT) CHRYSANTHEMUM (CUTTINGS) APPLE (ORNAMENTAL) (FOLIAR TREATMENT) **APPLES (FOLIAR TREATMENT)** **PEARS (FOLIAR TREATMENT)** DIEFFENBACHIA (CUTTINGS) PEAR (ORNAMENTAL) (FOLIAR TREATMENT) PHILODENDRON (FOLIAR TREATMENT)

7401-311	VPG	FERTI-LOME FIRE BLIGHT SPRAY	STREPTOMYCIN SULFATE	22.4	**APPLES (FOLIAR TREATMENT)** CHRYSANTHEMUM (CUTTINGS) **PEARS (FOLIAR TREATMENT)** DIEFFENBACHIA (FOLIAR TREATMENT) DIEFFENBACHIA (CUTTINGS) PYRACANTHA (FOLIAR TREATMENT) ROSES (FOLIAR TREATMENT) PHILODENDRON (FOLIAR TREATMENT) ROSES (BARE ROOT)
55146-80	NUFARM	STREPTROL	STREPTOMYCIN SULFATE	21.3	TOBACCO (FOLIAR TREATMENT) PYRACANTHA (FOLIAR TREATMENT) PHILODENDRON (FOLIAR TREATMENT) CELERY (FOLIAR TREATMENT) CHRYSANTHEMUM (CUTTINGS) DIEFFENBACHIA (CUTTINGS) PEACHES (TREES) (POSTHARVEST APPLICATION) **APPLES (FOLIAR TREATMENT)** **PEARS (FOLIAR TREATMENT)** APPLE (ORNAMENTAL) (FOLIAR TREATMENT) PEAR (ORNAMENTAL) (FOLIAR TREATMENT) PEARS (DELAYED DORMANT APPLICATION) PEACHES (DORMANT) ROSES (CUTTINGS) ROSES (FOLIAR TREATMENT) POTATOES (SEED PIECE TREATMENT-CUT) TOMATOES (FOLIAR TREATMENT) PEPPERS (FOLIAR TREATMENT)

55146-96	NUFARM	AGRI-MYCIN 17	STREPTOMYCIN SULFATE	22.4	TOBACCO (FOLIAR TREATMENT) **APPLES (FOLIAR TREATMENT)** DIEFFENBACHIA (CUTTINGS) DIEFFENBACHIA (FOLIAR TREATMENT) CHRYSANTHEMUM (CUTTINGS) CARNATION (SOIL TREATMENT) **PEARS (FOLIAR TREATMENT)** POTATOES (SEED PIECE TREATMENT-CUT) PEPPERS (FOLIAR TREATMENT) IMPATIENS (FOLIAR TREATMENT) CALLA LILY (BULB TREATMENT) CALLA LILY (FOLIAR TREATMENT) CELERY (FOLIAR TREATMENT) TOMATOES (FOLIAR TREATMENT) HYDRANGEA (CUTTINGS) BLACKEYED SUSAN (FOLIAR TREATMENT) ORNAMENTAL PLANTS (FOLIAR TREATMENT) ORNAMENTAL PLANTS (CUTTINGS) COTONEASTER (FOLIAR TREATMENT) PYRACANTHA (FOLIAR TREATMENT) FORSYTHIA (FOLIAR TREATMENT) SALVIA (FOLIAR TREATMENT) GERANIUM (FOLIAR TREATMENT) HYDRANGEA (FOLIAR TREATMENT) PHILADELPHUS (FOLIAR TREATMENT) ROSES (FOLIAR TREATMENT) ROSES (DIP TREATMENT) SYRINGA (FOLIAR TREATMENT) VIBURNUM (FOLIAR TREATMENT) HEDERA (FOLIAR TREATMENT) HONEYSUCKLE (FOLIAR TREATMENT) PHILODENDRON (FOLIAR TREATMENT) RUDBECKIA (FOLIAR TREATMENT) ORCHIDS (FOLIAR TREATMENT) GLADIOLUS (FOLIAR TREATMENT) GLADIOLUS (BULBS) POINSETTIA (FOLIAR TREATMENT)
55146-98	NUFARM	AS-50 AGRICULTURAL STREPTOMYCIN	STREPTOMYCIN SULFATE	65.8	**PEARS (FOLIAR TREATMENT)** BEANS (SEED TREATMENT) **APPLES (FOLIAR TREATMENT)**

66222-121	MANA	AG STREPTOMYCIN	STREPTOMYCIN SULFATE	22.4	APPLE (ORNAMENTAL) (FOLIAR TREATMENT) PEAR (ORNAMENTAL) (FOLIAR TREATMENT) DOMESTIC DWELLINGS (OUTDOOR) **APPLES (FOLIAR TREATMENT)** ROSES (CUT PLANT MATERIAL) PEPPERS (FOLIAR TREATMENT) DIEFFENBACHIA (CUTTINGS) TOMATOES (FOLIAR TREATMENT) POTATOES (SEED PIECE TREATMENT-CUT) **PEARS (FOLIAR TREATMENT)** PYRACANTHA (FOLIAR TREATMENT) CELERY (FOLIAR TREATMENT) CHRYSANTHEMUM (CUTTINGS) PHILODENDRON (FOLIAR TREATMENT) TOBACCO (FOLIAR TREATMENT)
69361-4		STREPTOMYCIN 3000 DUST	STREPTOMYCIN SULFATE	0.75	**PEARS (FOLIAR TREATMENT)** **APPLES (FOLIAR TREATMENT)** TOBACCO (FOLIAR TREATMENT)
69361-9	REPAR	REPAR STREPTOMYCIN 17	STREPTOMYCIN SULFATE	22.4	ROSES (BARE ROOT) **PEARS (FOLIAR TREATMENT)** TOMATOES (FOLIAR TREATMENT) DIEFFENBACHIA (CUTTINGS) ROSES (CUT PLANT MATERIAL) PEPPERS (FOLIAR TREATMENT) CELERY (FOLIAR TREATMENT) PYRACANTHA (FOLIAR TREATMENT) **APPLES (FOLIAR TREATMENT)** ROSES (FOLIAR TREATMENT) POTATOES (SEED PIECE TREATMENT-CUT) TOBACCO (FOLIAR TREATMENT) PHILODENDRON (FOLIAR TREATMENT) CHRYSANTHEMUM (CUTTINGS)
80990-3	AGROSOURCE	RG S 50 WP	STREPTOMYCIN SULFATE	65.8	**PEARS (FOLIAR TREATMENT)** **APPLES (FOLIAR TREATMENT)** BEANS (SEED TREATMENT)

80990-4	AGROSOURCE	FIREWALL 17 WP	STREPTOMYCIN SULFATE	22.4	ROSES (DIP TREATMENT) **APPLES (FOLIAR TREATMENT)** PHILODENDRON (FOLIAR TREATMENT) DIEFFENBACHIA (FOLIAR TREATMENT) DOMESTIC DWELLINGS (OUTDOOR) TOMATOES (FOLIAR TREATMENT) DIEFFENBACHIA (CUTTINGS) POTATOES (SEED PIECE TREATMENT-CUT) FIRETHORN (FOLIAR TREATMENT) CELERY (FOLIAR TREATMENT) PYRACANTHA (FOLIAR TREATMENT) PEPPERS (FOLIAR TREATMENT) TOBACCO (FOLIAR TREATMENT) **PEARS (FOLIAR TREATMENT)** CHRYSANTHEMUM (CUTTINGS)

Item B-8: Chemical abstract services number and product labels

Chemical abstract numbers (CAS),

Streptomycin sulfate: 3810-74-0

Streptomycin: 57-92-1

(See Appendix for product labels)

Item B-9: Physical and chemical properties/mode of action

Physical / Chemical Properties:

Streptomycin technical is a light tan solid with a melting point of 168C. Streptomycin is miscible with methanol, ethanol, isopropanol, carbon tetrachloride, and ether. It has a water solubility of less than 20 mg/mL at 28 C. Additional physical/chemical properties are found in the table below.

Parameter	**Value**
pH	5.5 (1g sample / 5 mL water)
Density	1.78 g / mL
Water Solubility (28 C)	> 20 mg / mL
Dissociation Constant, pKa	7.97

Mode of Action:

Streptomycin helps to control fire blight by killing the bacterial pathogen *Erwinia amylovora*. When streptomycin enters the cells of *Erwinia amylovora*, it binds to cellular components called ribosomes and reduces their ability to correctly synthesize proteins

needed for growth and survival. The result is accumulation of erroneous proteins within the cell and cell death (Hermann, 2007).

Item B-10: Safety information (Human Health/Environment)

(see Appendix for product MSDS)

Human Health

Animal studies have been conducted with streptomycin to determine the potential toxic effects of this substance (EPA, 1992). Streptomycin was found to have low acute toxicity when administered to rats and mice. A 2-year feeding study in rats indicated that streptomycin does not cause cancer in these animals. No developmental effects were seen when pregnant rabbits were administered streptomycin on the critical days of gestation. Streptomycin sulfate exhibited negative to weakly positive results in a series of genetic toxicity tests to determine its potential to interact with DNA or damage chromosomes – indicating that it is unlikely to cause cancer (NTP, 2005).

The toxicity of streptomycin to humans has been extensively reviewed because of its use in medicine. HSDB (2002) summarizes the toxic effects of streptomycin. Such effects include ototoxicity (hearing loss or vestibular problems), nephrotoxicity (manifested as increased or decreased frequency or urination or amount of urine, increased thirst, loss of appetite, nausea, vomiting), effects on vision, peripheral neuritis (burning of face or mouth, numbness, tingling), neurotoxicity (muscle twitching, numbness, seizures, twitching), and hypersensitivity/allergic reactions (rashes, hives, swelling, anaphylactic shock). The FDA has categorized streptomycin as pregnancy category D due to the risk of fetal ototoxicity (deafness). Pregnancy category D is for substances that have demonstrated positive evidence of human fetal risk, and should only be given in pregnancy when the benefit outweighs the risk. Although there is a risk of fetal deafness following therapeutic doses of streptomycin, the exposure that occurs from the use of streptomycin as a pesticide is not expected to pose this risk. The typical therapeutic dose of streptomycin is 15 to 30 mg/kg body weight, and there is a risk of fetal deafness at this dose. EPA (2006) has established that chronic exposure to 0.05 mg/kg body weight per day of streptomycin is expected to be safe without risk of adverse effects such as fetal deafness. EPA (2006) estimated the aggregate exposure to streptomycin due to its use as a pesticide (coming from food, water, and residential uses) and found it to be well below the safe exposure level.

Streptomycin can be phytotoxic at concentrations much higher than those used for control of fire blight in apples and pears. At the appropriate concentrations, it is non-toxic to plants. EPA determined that streptomycin is practically non-toxic to birds, freshwater invertebrates, and honey bees, and is slightly toxic to cold and warm water species of fish (EPA, 1992). Streptomycin is toxic to algae, with cyanobacteria being more sensitive than green algae (Qian *et al*., 2012). Streptomycin causes toxicity to algae by inhibiting cell growth and photosynthesis-related organelles and proteins. Because of its toxicity to algae, EPA requires that all pesticide products containing streptomycin, except those specifically used as algicides in ornamental aquaria and ponds, include a warning not to apply directly to water or in areas where surface water is present, and not to contaminate water during cleaning of equipment or disposal of wastes.

No information could be found to suggest that agricultural streptomycin products contain toxic 301 contaminants or that the degradation products of streptomycin would result in toxic effects to humans or the environment. There is no evidence to suggest substantial, long-term persistence of streptomycin in the environment following its use as a pesticide to control fire blight in apples and pears.

<u>Environment</u>
A certain background level of streptomycin is expected in soil due to the natural presence of the bacterium *Streptomyces griseus* (Brosché, 2010). EPA (1988, 1992) cited data that show that streptomycin biodegrades relatively quickly in soil and water. The breakdown products included methylamine, carbon dioxide, and urea, all of which occur naturally in the environment.

As no other environmental fate and transport data were submitted to the EPA, the Health Effects Division (HED) Chapter of the 2006 TRED reported that EPA employed an environmental fate estimation program (EPI Suite) to provide data for risk assessment. The results of the estimates as reported in EPA (2006) were as follows:

> *Streptomycin has a very low Henry's law constant and is very highly soluble in water. The chemical is moderately persistent in aerobic soil (a single value of t1/2= 17.5 days was determined). EPI Suite estimated a shorter aerobic soil half-life (t1/2= 25 days) and a longer sediment half-life (t1/2= 100 days). However, once it reaches a receiving water body, it predominantly partitions into the water column. No data are available on the effects of photolysis; however, it was reported that streptomycin is stable for hydrolysis in neutral solutions (at 20 °C) and is unstable in both alkaline and acidic conditions. Based on EPI Suite estimates, streptomycin is very highly mobile (Koc = 10 L kg-1). Given the moderate*

> *persistence/high mobility and solubility of streptomycin, the chemical is expected to dissipate relatively slowly and at the same time be vulnerable to leaching/run-off.*

Kummerer (2009) reports that data on streptomycin concentrations in soil following application to growing fruit are unavailable. Gavalchin and Katz (1994) studied the persistence of seven antibiotics commonly used in animal feed, including streptomycin, in typical agricultural soil (sandy loam). The level of streptomycin incorporated into the soil with manure was 5.6 µg/g. No detectable streptomycin was found in the soil samples following 30 days of incubation at 30, 20, or 4 degrees Celsius. However, the addition of manure or sludge to soil, such as in this study, has often resulted in increased biodegradation of antibiotics in soil (Thiele-Bruhn, 2003). Furthermore, the extent and kinetics of antibiotic degradation in soil is highly dependent on temperature, soil type, and antibiotic adsorption to soil.

Gardan and Manceau (1984) reported that no surface residue of streptomycin was detectable on pear or apple trees after four to six weeks following spray application. However, Mayerhofer *et al*. (2009) showed that the use of streptomycin sprays can lead to detectable concentrations of streptomycin in apples. Streptomycin was detected in 20 of 41 samples from orchards that were treated one to three times with streptomycin sprays. The concentration of streptomycin was highest in the apple cores and skin, ranging from 1.9 to 18.4 µg/kg (equivalent to 0.0019 to 0.0184 ppm, well below the EPA's established tolerance of 0.25 ppm).

The Reregistration Eligibility Document (RED) for streptomycin and streptomycin sulfate concluded that there are no ecological concerns from the use of this naturally occurring antibiotic (EPA, 1992). As part the current registration review for streptomycin, the EPA has called for environmental fate data to determine the persistence of streptomycin in the environment as well as the potential for antibiotic resistance to transfer from plant pathogens in the environment to human pathogens (EPA, 2009). EPA's final registration review decision for streptomycin is scheduled for 2014.

Based on the limited data available, there is no evidence to suggest substantial, long-term persistence of streptomycin in the environment following its use as a pesticide to control fire blight in apples and pears.

Item B-11: Research Information/Bibliography

Field research using streptomycin sulfate for control of fire blight in apples and pears has been on-going for decades. Due to its bactericidal activity, streptomycin sulfate has been widely utilized against *Erwinia amylovora* (the pathogen responsible for fire blight) in U.S. apple and pear growing regions. No other control product has shown the equivalent consistent and efficacious performance against fire blight as streptomycin sulfate.

A selection of bibliographic sources (followed by their URLs) dealing streptomycin and fire blight control in apples and/or pears is listed below.

Univ. Mass. Extension, Healthy Fruit, Issue 6, May 6, 2008, Healthy Fruit Disease Elements, Fire Blight,
http://www.umass.edu/fruitadvisor/healthy_fruit/hf0608KEs64V.pdf

TreeHelp.com, Fire Blight Informational guide, http://www.fireblight.com/

Invasive Species website, http://www.invasive.org/browse/subject.cfm?sub=673

University of Minnesota Extension, Fire Blight,
http://www.extension.umn.edu/yardandgarden/ygbriefs/p223fireblight.html

Cooperative Extension Service, Perdue University, Fire Blight,
http://www.ces.purdue.edu/extmedia/BP/BP-30.html

Clemson University Extension, Fire Blight of Fruit Trees,
http://hgic.clemson.edu/factsheets/hgic2208.htm

University of Wisconsin Extension, University of Wisconsin Garden Facts, XHT1090, Fire Blight, http://wihort.uwex.edu/gardenfacts/XHT1090.pdf

Penn State Fruit Pathology Fact Sheet, Fire Blight,
http://fpath.cas.psu.edu/Fruit_facts/Apple/FBAP.html

Colorado State University Cooperative Extension Service, Fire Blight,
http://www.colostate.edu/Dept/CoopExt/4dmg/Pests/Diseases/fire.htm

Bacterial Fireblight Pathogen, http://buckeyegardening.com/bacterialfireblight.html

Michigan State University Extension, Fire Blight, http://www.canr.msu.edu/vanburen/fblinks.htm

Bartlett Tree Research Laboratories, Fireblight, http://www.onlinegardener.com/disease/Fireblight.pdf

University of Illinois Extension, Report on Plant Disease, RPD No. 801, June 2005, Fire Blight on Apple, http://web.aces.uiuc.edu/vista/pdf_pubs/801.PDF

University of Missouri Extension, Fire Blight, http://extension.missouri.edu/explorepdf/agguides/hort/g06020.pdf

American Phytopathological Society, Plant Disease Lessons, Fire blight of apple and pear, http://www.apsnet.org/education/LessonsPlantPath/FireBlight/default.htm

North Carolina State University, Plant Pathology Extension, Fire Blight of Apple and Pear, http://www.ces.ncsu.edu/depts/pp/notes/oldnotes/fd3.htm

Cornell University Tree Fruit & Berry Pathology, NYS IPM Tree Fruit Crops Fact Sheet Series, Fire Blight, http://www.nysaes.cornell.edu/pp/extension/tfabp/firepm.shtml

University of Nevada, Cooperative Extension, FS 01-56, Fire Blight, http://www.unce.unr.edu/publications/files/ho/2001/fs0156.pdf

Exploring Fire Blight Management, Part I: Models http://www.omafra.gov.on.ca/english/crops/hort/news/hortmatt/2007/22hrt07a1.htm

Exploring Fire Blight Management, Part 2: Infection Sources http://www.omafra.gov.on.ca/english/crops/hort/news/hortmatt/2007/23hrt07a5.htm

Exploring Fire Blight Management, Part 3: Antagonists of *Erwinia amylovora* http://www.omafra.gov.on.ca/english/crops/hort/news/hortmatt/2007/24hrt07a2.htm

Exploring Fire Blight Management, Part 4: Antibiotics http://www.omafra.gov.on.ca/english/crops/hort/news/hortmatt/2007/24hrt07a3.htm

ISHS Acta Horticulturae 590: IX International Workshop on Fire Blight, PRESENT WORLDWIDE DISTRIBUTION OF FIRE BLIGHT, T. van der Zwet, http://www.actahort.org/books/590/590_1.htm

Epidemiology of Fire Blight, Sherman V. Thomson, Dept. of Biology, Utah State University, http://books.google.com/books?hl=en&lr=&id=j6JOUpYnSDYC&oi=fnd&pg=PA9&dq=fire+blight&ots=Zb94c6pseh&sig=M4Lg-SLA_kwJm9lbsh1AxhA-0NA#PPA9,M1

Fire Blight, The Disease and its Causative Agent, *Erwinia amylovora*, J.L. Vanneste, ed. CABI Publishing, http://books.google.com/books?hl=en&lr=&id=j6JOUpYnSDYC&oi=fnd&pg=PA199&dq=fire+blight&ots=Zb94c6pu5m&sig=IO-zfRkBfOjXiJWDNbRycvy49pY#PPA210,M1

Epidemiology and Control of Fire Blight, Annual Review of Phytopathology Vol. 12: 389-412 (Volume publication date September 1974), http://arjournals.annualreviews.org/doi/abs/10.1146/annurev.py.12.090174.002133

Annual Report, 2010, Evaluation of new bactericides for control of fire blight of pears caused by *Erwinia amylovora*, J.E. Adaskaveg and D. Gubler, prepared for the California Pear Board, http://www.calpear.com/_pdf/research-reports/JEA%20Fireblight.pdf

Fire Blight in Apples and Pears – Paul Steiner, http://www.mdhortsociety.org/pdfs/Fire%20Blight%20in%20Apples%20and%20Pears.pdf

Fire Blight Management in the Twenty-first Century, Using New Technologies that Enhance Host Resistance in Apple, Norelli, Jones and Aldwinckle, Plant Diseases, Vol. 87, No. 7, 2003. http://apsjournals.apsnet.org/doi/pdf/10.1094/PDIS.2003.87.7.756

Fire Blight, An Economically Important Disease of Apple and Pear: A Review of the Pathogen (*Erwinia amylovora*), Disease Occurrence, Biology and Management, Prepared by Bernt Solymár, Earth Tramper Consulting, Inc., for The Apple Working Group of the Canadian Horticultural Council, Feb. 2005. http://publications.gc.ca/collections/collection_2009/agr/A52-158-2005E.pdf

Item B-12: Petition Justification Statement

In March 2011, the NOSB Crops Committee conducted a Technical Evaluation Report (TEP) as part of the second sunset review for streptomycin and recommended to the NOSB that streptomycin not be relisted to the National List. The NOSB voted to relist streptomycin – but only until October 21, 2014, giving it an expiration date three years prior to what would have been its five-year sunset date. This expiration date does not provide sufficient time for the complete development and refinement of biological alternatives to streptomycin for fire blight control on apples and pears. Therefore, this petition seeks removal of the expiration date for streptomycin and the establishment of October 21, 2017 as its sunset date to provide adequate time for the transition to proven effective non-antibiotic, i.e., biological alternatives for fire blight control in apples and pears.

Item B-13: Confidential Business Information Statement

This petition contains Confidential Business Information (Item B-5, above) consisting of "trade secrets", i.e., information relating to the production process for streptomycin sulfate, quality control tests, data and research methodology. This confidential business information is commercially viable, is used in the manufacture of streptomycin sulfate for agricultural use and is maintained in secrecy by the manufacturers.

Executive Summary

Streptomycin, for control of fire blight in apples and pears, was added to the National List as an exempt synthetic substance under §205.601(i)(10) by final rule on December 21, 2000 (65 FR 80613). This action established October 21, 2007 as the first sunset date for streptomycin subject to review as mandated by the Organic Foods Production Act (OFPA) of 1990 (7 U.S.C 6517(e)) which stipulates that each substance identified in §205.601 is subject to a sunset review process by the NOSB every five years.[1] The first sunset review of streptomycin was completed by the Crops Committee in 2006 which recommended to the NOSB that streptomycin be relisted on the National List with a new sunset date of October 21, 2012.

A second sunset review of streptomycin by the Crops Committee conducted in March 2011 resulted in a recommendation to the NOSB against relisting of streptomycin on the National List. At its semi-annual meeting in Seattle, Washington (April 26-29, 2011) the NOSB received verbal testimony from organic pome fruit growers, university and extension personnel involved with fire blight research, individuals from various state, regional and national commissions, boards, councils and leagues representing apple and pear growers, and manufacturer's representatives. From these individuals, a consensus emerged that the prohibition of antibiotics,

[1]See at:http://farmlandinfo.org/documents/38361/Federal_Organic_Food_Production_Act.pdf

particularly oxytetracycline, for fire blight control on organic apples and pears after October 21, 2012 would have serious negative impacts to U.S. organic apple and pear growers because currently available biological alternatives for fire blight control do not deliver consistently equivalent performance compared to antibiotics, especially streptomycin. Based upon this testimony and other considerations, the NOSB voted to relist streptomycin to the National List but only until October 21, 2014 – three years less than what would have been its five year sunset date.[2]

With just two more growing seasons until antibiotics for fire blight control are scheduled to be removed from the National List, concern among a coalition of organic pome fruit growers, fire blight researchers and industry trade organizations is that the 2014 expiration date provides too little time for the complete development of non-antibiotic alternatives; hence this petition. Specifically, petitioners contend expiration of streptomycin from the National List on October 21, 2014 will:

1. likely result in a significant net decrease in organic apple and pear acreage in major pome fruit growing states, e.g., California, Michigan, New York and Washington state; this will lead to a corresponding increase in *conventional* apple and pear acreage as organic production is withdrawn and a disruption and economic hardship to organic apple and pear producers facing the loss of previously established organic markets;

2. is unwarranted and unwise since biological alternatives to streptomycin currently available to growers of organic apples and pears have not demonstrated consistently equivalent performance vs. streptomycin under severe fire blight disease pressure, and

3. is not supported by –
    a. a broad segment of growers, packers and shippers of organic apples and pears,
    b. a wide range of state, regional and national commissions, boards, councils and leagues representing apple and pear growers, and
    c. major university pomologists and plant pathologists, USDA horticulture scientists and state extension personnel conducting field research with biological alternatives to antibiotics for fire blight control.

To avoid the adverse consequences likely to fall on U.S. organic apple and pear growers if streptomycin is removed from the National List in 2014 and to provide adequate time for the

[2] Oxytetracycline (tetracycline) had been scheduled to expire from the National List on October 21, 2012; during these same proceedings, the NOSB voted to extend the date for expiration of tetracycline to October 21, 2014.

complete development and biological control alternatives to streptomycin, petitioners seek removal of the annotated October 21, 2014 expiration date for streptomycin and re-instatement of streptomycin sulfate into the sunset process with a five-year sunset date of October 21, 2017.

Petition to Remove Expiration Date for Streptomycin and to Re-instate Sunset Date

Petitioners submit three points to support removal of the annotated sunset date for streptomycin of October 21, 2014 and it re-instatement into the sunset process with a sunset date of October 21, 2017 under §205.601(i)(10).

1. **The loss of streptomycin for control of fire blight in organic apples and pears will result in a significant net reduction in the amount of organic apples and pears produced in major pome fruit producing states. Such a reduction will result in a severe negative economic impact on organic pome fruit growers throughout the country.**

Growth of Organic Apple and Pear Market

Certified organic acres devoted to apples and pears in the U. S. have risen dramatically since the year 2000 principally in the states of Oregon and Washington. In 2009 (latest year for which complete figures are available), approximately three-fourths of all organic apples and pears grown in the United States were grown in Washington State, where, in 2000 approximately 4,321 acres of apples were certified organic; by 2009 this figure had grown to 15,735 – an increase of 264%. The trend for pears is similar: in 2000, there were approximately 575 certified organic acres in Washington State; by 2009 there were 1,964 acres – an increase of 242%[3]. While a number of factors contributed to these increased acreages, the approval in 2000 of streptomycin and tetracycline by the NOP to the National List as an exempted (naturally derived, semi) synthetic substances gave organic apple and pear growers, particularly in Washington State and Oregon, (the Pacific Northwest, PNW) and California the assurance that they would have an effective treatment to bring to bear in their efforts to combat this serious disease.

Just how important the listing of the antibiotics streptomycin and oxytetracycline as exempt substances on the National List has been to the growth of the U.S. organic apple and pear industry has been made clear in multi-year surveys of PNW organic apple/pear growers by

[3] Data summarized from: *Recent Trends in Organic Fruit Production, Washington State, 2009* by Elizabeth Kirby and David Granatstein, Washington State University Center for Sustaining Agriculture & Natural Resources, (WSU-CSANR), see at: http://csanr.wsu.edu/publications/techreports/wa_orgtreefr_11_09_final.pdf and from personal communication from David Granatstein.

Washington State University, Sustainable Agriculture Specialist David Granatstein.[4] In recent years, organic pome fruit growers have become increasingly aware of growing pressure to discontinue allowance of antibiotics to control fire blight in apples and pears. At the same time growth of the organic pome fruit industry has created market forces spurring significant research into biological alternatives for fire blight control on apples and pears. In this context, Granatstein asked representative groups of PNW organic apple and pear growers in February 2010, 2011 and most recently in 2012 the following critical question: *"How would the loss of antibiotics for fire blight control impact your operations?"*

- *In 2010,*
  - *24% said it would have little or no effect*
  - *13% said it would lead them to reduce their organic pear acreage*
  - *35% said it would lead them to reduce their susceptible organic apple acres*
  - *28% said it would cause them to exit organic apple/pear production altogether*
- *In 2011*
  - *21% said it would have little or no effect*
  - *16% said it would lead them to reduce their organic pear acreage*
  - *41% said it would lead them to reduce their susceptible organic apple acres*
  - *22% said it would cause them to exit organic apple/pear production altogether*
- *In 2012,*
  - *8% said it would have little or no effect*
  - *4% said it would lead them to reduce their organic pear acreage*
  - *44% said it would lead them to reduce their susceptible organic apple acres*
  - *44% said it would cause them to exit organic apple/pear production altogether*

The most revealing conclusion of this 3-year survey is that organic apple and pear growers (at least in the PNW) have become increasingly skeptical regarding their ability to maintain production without the use of antibiotics for control of fire blight. In 2010 76% of organic apple and pear growers surveyed indicated that without the ability to control fire blight using antibiotics, they would either reduce or eliminate completely their organic apple and/or pear production; by 2012 this number had risen to 92%.

In 2011 Granatstein also asked this same group of organic apple and pear growers: *"In a severe fire blight year, would you be able to control the disease without antibiotics."* Responding to

[4] Summarized from surveys of organic apple and pear growers in Washington State: *Organic Orchards: Needs and Priorities*, conducted by David Granatstein (WSU-CSANR), Mark LaPierre, Wilbur-Ellis Co., Aaron Avila, G.S. Long, Co., Inc. and Nadine Lehrer, WSU-TFRC.
2010 survey: http://csanr.wsu.edu/publications/presentations/Research_Priorities_WE_2010.pdf
2011 survey: http://www.tfrec.wsu.edu/pdfs/P1773.pdf
2012 survey: Unpublished grower survey, personal communication from David Granatstein.

this question, fully 82% of the organic apple and pear growers answered *"No"*. In 2012 Granatstein's survey indicated that 73% of organic apple and pear growers had tried various non-antibiotic regimes to control fire blight, yet of these two-thirds (67%) stated that the non-antibiotic control programs used were not successful at controlling fire blight in their orchards. Recognizing the "gap" that exists between proven and effective antibiotics for fire blight and non-antibiotic alternatives still being developed and perfected, 93% of these surveyed organic apple and pear growers indicated support for new petitions to the NOSB to extend the use of streptomycin and oxytetracycline on apples and pears beyond 2014.

Economic Impact Estimate

Although 80% – 90% of the total U.S. production of organic apples and pears are produced by just 3 – 5 states, organic apples are grown commercially in 41 states; organic pears in 37 states.[5] For each of these organic pome fruit orchardists in each of these states, fire blight – and the tools needed for its control – is a matter of great concern. Therefore, actions taken by the NOSB with regard to the use of antibiotics for fire blight control have direct impact throughout much of the country, not just the PNW. According to USDA-NASS figures, the U.S. organic apple market was valued at $136.8 million (M); the organic pear market at $16.2 M giving a combined total of $153 M in 2008 (see Table 1).

Table 1. Summary of U.S. *organic* apple and pear production and leading states, 2008, USDA-NASS Census of Agriculture, Organic Production Survey. Figures in parentheses represent the proportion of total U.S. acres, tons or value.

APPLES	U.S. Total	Washington	California	Oregon	Arizona	Colorado
Acres	20,009	13,005 (65%)	3,192 (16%)	238 (1.2%)	1,023 (5%)	426 (2%)
Tons	244,100	212,600 (87%)	11,200 (5%)	1,300 (0.5%)	8,600 (3.5%)	2,800 (1%)
Value, $ (M)	136.8	118.9 (87%)	6.5 (5%)	0.73 (0.5%)	4.2 (3%)	1.5 (1%)

PEARS	U.S. Total	Washington	California	Oregon	Virginia
Acres	2,145	1,319 (61.5%)	212 (10%)	344 (16%)	60 (2.8%)
Tons	21,900	17,200 (78.5%)	88 (0.4%)	2,500 (11.4%)	22 (0.1%)
Value, $ (M)	16.2	12.8 (74%)	0.9 (5.5%)	1.4 (8.6%)	1.6 (1%)

APPLES + PEARS	U.S. Total	Washington	California	Oregon	Arizona, Colorado, Virginia
Acres	22,154	14,324 (65%)	3,404 (15.4%)	582 (2.6%)	1,509 (6.8%)
Tons	266,000	229,800 (86.4%)	11,288 (4.2%)	3,800 (1.4%)	11,422 (4.3%)
Value, $ (M)	153.0	131.7 (86.1%)	7.9 (5.2%)	2.1 (1.4%)	7.3 (4.8%)

[5] USDA-NASS 2007 Census of Agriculture – Organic Production Survey (2008).

Consumers are usually willing to pay more, *i.e.*, a "premium", for organic fruit compared to conventionally grown fruit of the same variety/size/grade class. However, premiums vary by variety and from year to year based upon supply and demand market forces.[6] Five-year average FOB premiums for all varieties in Washington State[7] were $6.47 per box for apples and $9.66 per box for pears.[8] While the Granatstein survey reveals grower sentiments and qualitative assessments concerning the loss of the antibiotics for fire blight control, it does not attempt to quantify the potential economic loss to U.S. growers of organic apples and pears should they be forced to battle fire blight without antibiotics. However, it is possible to estimate the economic impact should this occur based on the Granatstein survey results and known price/volume data for organic apples and pears.

If, as Granatstein's survey indicates, 92% of PNW organic apple and pear growers (who produce 88% and 90% of all organic apple and pears, respectively, in the U.S.) reduce or eliminate production in response to prohibition of antibiotics for fire blight control, a loss coefficient for this action can be applied to the value of the total U.S. organic apple and pear market. Using PNW production and organic price premium data and a range of potential loss coefficients (50%, 60% and 70%), the economic impact to the U.S. organic apple and pear market – if antibiotics are prohibited for fire blight control – may be estimated by the following equation:

$$EI_{ap} = \left[\frac{(B_a \times P_a)C_a}{F_a}\right] + \left[\frac{(B_p \times P_p)C_p}{F_p}\right]$$

Where:

EI_{ap} = the Economic Impact to the organic apple and pear market if antibiotics are not allowed for fire blight control, and, for apples –
B_a = boxes organic apples produced
P_a = 5-year average premium for organic apples (averaged over all varieties)
C_a = market loss coefficient if antibiotics for fire blight prohibited, apples
F_a = fraction Washington organic apples in relation to total U.S. production

[6] Premiums for organic apples and pears are normally established once per season by fruit brokers and wholesalers. On rare occasion, organic premiums have dropped to zero in certain years for certain varieties when production for that particular variety has overtaken consumer demand.

[7] Average premiums for organic apples and pears produced and sold in other states may be slightly higher or lower, but with Washington producing 87% of the organic apples and 65% of the organic pears in the U.S., its premiums for organic pome fruit tend to set the U.S. standard.

[8] Five-year averages (2004/05 through 2008/09) from Tables A20 and A27, pages 32 and 34, *In* Status of Organic Tree Fruit in Washington State and Other Regions: 2010. See at: http://www.tfrec.wsu.edu/pdfs/P2191.pdf Premiums were calculated using unpublished Washington Growers Clearing House Association data (all grades & sizes, CA and regular storage). Note: a "box" of apples weighs, on average 42 lbs. A "box" of pears weighs, on average, 44 lbs.

Likewise for pears:

B_p = boxes organic pears produced
P_p = 5-year average premium for organic pears (averaged over all varieties)
C_p = market loss coefficient if antibiotics for fire blight prohibited, pears
F_p = fraction Washington+Oregon organic pears in relation to total U.S. production

In Washington alone 6.68 million boxes of organic apples were sold in the 2010/11 season. In the PNW (Washington and Oregon) 711,619 boxes of organic pears were sold during the same 2010/11 season.[9] Table 2 presents economic impact (EI_{ap}) using the equation given above to the U.S. organic apple and pear market assuming 50%, 60% and 70% reductions organic apples and pears in response to the prohibition of antibiotics for fire blight control.

Table 2. Estimated Economic Impact to U.S. Organic Apple and Pear Market if Antibiotics Not Permitted for Control of Fire Blight.

Crop	Boxes Sold (million)	Avg. Premium, $/box	Total Organic Premium*	Economic Impact at Loss Coefficient**		
				50%	60%	70%
Apples	6.68	$ 6.47	$ 43,219,600	24,838,851	29,806,621	34,774,391
Pears	0.71	$ 9.66	$ 6,874,239	4,161,162	4,993,394	5,825,627
Total	**7.39**	---	**$ 50,093,839**	**29,000,013**	**34,800,015**	**40,600,018**
Reduction in Total Organic Premium:				**-57.8%**	**-69.5%**	**-81.0%**

*For apples, Washington State only; for pears Washington + Oregon only.
**Loss coefficients = estimated reduction in total organic U.S. apple and pear market value if antibiotics not permitted for control of fire blight in organic apples and pears.

Should the use of antibiotics be prohibited by the NOSB for fire blight control and 50% to 70% of the U.S. organic apple and pear is no longer able to be marketed as "organic" (not an unrealistic assumption according to the Granatstein surveys), financial losses are estimated at $29 M to $40 M with total organic premiums being reduced by 58% to 81%, respectively (Table 2). Such losses would also occur rapidly as growers would not delay their decision regarding fire blight control measures. Further, this adverse economic impact on the U.S. organic apple and pear market would be borne primarily, if not exclusively, *by growers* since the loss of organic premiums would have a direct and immediate effect on their operations. Wholesalers and retailers would look for alternate sources of organic apples and pears while retail prices may increase as consumers would be presented fewer choices for organic apples and pears if supply fails to keep up with demand. Yet the brunt of the economic impact would be borne by U.S. organic apples and pear growers no longer receiving the premiums they once did for their fruit.

[9] *Ibid*, pages 1 and 2.

Although organic apple and pear growers are overwhelmingly opposed to the loss of antibiotics for fire blight control until non-antibiotic alternatives can be fully developed and proven, there is general recognition among growers, researchers and the various organizations representing the U.S. apple and pear industry, that streptomycin and (oxy)tetracycline will ultimately be removed from the National List by the NOSB. Yet, to de-list these critical fire blight tools *before* equivalent biological alternatives can be fully developed and perfected will put large acreages of organic apples and pears (and their business operations) at great financial risk. If this happens, the logical response for many organic pome fruit growers will be allow their "organic" acres to return to "conventional" acres. In other words, many if not most organic pome fruit growers will continue to use streptomycin and/or oxytetracycline for fire blight control rather than risk losing their orchards by relying on biological products that do not (yet) deliver the same degree of control as does streptomycin.

Summary of Point 1.

The growth of the organic apple and pear industry has been driven over the past decade in no small measure by the fact that streptomycin and oxytetracycline have been defined as exempt substances on the National List thus allowing the option for their use by organic apple and pear growers when faced with severe fire blight conditions. Fire blight epidemics have utterly destroyed entire orchards causing millions of dollars in losses in various apple and pear growing regions, not only in the U.S. but in Europe as well. In view of this reality, the premature loss of streptomycin (and oxytetracycline) from the National List will undoubtedly lead to a significant reduction in organic apple and pear acreage and the reversion of these organic orchards to conventionally-managed orchards. Although non-antibiotic alternatives to streptomycin and oxytetracycline for fire blight control have been developed, none has demonstrated consistently equivalent performance compared to streptomycin in the face of severe fire blight pressure. This is discussed further in the next point of this petition.

A reduction in organic apple and pear acres in response to the loss of antibiotics for fire blight control would result in corresponding losses for organic premiums directly to organic apple and pear growers. The resulting economic impact on the U.S. organic apple and pear markets would be rapid and significant. Organic apple and pear growers recognize and support efforts to develop effective biological alternatives to antibiotics for fire blight control. Further, there is generally wide-spread recognition among apple and pear growers of the will expressed by a majority of NOSB members to de-list antibiotics for fire blight control; the critical matter is *when* to do so. If the NOSB takes this action before effective alternatives are fully developed and perfected, growers of organic apples and pears will be forced to choose between using a fire blight control product with proven reliability, *i.e.*, streptomycin and/or oxytetracycline and

thereby returning their organic apple and/or pear orchards to conventional production, *or* risking their entire organic pome fruit investment with biological alternatives for fire blight control that, so far, have failed to deliver consistently equivalent performance under severe fire blight pressure compared to antibiotics.

2. The loss of streptomycin for control of fire blight in organic apples and pears is unwarranted and unwise since biological alternatives to streptomycin currently available have not demonstrated consistent and a comparable level efficacy under severe fire blight disease pressure.

The research and development for alternatives to streptomycin and oxytetracycline for fire blight control has been on-going since the 1980s and has been supported by four major "stake-holders" – growers, researchers, trade organizations and commercial manufacturers. Nationally, apple and pear growers have invested more than $600,000 to support research of non-antibiotic fire blight controls and practices. At the federal level, the USDA-Agriculture Research Service (ARS) supports key research programs on non-antibiotic fire blight control in Wenatchee Washington, Kearneysville, West Virginia and Geneva, New York with a cumulative investment to date exceeding $5 million with additional USDA funds exceeding $1 million.

<u>Currenly registered "biologicals" for fire blight</u>
Several commercial companies have introduced multiple biological fire blight control products beginning in the 1990s. These include –

- Blight Ban A506 (*Pseudomonas fluorescens* strain A506)
- Blight Ban C9-1 (*Pantoea agglomerans* strain C9-1)
- Serenade Max (*Bacillus subtilis* QST 713)
- Bloomtime™ Biological FD (*Pantoea agglomerans* strain E325)
- Blossom Protect™ (*Aureobasidium pullulans* strain DSM 14940/41)

All of the above (and other products not yet registered) have been tested extensively as replacements for antibiotics in different regions of the country by various plant pathologists and field extension personnel in multiple university and extension locations across the country. In perhaps the most extensive field testing east of the Mississippi, Sundin *et al*. (2009) evaluated multiple biological treatments over 7 years in Michigan, Virginia, and New York and found these products exhibited low efficacy and high year-to-year and location-to-location variability, though when sequenced with antibiotics, *i.e*., streptomycin, fewer streptomycin applications

were generally required. Based on their results, Sundin *et al.* (2009a) concluded that "…the prospects for biological control of fire blight in the eastern United States are currently not high."

Kunz *et al.* (2011) report on a relatively recent introduction, Blossom Protect™, a live formulation of naturally occurring yeast commonly found in orchards. Field evaluations of Blossom Protect™ against fire blight in apples and pears are ongoing. In Washington, Smith (2011) summarized multiple years' field trials on both apples and pears and found that Blossom Protect™ delivered, on average, fire blight control somewhat less than with streptomycin and comparable to oxytetracycline while Serenade delivered considerably less control than streptomycin and well below that of oxytetracycline. A number of other products (biological and antibiotics – some registered, some not) were also included in Smith's summary (See Figure 1).

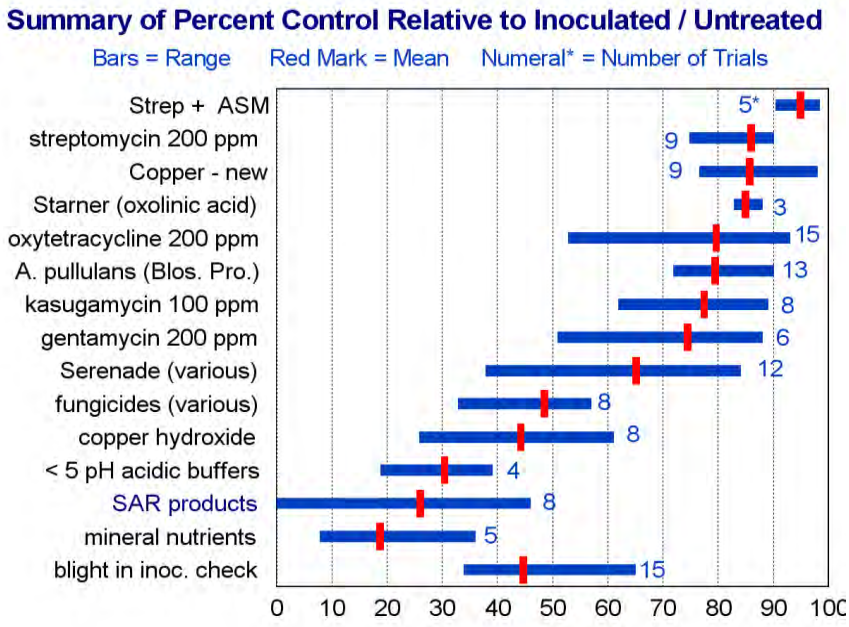

Figure 1. Summary of "percent control" of blossom infection in the past 10 years of similar fire blight control material trials in eastern Washington. [Strep=streptomycin; ASM= acibenzolar–s-methyl; Blos. Pro.=Blossom Protect™; SAR=systemic acquired resistance; inoc.=inoculated]

Experience by researchers in Oregon (Johnson, unpublished data) and California (Zoller, 2011) has been similar, although recent trials in Oregon indicate applications of Bloomtime™ Biological FD followed by Blossom Protect™ may provide fire blight control similar to streptomycin and/or oxytetracycline.[10] These results suggest Bloomtime™ Biological FD

[10] Ken Johnson, Oregon State University, personal communication to David Granatstein, 2011.

provides protection against fire blight on the flower stigmas while later application of Blossom Protect™ provides protection against fire blight in the flower nectary. Adaskaveg and Gubler (2010) evaluated Blossom Protect™ on pears in California and their results indicated the product delivered fire blight control comparable to streptomycin and oxytetracycline. Yet Sundin *et al.* (2009b, 2010) found in Michigan, that four applications of Blossom Protect™ on apples did not provide fire blight control anywhere near to streptomycin (64% vs. 98% control, respectively) in two of three years when disease pressure was moderate and high.

Although Blossom Protect™ appears to be a leading streptomycin/oxytetracycline replacement candidate for fire blight control several practical issues that stand in the way. First, product labeling does not allow mixing it with lime sulfur, sulfur or copper; nor can it be used within 25 hours (before or after) of these materials. These limitations represent serious challenges for growers who must use one of these materials for bloom thinning or control of apple or pear scab. Second, product labeling prohibits application when fruit are present since fruit russetting may occur as a consequence. This presents serious problems to growers needing fire blight protection on secondary bloom (also known as "rat-tail" bloom) since in western states infection of secondary bloom usually results in the greatest amount of fire blight. Unless and until these limitations can be resolved, the likelihood that Blossom Protect™ can provide the same level of fire blight control as streptomycin is remote. Nevertheless, a four-year project (begun in 2011) funded by the USDA Organic Agriculture Research and Extension Initiative (OREI) will further validate efficacy of biological fire blight control products, design suitable integrated fire blight control programs, and educate growers to results from these efforts.

Copper

Certain copper products are already used by organic growers during the dormant season to help suppress fire blight bacteria in cankers on the trees. New copper formulations are being tested for use during bloom and have shown generally positive results (see Fig. 1). However, additional experience is required to allay concerns about fruit russetting (which renders the fruit unmarketable) particularly in pears as a result from copper applications after dormancy. It is also unknown if the manufacturers of these new copper formulations will petition for their inclusion on the National List (or with OMRI) and thus their availability to organic growers is not certain. Regardless, copper products are not likely to be a suitable long-term replacement for antibiotics since copper, although an essential plant micronutrient, is a heavy metal that persists in soils and therefore has potential for environmental contamination.

Other Possibilities

Research on fire blight biology and other possible controls is on-going and includes identifying stigma exudates and defining their role as a microbial food source, water dynamics and osmotic adaptation possibilities; additional work by multiple researchers is investigating the use of bacteriophages attached to other bio-control organisms (Johnson *et al*., 2000, Johnson *et al*., 2009, Pusey *et al*., 2009).[11] Alternatives to antibiotics have been actively pursued by researchers and industry for several decades, with a significant infusion of grower funds for their evaluation. As discussed above, several biological control materials are now registered for use by organic growers for control of fire blight in apples and pears. However, availability does not equate to demonstrated equivalence with the material they are intended to replace (also shown above). At this time, the tools for non-antibiotic control of fire blight for organic apple and pear growers are not sufficiently proven to replace streptomycin and/or oxytetracycline. Although some growers have reported success with non-antibiotic treatment programs, these programs have not been widely tested in the diverse growing environments across the country over multiple years under high fire blight pressure.

Cultivars and rootstocks

No domesticated apples or pears are known to have complete immunity to fire blight; all will become infected under high risk conditions. Once infected, greater resistance (or tolerance) leads to less spread of the disease in the tree and less damage. 'Red Delicious' has the greatest level of resistance of all major apple cultivars in wide commercial use, but can still suffer 45 – 65% infection of blossoms if untreated with antibiotics. As a rule, the older the tree, the more resistant it is to fire blight damage, and older wood on a tree is more resistant than young wood on the same tree. Different plant parts show varying susceptibility. For example, flowers of 'Red Delicious' are very susceptible, but the young wood is not; thus bacteria entering through the flower usually do not spread very far down the branch and damage is generally limited when this cultivar becomes infected.

Virtually all commercial apple orchards are planted with grafted trees; therefore fire blight resistance of both the scion (top) and rootstock must be considered. Fire blight susceptibility in an apple cultivar is increased by grafting to fully dwarfing rootstocks. These rootstocks lead to flowering at an earlier age (when the tree is more susceptible) and to more secondary bloom (which occurs in warmer weather with higher infection risk). Dwarfing rootstocks have essential horticultural characteristics needed for commercial apple production but the dominant dwarfing rootstock, M.9, is highly susceptible to fire blight. The new 'Geneva' rootstocks have a high level of fire blight resistance, if not immunity, and desirable horticultural qualities, but are only available commercially in limited quantities. While a rootstock with high resistance to fire blight

[11] Larry Pusey, USDA-ARS, personal communication to David Granatstein, 2011.

may survive an infection that kills the grafted scion, this resistance is not transferred upward. Resistant rootstocks may survive during an epidemic but their resistance cannot prevent infection of flowers, buds and stems; therefore control measures are still essential in orchards planted on highly resistant/immune rootstocks.

Pears show less variation in resistance to fire blight and are generally more susceptible than apples. Many pear orchards are decades old and these large trees may become infected but are less likely to die than young trees. 'Bosc' pear is particularly susceptible to fire blight, and even 15 – 20 year-old trees can die. But since 'Bosc' produces minimal late bloom, it generally escapes infection with bloom occurring during cooler periods that are not high risk for infection. The "blight resistant" cultivars that have been developed by various pear breeding programs around the world have not been popular with growers or customers, and are more tolerant of blight, not highly resistant.

Plant breeding for fire blight resistance

Until relatively recently, most apple (and pear) breeding programs have focused on the eating quality of the fruit, as this will determine the economic viability of the cultivar. Yet breeders are now increasingly screening for horticultural traits in addition to fruit quality attributes; with the advent of genome mapping and marker-assisted breeding, it has become easier to screen for specific traits such as fire blight resistance. North American apple scion breeders have seldom actively bred for fire blight resistance, while some European breeders have. For example, the apple breeding program at Dresden-Pilnitz has produced several selections in the Re series with enhanced resistance to fire blight and commercially acceptable fruit quality. Some of the current work involves the use of molecular biology approaches, but only uses genes from *Malus* species, a *cis-genic* approach versus transgenic. This allows a known variety with established consumer acceptance to have its resistance increased; whether *cis-genic* varieties would be approved or even regards as "organic" is uncertain.

Planting fire blight resistant orchards

The life of a modern apple orchard is generally 15 – 20 years; for pears 30 – 100 years. Replanting an orchard is a very expensive process costing $12,000 – $22,000 per acre to remove the old trees, remediate the soil, plant new trees and install the support systems. When replanting an apple orchard, a grower could replace both the scion and rootstock with more fire blight resistant choices if: 1) there is a market for the fruit, 2) the scion is available, and 3) the rootstock is available. Specific scion/rootstock combinations must be ordered from a nursery several years in advance. Due to limited supplies of fire blight resistant 'Geneva' rootstocks, a decision to replant today would not likely be completed for 2 – 8 years. Alternatively, an apple

grower could remove fire blight susceptible scion and re-graft a new more resistant scion. This would cost less than removing and replanting and would improve scion resistance but would not affect rootstock resistance to fire blight.

Apples, and to some extent pears, are one of the few food items sold by cultivar name in the U.S. Therefore, switching to an unknown, fire blight resistant, variety having high consumer appeal (high eating quality) entails a significant risk to the grower. Until the consumer market is developed for a new variety, it is not possible to sell significant volumes through commercial channels. As well, developing consumer recognition and acceptance of a new variety is a multi-year and multi-million dollar process, with no guarantee of success. Thus, it is unrealistic to ask organic growers to assume the market risk of planting acreage of a new fire blight resistant variety with no advance consumer recognition and demonstrated willingness to purchase. Introducing a truly fire blight resistant apple or pear variety will likely occur over a period of many years and therefore is not a short-term solution to the phase out of antibiotics for fire blight control.

Summary of Point 2

Research to develop non-antibiotic fire blight products has been conducted for more than 30 years. These efforts have been funded and supported by growers, the USDA and state extension services. In addition, multiple biological fire blight control products have been introduced and commercialized in the past decade and their performance in apple and pear orchards has been independently assessed by various research plant pathologists and pomologists across the U.S. While promising, none of these "biologicals" has demonstrated a comparable level of fire blight control vs. streptomycin over multiple seasons across multiple locations. At best, they appear to offer greatest control of fire blight when integrated with streptomycin and/or oxytetracycline applications – an option clearly unacceptable to the NOSB. Various non-antibiotic products for control of fire blight have been evaluated under research trial conditions. New formulations of copper appear efficacious yet the status of copper as a heavy metal may pose environmental concerns while field trials in the PNW with various systemic acquired resistance (SAR) products have shown poor performance against fire blight.

The planting of resistant cultivar varieties and rootstocks is often suggested as a logical way to avoid the use of antibiotics for fire blight control. Yet there are two major flaws with this simplistic solution, aside from the significant cost and time to market: 1) virtually all cultivar varieties of apples and pears are susceptible to fire blight – some are just less susceptible than others, and 2) those cultivar varieties least susceptible to fire blight *e.g.*, 'Red Delicious', generally have relatively low organic market appeal and thus usually the lowest organic

premiums. Since organic apple and pear growers are businessmen and business women, choices made regarding cultivar varieties to plant are fundamentally economic decisions designed to provide the highest possible return on investment (ROI). It does not serve their interests to plant cultivars with low-to-non-existent organic premiums. Nor is it fair that organic apple and pear growers bear the cost of changing consumer preferences to cultivars that may be more resistant to fire blight.

Although 'Geneva' rootstocks show high resistance (if not immunity) to fire blight, this resistance does not transfer to the scion portion of the tree. Therefore, rootstock resistance/imunity does not obviate the requirement to control fire blight in the orchard – whether with antibiotics or biological control agents. Breeding fire blight resistance into apple and pear cultivars may be possible, but this would be a very long-term solution and the prospect of genetic engineering for fire blight resistance, even with genes from *Malus* species, may be unacceptable to a broad segment of organic apple and pear growers and to the NOSB. The best solution currently available appears to be a combination of "biologicals" with streptomycin and/or oxytetracycline applied to resistant cultivar varieties having high consumer appeal planted on 'Geneva' rootstocks.

3. **The removal of streptomycin from the National List for control of fire blight in organic apples and pears is not supported by –**
    a. **a broad segment of growers, packers and shippers of organic apples and pears;**
    b. **major university and federal scientists conducting research on fire blight and the exploration of alternatives to conventional antibiotics for fire blight control, and**
    c. **a wide range of state, regional and national commissions, boards, councils and leagues representing apple and pear growers.**

The petitioners canvassed pome fruit growers and representatives from among the apple and pear growing industry and asked the following question – *"How would the loss of streptomycin affect your commitments to your organic production of pome fruit?"* In the case university researchers and state extension personnel/crop advisors having extensive experience in fire blight research and/or investigation into alternatives to tetracycline (or antibiotics in general) for the control of fire blight, the question was –*"Can the currently available non-antibiotic fire blight control products deliver equivalent performance to streptomycin (or oxytetracycline if you are in a streptomycin-resistant location) in the face of severe fire blight pressure?"*

Responses to this question were submitted via email to petitioner and are reproduced below:

Name: Timothy J. Smith
Contact Information: Phone, 509-667-6540 **EMAIL** smithtj@wsu.edu
Affiliation: Washington State University
Position: Regional Extension Specialist, Tree Fruit Pest Management. Plant Pathology emphasis.
Comments: I have been working 32 years on the practical aspects of fire blight control with fruit growers in the Pacific Northwest, with multiple contacts and presentations in other USA regions, and several countries around the world. Having attended the ISHS World Workshop on Fire Blight each of 10 meetings held since 1983, I have had opportunities to be informed about almost all world-class scientific research on fire blight control, including many trials including non-antibiotic options. I have also conducted large preventive spray material efficacy trials for about 20 years, using intensive methods approved by other scientists and required by international agreements. In these trials, I have tested many products proven or claimed to reduce fire blight infection. I have not tested all products that make this claim, because there are new products that seem to arise each year, untested, but claiming to control blight; and it takes a few years to put them into a valid test. I have had some success with a very few non-antibiotic control products, but these product are at this time, considered supplemental to, not replacements of, antibiotics. The use of the most effective products are critical for fire blight management, as 99% control of blight will still lead to severe orchard damage after an infection event, as there are hundreds or thousands of flowers on each host tree, and each one is a potential infection site. Antibiotics approach this control level, non-antibiotic products usually control blight at 50 to 80%, a level that is effective only in low disease pressure situations. While a very few non-antibiotic materials appear promising in trials, and are currently being included in tests of prevention programs, adequate control of this critical disease to the necessary degree requires all available resources, including antibiotics. Those of us in the fire blight control world are working to make it possible to do without antibiotics, but that hasn't happened yet.

Name: David Granatstein
Contact Information: Tel 509-663-8181 granats@wsu.edu
Affiliation: Washington State University
Position: Sustainable Agriculture Specialist
Comments: After reviewing relevant published literature and discussing the situation at length with the leading fire blight researchers in the region, eliminating antibiotics at this time appears to be premature. Previous attempts to replace antibiotics with the biocontrol

products have not been consistently successful. Newer efforts to integrate this products in different sequences and with other potential management are showing more promise, however, this has been done primarily in small research trials and is not ready for widespread grower use. Based on the progress, it appears that non-antibiotic fire blight control regimes at commercial scale may be ready to use in 4-6 years, particularly in regions such as the Pacific Northwest. This spring did have some extreme fireblight infection periods during which the most promising product, Blossom Protect, probably would not have worked on a commercial scale due to label restrictions and the particular weather and pattern of bloom development. Given the risk that a fire blight outbreak poses, it is not surprising that organic growers whom I have surveyed on this issue are very reluctant to lose the last line of defense they have and many would exit organic production with the phase-out of antibiotics.

Name: Allyn Anthony
Contact Information: Tel 269.424.3990 MIHortSociety@aol.com
Affiliation: Michigan State Horticultural Society
Position: Executive Secretary
Comments: Biological alternatives for fireblight management are currently not acceptable replacements for antibiotics. Fire blight continues to present a serious threat to organic apple and pear fruit production across the United States. Fire blight is especially troublesome in the areas with temperate climates like the North Eastern United States. Presently there are no suitable replacements for antibiotics in these. New alternatives are continually being researched but have been slow to develop. It is my strong opinion that if we lose Streptomycin we will face an immediate and severe reduction in the amount of certified organic apple and pear acreage in the Midwestern and Eastern states.

Name: George W. Sundin
Contact Information: 517-355-4573; sundin@msu.edu
Affiliation: Michigan State University
Position: Professor of Plant Pathology
Comments: There are no suitable alternatives for streptomycin (or oxytetracycline in a resistance situation) for fire blight blossom blight control. In organic orchards, only Serenade MAX and bacterial antagonists are available. These provide partial control at best and are inconsistent year-to-year. In the face of severe fire blight pressure, the only result imaginable is a disease epidemic. The economic realities of apple and pear production necessitate the growth of cultivars that are highly susceptible to fire blight. The only way that growers can adequately handle disease pressure is to use well-

timed applications of antibiotics. Disease forecasting models provide the basis for growers to best time their streptomycin (or oxytetracycline) applications and maximize disease control.

Name: Jake and Zach Koan
Contact Information: 810.659.6568
Affiliation: AlMar Orchards, Flushing MI
Position: 4th generation apple farmers
Comments: My Brother and I have been organic farmers for most of our lives. We produce about 50,000 bushels of apples yearly and are in the process of putting in more trees and growing our farm to nearly 100,000 bushels per year. We have heard that streptomycin is in consideration at the next meeting to be reviewed and most likely thrown out of the "allowed chemicals" to control fire blight in apples. As an experienced apple grower, I know that in 1 out of every 4 years when the temperature, precipitation and blight conditions are right, streptomycin is critical to control our orchards from a total disastrous loss. To my knowledge, there are not any antibiotics out there that compare in the effectiveness that streptomycin has. It will cost a lot of money and time for the universities and other scientists to be able to produce others means of 100% effectiveness in controlling fire blight in organic apple orchards at this time, and we are in no condition to totally eliminate streptomycin at this time. If streptomycin is removed from the allowed substances in organic production in apples, I am sorry to say this, but I will be forced to transition my 300+ acres back to conventional apples. I will not be able to afford the total loss of my apple trees due to this terrible disease. It takes years to establish the orchard that we have, and I will take every precaution in preventing my farm from going broke, even if the last thing to do is go against all our values, and that is transitioning back to conventional apple production.

Name: David Rosenberger
Contact Information: Phone 845-691-7151 EMAIL: dar22@cornell.edu
Affiliation: Cornell University
Position: Professor of Plant Pathology (extension/research on tree fruit)
Comments: I am writing to inform you that streptomycin and oxytetracycline, antibiotics used to control fire blight in apples and pears, are essential for organic producers in all locations east of the Rocky Mountains. Rainfall during bloom can spread fire blight bacteria, and blossom infections can severely devastate older trees and kill trees less than 10 years old. Investing $10,000 to $20,000 per acre to plant a new organic apple orchard would be an extremely foolish venture if one knew from the outset that the total

investment could be lost to fire blight in any given year. If there is no approved way to control fire blight, then university researchers like me who have committed some of their time to trials with OMRI-approved products will also cease further work on organic apple and pear production. Why would I want to waste my time on research for a system with a fatal flaw that almost ensures failure for growers attempting to grow apples and pears organically? Fire blight CANNOT be controlled effectively or consistently in without antibiotic treatments. Sanitation does not work because an infected tree within a mile can provide inoculum for infections in unprotected orchards. Farmers have neither the time nor the authority to remove all of the blighted trees that might be located on properties with a mile of their orchard. Biorational products like Serenade are registered to control fire blight, but extensive research has shown that they have almost no value when used alone and are only marginally effective when used in alternations with standard antibiotic treatments (see Plant Disease 93:386-394 [2009]). This is especially true under east-coast conditions where frequent rains remove residues that required for these products to work at all. Apple and pear cultivars vary somewhat in susceptibility to fire blight, but no cultivars are completely resistant if hot weather and rains or dews during bloom create ideal conditions for blossom blight infection. Without strep or oxytet, organic pome fruits will all come from WA or OR. It may not matter, because many eastern consumers are already learning to prefer "buy local" rather than choosing organic, especially if the only sources of organic apples and pears are large corporate farms in the Pacific Northwest.

Name: Dr. J. E. Adaskaveg
Contact Information: 951-288-9312
Affiliation: University of California at Riverside, Department of Plant Pathology
Position: Professor
Comments: No I do not think that there are alternatives that are equivalent in performance to streptomycin or oxytetracycline for managing fire blight at this point in time. I support the request to re-instate streptomycin and oxytetracycline to the organic list beyond the current "sunset" dates for each material. Furthermore, I support the addition of kasugamycin to the organic list when it becomes registered. I have evaluated all the current registered and numerous non-registered products that available for testing against fire blight in my research program supported by the California Pear Board and the California Apple Commission. To my knowledge and direct experience, no other products are equivalent to the antibiotics streptomycin, oxytetracycline, or kasugamycin.

Name: Matthew J. Grieshop Ph.D.

Contact Information: (517) 432-8034, grieshop@msu.edu
Affiliation: Michigan State University, Department of Entomology, East Lansing MI
Position: Assistant Professor — Organic Pest Management
Comments: Biological alternatives for fireblight management are currently not acceptable replacements for antibiotics. Fire blight continues to present a serious threat to organic apple and pear fruit production across the United States. Fire blight is especially troublesome in the areas with temperate climates like the North Eastern United States. Presently there are no suitable replacements for antibiotics in these. New alternatives are continually being researched but have been slow to develop. It is my strong opinion that if we lose Streptomycin we will face an immediate and severe reduction in the amount of certified organic apple and pear acreage in the Midwestern and Eastern states.

Name: Dan Griffith
Contact Information: dang@gslong.com
Affiliation: GS Long, Yakima WA
Position: Tree Fruit Consultant
Comments: I am a tree fruit consultant for GSLong in Yakima. I was with WECO for 17 yrs, & have been with GSLong for 14 yrs. I consult on 1000's of acres, & have a lot of experience fighting fire blight, both conventionally & organically. There is no way any of the antiobiotic free programs can compare with the antiobiotic programs when fighting fireblight. Without antiobiotics, both streptomycin & mycoshield, there are some areas in the state that would be devastated by blight. The non antiobiotic programs help us, & are an important part of the whole blight program, but they definitely are not a stand alone program. We try not to overuse antiobiotics, but they are critical in having a successful program. Even though we realize strep resistance will happen quickly, we frequently use it as a silver bullet in our programs. Once we get resistance & quit using it, after a number of years, the blight will become susceptible again, just as it did recently. Most of the industry had massive strep resistance 20-30 yrs ago, we quit using it, then after a while, it started working again. There are some areas in the state which would be destroyed by blight on Pink Ladies, Jazz & Galas, due to their high risk locations, if they didn't have streptomycin & mycoshield. These areas are the Radar Ridge area, Basin City, Fishook Park, Prescott, Ringold, Finley, Taylor Flat road area north of Pasco. We call this area the blight corridor of Eastern Washington. It seems to get more dew than the Mattawa area, causing havic with growers. I'm sure you could get some direct testimonials from growers in these areas.

Name: Jackie Hoch

Contact Information: 616-490-7917, schwalli@msu.edu
Affiliation: Organic Tree Fruit Grower's Association
Position: President OTFA
Comments: OTFA supports the petition to put the sunset review back of streptomycin on the five-year schedule in 2017. We see the progress being made with alternative practices. We believe and want organic fruit to be antibiotic free in the future. We believe that the growers need to have more education on the new alternative practices to be successful in reducing the risk of fire blight.

Response from commissions, boards, councils and leagues representing apple and pear growers.

In addition to the above testimony from organic growers and researchers involved directly with fire blight, Table 3 lists organizations, commission, and boards representing apple and pear growers (both organic and conventional) across the U.S. that have reviewed this and endorsed petition on behalf of the thousands of apple and pears growers they represent.

Table 3. Apple and Pear Trade Organizations Supporting Petition to Remove Amended Sunset Date for Streptomycin on National List of Approved Substances.

Organization	No. Growers* Represented
California Apple Commission	70
California Pear Advisory Board	Approx. 180
Columbia Gorge Fruit Growers	440
Michigan State Horticultural Society	Approx 1,800
Northwest Horticultural Council	Approx. 3,700
New York Apple Association, Inc.	Approx. 700
Organic Tree Fruit Grower's Association	Approx. 40
Pear Bureau Northwest/USA Pears	Approx. 1,550
Tilth Producers of Washington	Approx. 400
U.S. Apple Association	Approx. 7,500
Washington Apple Commission	Approx. 2,200
Washington State Horticultural Association	Approx. 1,500
Washington Growers Clearing House	2,200+
Washington Tree Fruit Research Commission	†
Washington Growers League	407
Wenatchee Valley Traffic Association	‡
Yakima Valley Growers and Shippers Assoc.	‡

*Figure includes both organic and conventional growers of apples and pears.

†The Washington Tree Fruit Research Commission (WTFRC), though not directly representing growers as other organizations listed here, is a grower-funded, state commodity commission serving apple and pear growers through on-going research and education into a variety of areas related to tree fruit, including fire blight research and management.
‡This organization serves both the Washington Apple Commission and the Pear Bureau Northwest with a combined membership of approximately 3,750 growers.

In addition to the above, AgroSource, Inc. and Nufarm Americas, Inc., manufacturers and registrants of FireWall™ and Agri-Mycin®, respectively, agricultural streptomycin for control of fire blight in apples and pears, fully support this petition to the NOSB.

Summary of Point 3

A broad segment of pome fruit growers have indicated the removal of streptomycin from the National List will have serious repercussions to their commitments to continue producing organically grown apples and/or pears. They base their comments on the inescapable reality that fire blight epidemics continue to occur each year and consistently reliable alternative biological control measures in the face of a full-scale fire blight epidemic are not yet available. This point is further substantiated by the written testimony from a wide range of pomologists, field research scientists and state extension agents across the U.S. familiar with the current state of fire blight research and with the local conditions in which they conduct their research. Testimony from those most involved in fire blight research does not support the action taken by the NOSB to remove streptomycin from the National List based on the logic that alternative measures are available. In addition, various commissions, councils, research groups, boards and trade associations devoted to the research, production and promotion of apples and pears, collectively representing thousands of small, medium and large apple and pear growers – both organic and conventional, have endorsed this petition because they clearly recognize the adverse impact the loss of streptomycin will have on their grower members.

Petition Summary and Conclusions

The United States Department of Agriculture (USDA), Agricultural Marketing Service, 7 CFR, Part 205 – National Organic Program, Subpart G – Administrative, contains the National List of Allowed and Prohibited Substances (the National List) for use in organic agriculture. Within the National List §205.601 establishes that certain synthetic substances may be used in organic crop production provided the "…use does not contribute to contamination of crops, soil, or water." Streptomycin sulfate was added to the National List by final rule action in December 2000. The Organic Foods Production Act (OFPA) of 1990 mandates that each substance identified in §205.601 is subject to a sunset review process by the NOSB every five years. The first sunset review for streptomycin was conducted by the NOSB – Crops Committee in 2006 prior to its

sunset date of October 21, 2007. On April 20, 2006 the NOSB-Crops Committee voted to recommend renewal of streptomycin as an exempted substance on the National List. Subsequently, streptomycin for fire blight control was renewed to the National List on October 16, 2007. With a new sunset date of October 21, 2012, streptomycin would be removed from the National List pending a sunset review as per OFPA, a majority vote to recommend renewal by the Crops Committee as an exempted substance under §205.601, a vote by the NOSB to accept the recommendation and final rule adoption.

After a second sunset review of streptomycin in March 2011, the Crops Committee recommended to the NOSB against relisting streptomycin on the National List. However, on April 29, 2011 the NOSB voted (13 to 1) to keep streptomycin on the National List but to amend its listing under §205.601 by changing its sunset date (which would have been 2017) to an expiration date of 2014, thereby removing streptomycin from any further sunset reviews under OFPA and from the National List entirely effective October 21, 2014.

Original approval of streptomycin and tetracycline to the NOP National List in 2000 gave apple and pear growers the confidence to expand acreages devoted to these crops while facing possible outbreaks of fire blight. The result for the past decade has been a greater abundance of organic apples and pears for consumers and greater participation and acceptance on the part of apple and pear growers to the National Organic Program as well as many state organic programs. Should the expiration date for streptomycin be allowed to stand, the result will be a net reduction in the number of acres devoted to growing organic apples and pears – especially in the Midwestern and Eastern states – simply because the risk of growing these fruit crops without the option of streptomycin to control a fire blight epidemic is too great for most growers to bear. In the end, the loss of streptomycin (and tetracycline) will mean many – perhaps a majority – of organic apple and pear orchards will be converted back to conventionally managed orchards.

By the rule changes adopted on July 6, 2010 and April 2011, a process to remove streptomycin from the National List has been set in motion that fails to give adequate regard to the adverse consequences outline in this document such action will have on organic apple and pear growers in the United States. Petitioner requests an amendment to remove the expiration date and re-instate streptomycin into the sunset process under §205.601(i)(11) of the National List. A re-instatement of streptomycin to the National List for approved substances will give growers of organic apples and pears throughout the United States confidence to continue their production commitments and future plans while development of biological alternatives for the control of fire blight continues to advance.

The rapid growth in organic apple and pear acreage over the past ten years has justified and given impetus to significant research efforts focused on developing biological alternatives for the control of fire blight. If streptomycin is removed from the National List in 2014, the subsequent large-scale reductions in organic apple and pear acreages will undoubtedly lead to a reduction in research priority levels for biological alternatives to streptomycin. Therefore, maintaining streptomycin on the National List until 2017 is vital to not only existing growers of organic apples and pears in their annual battle with fire blight but for the continuation of multiple promising research efforts underway to develop viable biological alternatives to antibiotics for the control of fire blight in apples and pears.

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Appendix

Commercial labels and Material Safety Data Sheets (MSDS) for streptomycin sulfate products currently registered by the EPA for use on apples and pears ton control fire blight. These can be accessed by selecting the links below. These documents have also been attached to this petition.

Streptomycin Sulfate Product	Universal Record Locator (URL)	
Agri-Mycin® 17	Label	MSDS
AG Streptomycin	Label	MSDS
Bac-Master	Label	MSDS
Ferti-lome Fire Blight Spray	Label	MSDS
FireWall™ 17 WP	Label	MSDS
Streptomycin 17	Label	MSDS

Bac-Master™

PLANT PROTECTION

AGRICULTURAL STREPTOMYCIN

Active Ingredient:

Streptomycin Sulfate*	21.3%
Other Ingredients:	78.7%
Total:	100.0%

*(equivalent to 17% Streptomycin)

KEEP OUT OF REACH OF CHILDREN

CAUTION

SEE BACK OF BAG FOR USE DIRECTIONS

FIRST AID	
If on skin or clothing:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice
If in eyes:	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
If inhaled:	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. • Call a poison control center or doctor for further treatment advice.

HOT LINE NUMBER

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-323-264-3910 for emergency medical treatment information.

IMPORTANT:

Read the entire Directions for Use before using this product.

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

CAUTION. May cause allergic skin reactions. Do not breathe dust or spray mist.

Personal Protective Equipment (PPE)

Applicators and other handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes plus socks, and a dust/mist filtering respirator (MSHA/NIOSH approval number TC-21C), or a NOISH approved respirator with any R, P or HE filter. Follows manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry. This material is not to be used for medical, veterinary, or human purposes.

EPA Reg. No. 55146-80-5481 **EPA Est. No. 33967-NJ-1**

AMVAC

4100 E. Washington Blvd. • Los Angeles, CA 90023, USA
1-323-264-3910 • www.amvac-chemical.com

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove PPE immediately after handling this product. Wash outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Environmental Hazards

Do not apply directly to water, areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wastewater.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Do not apply this product through any type of irrigation system. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State of Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is:

- Coveralls
- Chemical resistant gloves made from any waterproof material
- Shoes plus socks

MIXING INSTRUCTIONS

Concentration Desired ppm*	Quantity Bac-Master per Volume of Water		
	50 gals.	100 gals.	500 gals.
50	2 oz.	4 oz.	20 oz.
60	2.4 oz.	4.8 oz.	1½ lb.
100	4 oz.	½ lb.	2½ lb.
200	½ lb.	1 lb.	5 lb.

*ppm = parts per million

SPRAY APPLICATION

CELERY*

(Florida Area) *Bacterial Blight*. Recommended concentration of 200 ppm. Apply first spray when seedlings are in the 2-leaf stage, when first true leaves appear. For follow-up spray schedule, apply at 4 to 5 day intervals. Continue applications until celery is transplanted in the field.

NET WT: **11634-1**

PHILODENDRON*

Bacterial Leaf Rot. Recommended concentration of 200 ppm. Apply first spray as preventative or at first signs of water soaked areas on leaf. For follow-up spray schedule, apply every 4 to 5 days. For curative action, remove all rotted leaves from plant and then spray at 200 ppm every 4 days.

TOMATOES, PEPPERS*

Bacterial Spot. Recommended concentration of 200 ppm. Apply first spray when seedlings are in the 2-leaf stage, when first true leaves appear. For follow-up spray schedule, apply at 4 to 5 day intervals. Continue applications until transplanted in the field.

DIEFFENBACHIA CUTTINGS*

Bacterial Stem Rot. Recommended concentration of 200 ppm. Soak cuttings in Bac-Master solution for 20 minutes. Plant cuttings in sterilized rooting medium. To check spread of *stem rot* in stock plants, use 100 ppm Bac-Master spray every 5 to 7 days.

CHRYSANTHEMUMS*

Bacterial Wilt. Recommended concentration of 50 ppm. Soak plant cuttings in Bac-Master solution for 4 hours; plant as usual.

ROSES*

(New Jersey Area) *Crown Gall.* Recommended concentration of 200 ppm. Remove infected plant. Cut out gall tissue. Soak the root system and cut surfaces on the infected area in Bac-Master solution for 15 minutes. Replant rose bushes in soil free of the crown gall organisms. Use 50 ppm Bac-Master in watering solution and in foliar sprays applied weekly, starting one week after planting as an adjunct to this treatment.

PEARS

Fire Blight. Recommend 24 to 48 oz. Bac-Master per acre (equivalent to 50 to 100 ppm at 600 gals. per acre). For first spray, spray trees at 20% to 30% of bloom. For follow up spray schedule, spray trees every 3 to 4 days during blossom time. Apply sprays after petal fall every 10 to 14 days to control *twig blight*. (This could mean an additional 6 to 8 applications after blossom sprays.) Do not apply within 30 days of harvest.

(West Coast Area) *Fire Blight.* Recommend 28.8 oz. Bac-Master per acre (equivalent to 60 ppm at 600 gallons per acre). Apply first spray at 10% bloom. For follow up spray schedule, repeat at 5 day intervals until all late bloom is over. (This could mean 12 to 15 applications.) Continue to spray at 5 to 7 day intervals to control shoot and fruit infections. Do not apply within 30 days of harvest.

ROSACEAE HOME GARDEN APPLE TREES, HOME GARDEN PEAR TREES, PYRACANTHA (FIRE THORN BUSH)

(California) *Fire Blight.* Recommended concentration of 100 ppm. Apply Bac-Master in foliar and blossom sprays. Apply first spray at start of blossoming period. Continue spray application every 3 to 4 days during blossom time. Apply additional sprays every 5 to 7 days after blossom period when weather favors spread of *fire blight*. Do not apply after fruit is visible.

APPLES

Fire Blight. Recommended concentration of 24 to 48 oz. Bac-Master per acre (equivalent to 50 to 100 ppm at 600 gallons per acre). For first spray, spray trees at 20% to 30% bloom. For follow up spray schedule, spray trees every 3 to 4 days during blossom time. Apply sprays after petal fall every 10 to 14 days to control *twig blight*. (This could mean an additional 6 to 8 applications after blossom sprays.) Do not apply within 50 days of harvest.

(West Coast Area) *Fire Blight.* Recommended concentration of 28.8 oz. Bac-Master per acre (equivalent to 60 ppm at 600 gallons per acre). Apply first spray at full bloom. For follow up spray schedule, apply at petal fall and late secondary bloom. Continue to spray at 5 to 7 day intervals to maintain disease control but, not later than 50 days before harvest.

POTATOES*

Soft Rot and Blackleg. Recommended concentration of 100 ppm. Soak cut seed pieces in Bac-Master solutions for several minutes; plant as usual. Do not use treated seed for food or feed purposes.

NOTE: A suitable fungicide (such as Captan or dithiocarbamates) should be used as an adjunct to this treatment for the control of fungal diseases associated with potato seed pieces.

TOBACCO*

Wildfire and Blue Mold. Recommended concentration of 100 ppm for preventative action. Apply first spray when plants are in the 2 leaf stage or about the size of a dime or when *blue mold* first appears in the area. For follow up spray schedule, repeat application at 5 to 7 day intervals until plants are set in the field. Additional protection may be obtained by spraying field plants with 100 ppm in a weekly spray schedule. Recommended concentration of 200 ppm for curative action. In locations where *wildfire* has been a problem in recent years or where applications have been delayed until disease appears, a spray of 200 ppm Bac-Master is recommended. Follow the same schedule as above.

*EXCEPT CALIFORNIA

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

Pesticide Storage: Keep tightly closed. Storage should be at a cool temperature when possible, and within minimum exposure to the atmosphere.

Container Disposal: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

Pesticide Disposal: Completely empty bag into application equipment. Then dispose of bag in a sanitary landfill, by incineration, or if allowed by State and local authorities, by burning. If burned, stay out of smoke.

For 24 hour emergency information, call 1-800-424-9300 (CHEMTREC), day or night.

Additional information regarding use of Streptomycin may be obtained from your local Agricultural Extension Agent or State Experimental Station.

This product contains a chemical (streptomycin sulfate) known to the State of California to cause reproductive toxicity.

LIMITED WARRANTY AND DISCLAIMER

The manufacturer warrants (a) that this product conform to the chemical description on the label; (b) that this product is reasonably fit for the purposes set forth in the directions for use, subject to the inherent risks referred to herein, when it is used in accordance with such directions; and (c) that the directions, warnings, and other statements on this label are based upon responsible experts' evaluations of reasonable tests of effectiveness, of toxicity to laboratory animals and to plants and residues on food crops, and upon reports of field experience. Tests have not been made on all varieties of food crops and plants, or in all states or under all conditions.

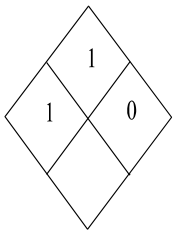
THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE SET FORTH HEREIN. THE MANUFACTURER NEITHER MAKES NOR INTENDS, NOR DOES IT AUTHORIZE ANY AGENT OR REPRESENTATIVE, TO MAKE ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, AND IT EXPRESSLY EXCLUDES AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE, OR ANY WARRANTY OF QUALITY OR PERFORMANCE. THIS WARRANTY DOES NOT EXTEND TO, AND THE BUYER SHALL BE SOLELY RESPONSIBLE FOR, ANY AND ALL LOSS OR DAMAGE WHICH RESULTS FROM THE USE OF THIS PRODUCT IN ANY MANNER WHICH IS INCONSISTENT WITH THE LABEL DIRECTIONS, WARNINGS OR CAUTIONS.

BUYER'S EXCLUSIVE REMEDY AND MANUFACTURER'S OR SELLER'S EXCLUSIVE LIABILITY FOR ANY AND ALL CLAIMS, LOSSES, DAMAGES, OR INJURIES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, WHETHER OR NOT BASED IN CONTRACT, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE, SHALL BE LIMITED, AT THE MANUFACTURER'S OPTION, TO REPLACEMENT OF, OR THE REPAYMENT OF THE PURCHASE PRICE FOR, THE QUANTITY OF PRODUCT WITH RESPECT TO WHICH DAMAGES ARE CLAIMED. IN NO EVENT, SHALL MANUFACTURER OR SELLER BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT.

AMVAC offers this product, and Buyer accepts it, subject to the foregoing Limited Warranty which may be varied only by agreement in writing signed by an authorized representative of AMVAC.

Amvac Chemical Corporation
4100 E. Washington Boulevard
Los Angeles, CA 90023 U.S.A.
1-323-264-3910
www.amvac-chemical.com

MATERIAL SAFETY DATA SHEET



1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME(S): Bac-Master™
GENERAL USE: Antibiotic for Agricultural Control of Bacterial Diseases in Plants
PRODUCT DESCRIPTION: Tan powder with a fermentation-like odor
EPA Registration Number: 55146-80-5481
MSDS No.: 306_2
Date This Revision: **17 April, 2007**

MANUFACTURER:
AMVAC CHEMICAL CORPORATION
4100 E. Washington Blvd.
Los Angeles, CA 90023-4406
Ph: 323-264-3910
FAX: 323-268-1028

EMERGENCY TELEPHONE NUMBERS:
MANUFACTURER: 323-264-3910
TRANSPORTATION (24 HOURS)
CHEMTREC: 800-424-9300
OTHER (24 HOURS)
AMVAC: 323-264-3910

2. COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT	WT%	CAS No.
Streptomycin sulfate [O-2-Deoxy-2-methylamino-alpha-L-glucopyranosyl-(1->2)-O-5-deoxy-3-C-formyl-alpha-L-lyxofuranosyl-(1->4)-N3,N3-diamidino-D-streptamine-sulfate (2:3)]	21.3%	3810-74-0
Inert Ingredients Includes traces of crystalline silica (quartz)	78.7%	N/A

OSHA HAZARDOUS COMPONENTS (29 CFR1910.1200)

COMPONENT	HAZARD	OSHA PEL*	ACGIH TLV*
Streptomycin sulfate	Antibiotic	Not established	Not established
Diluent	Irritant, possible carcinogen	15 mg/m^3 (total dust); 5 mg/m^3 (respirable dust)	3 mg/m^3 (respirable dust)
Crystalline Silica	Irritant, carcinogen	0.1 mg/m^3 (respirable dust)	0.05 mg/m^3 respirable silica)

* Exposure Limits 8 hrs. TWA

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

CAUTION! Potential Dust Hazard! Harmful if absorbed through skin. Causes moderate eye irritation. Avoid contact with skin, eyes or clothing. May cause allergic skin reactions. Do not breathe dust or spray mist.

KEEP OUT OF REACH OF CHILDREN!

May be toxic to aquatic plants. Do not contaminate water bodies with this product.

POTENTIAL HEALTH EFFECTS

ROUTE(S) OF ENTRY: Contact with the skin, eyes and inhalation of vapors or spray mist are most likely routes of entry.

SIGNS OF ACUTE OVEREXPOSURE: Exposure may cause skin or eye irritation. A skin sensitization (allergic) reaction may occur in some individuals. Antibiotics have the potential to significantly change the microflora of the intestine and allow overgrowth of nonsusceptible organisms.

SIGNS OF CHRONIC OVEREXPOSURE: Same as acute.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Preexisting skin diseases may be aggravated by exposure to this product.

4. FIRST AID MEASURES

EYES: Immediately flush the eyes with copious amounts of clear, cool running water for a minimum of 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eyes and lids with water. Contact a physician immediately. If there will be a delay in getting medical attention, rinse the eyes for at least another 15 minutes.

INHALATION: Remove victim to fresh air. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration. If breathing is difficult, give oxygen. Contact a physician immediately.

4. FIRST AID MEASURES, cont'd

INGESTION: Induce vomiting immediately by giving two glasses of water and giving Syrup of Ipecac according to directions on the bottle or by sticking finger down throat. Have the person sit up while vomiting to help prevent aspiration of the vomitus. Never give anything by mouth to an unconscious or convulsing person. Contact a physician immediately.

SKIN: Immediately flush all affected areas with large amounts of clear water for at least 15 minutes. Remove contaminated clothing. Do not attempt to neutralize with chemical agents. Wash clothing before reuse. If the clothing, including shoes, cannot be decontaminated, dispose of it as a hazardous waste. Contact a physician immediately.

NOTE TO PHYSICIANS: There is no specific antidote if this product is ingested. Be alert for possible intestinal obstruction. Treat symptomatically. An aqueous suspension of activated charcoal can be administered to absorb remaining toxicant.
Monitor serum aminoglycoside concentration, renal and eighth cranial nerve function carefully. Obtain baseline serum creatinine and BUN.
Observe for anaphylactic type reaction.
Maintain good urine output (3 to 6 mL/kg/hr) with IV fluids. Hemodialysis or peritoneal dialysis should be considered in the presence of renal failure.

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5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

Flash Point:	Not applicable
Autoignition Temperature:	Not available
Flammable Limits:	
Lower flammable limit:	Not applicable
Upper flammable limit:	Not applicable
Flammability:	This product will burn only in the presence of direct flame (NFPA rating = 1)

EXPLOSIVITY

Mechanical Impact:	Not explosive
Static Discharge:	Has not been tested

HAZARDOUS COMBUSTION PRODUCTS: During a fire, irritating and possibly toxic gases may be generated by thermal decomposition or combustion. Contact with the fumes and vapors should be avoided by staying upwind and by wearing impervious clothing and positive pressure self-contained breathing apparatus.

EXTINGUISHING MEDIA: Foam, dry chemical, carbon dioxide, water spray (fog).

5. FIRE FIGHTING MEASURES, cont'd

FIRE FIGHTING INSTRUCTIONS: Evacuate nonessential personnel from the area. Keep upwind. Wear self-contained breathing apparatus and impervious clothing, including gloves and eye protection. Clean all clothing before reuse. Severely contaminated clothing cannot be adequately decontaminated, and must be disposed as a hazardous waste. Shower with soap and water after contact with this product.

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6. ACCIDENTAL RELEASE MEASURES

GENERAL: Evacuate personnel and thoroughly ventilate the area. Due to the presence of a fine dust, this material can be an inhalation hazard, as well as a skin and eye hazard. Use adequate ventilation and appropriate personal protective equipment(See Section 8). Keep bystanders upwind and away from the spill.

SMALL SPILL: Cover with absorbent (clay, sawdust, straw, kitty litter, etc.) to prevent dust clouds when sweeping or vacuuming. Sweep into an open drum or vacuum. Decontaminate the area and equipment with dilute alkali or ammonia (less than 5% solution) and detergent. Flush the area with water. Absorb and sweep or vacuum into the same open drum. Close the drum and dispose of material as a hazardous waste.

LARGE SPILL: Dike the spill to prevent contamination of local water sources. Sweep or vacuum the solids into the original container or into a drum. Take care not to create dust clouds of toxic material. Clean the area as described for a small spill.

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7. HANDLING AND STORAGE

HANDLING: Wear appropriate personal protective equipment (PPE, Section 8)**.** Prevent skin contact. Do not breathe fumes or dust. Wash thoroughly and change clothes after handling. Keep product away from food, drink, cosmetics, and tobacco products. See product label or contact your local or national agricultural regulatory department for more detailed handling procedures.

STORAGE: Do not contaminate water, food or feed by storage or disposal. Store product in a cool, dry, locked place out of reach of children. Store in original container.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: A well-ventilated area, local exhaust ventilation, or other engineering controls are recommended for handling this product.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION, cont'd

RESPIRATORY PROTECTION: A NIOSH/MSHA (USA) or equivalent approved air-purifying respirator equipped with organic vapor cartridges or canisters may be used under certain circumstances where airborne concentrations may exceed exposure limits. For emergency and other conditions where the exposure limit may be greatly exceeded, use an approved positive-pressure, self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply. See label or contact your distributor for more complete instructions.

SKIN PROTECTION: Where contact is likely, wear chemical-resistant (such as nitrile or butyl) gloves, coveralls, socks and chemical-resistant footwear. For overhead exposure, wear chemical-resistant headgear. Always wash hands, face, and arms with soap and clean water before eating, drinking, using cosmetics, smoking, or going to the toilet. For more information see the product label or contact your distributor.

EYE PROTECTION: Safety glasses are needed whenever one is working with chemicals. Where eye contact is likely, use chemical splash goggles. See label or contact your distributor for more complete instructions.

OTHER PROTECTION: A safety shower and eyewash station must be present and working whenever personnel are working with this product.

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9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE:	Tan powder
ODOR:	Fermentation-like odor.
ODOR THRESHOLD:	None established
BOILING POINT:	Not available
FREEZING/MELTING POINT:	Not available
SPECIFIC GRAVITY:	0.227 g/mL
BULK DENSITY:	14 lb/ft^3
VAPOR PRESSURE (mm/Hg):	Not applicable
VAPOR DENSITY:	Heavier than air
PERCENT VOLATILE BY VOL:	Not applicable
SOLUBILITY (Water):	Inerts are dispersible in water, while the active ingredient (Streptomycin sulfate) is soluble in water
SOLUBILITY (Other):	This product is partially soluble in alcohols, ketones, and esters.
PARTITION COEFFICIENT (O/W):	Not applicable
pH (5% in water):	4.7
EVAPORATION RATE:	Not applicable

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10. STABILITY AND REACTIVITY

CHEMICAL STABILITY (Conditions to avoid): This product is stable under normal use and storage conditions.

INCOMPATIBILITY: Avoid strong oxidizers, strong acids, strong bases, heat, and sources of ignition.

HAZARDOUS DECOMPOSITION PRODUCTS: Heating product to decomposition will cause emission of acrid smoke and fumes of carbon oxides.

HAZARDOUS POLYMERIZATION: This product will not polymerize.

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11. TOXICOLOGICAL INFORMATION

The information below is for the active ingredient, Streptomycin sulfate.

INGESTION:	Oral LD_{50} (rat):	>5000 mg/kg
INHALATION:	Inhalation LC_{50} (rat):	>2.72 mg/L (4 hr)
DERMAL:	Skin LD_{50} (rabbit):	>2000 mg/kg
IRRITATION:	Eye irritation:	Mildly irritating
	Skin irritation:	Slightly irritating
SENSITIZATION:	Skin sensitization: (guinea pig)	Not a skin sensitizer

TERATOGENICITY: Auditory nerve damage in the developing fetus has been observed in studies using Streptomycin sulfate.

MUTAGENICITY: No information is available.

CARCINOGENICITY: None observed for Streptomycin sulfate. Inhalation of crystalline silica at high dust levels can cause pneumoconiosis, silicosis or pulmonary fibrosis. Because of this IARC has listed crystalline silica as a group 2A carcinogen and NTP recognizes crystalline silica as a substance reasonably anticipated to be a carcinogen.

REPRODUCTIVE TOXICITY: No information is available.

TOXICOLOGICALLY SYNERGISTIC PRODUCTS: No data available.

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12. ECOLOGICAL INFORMATION

GENERAL: No data is available for the toxic effects of Streptomycin on fish and wildlife. It is suspected that it may be harmful to aquatic plants. Keep out of any body of water. Do not contaminate water when disposing of equipment washwaters or wastes. Notify authorities if any exposure to the general public or environment occurs or is likely to occur.

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13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Pesticide wastes may be acutely hazardous. Improper disposal of excess pesticide, spray mixture or rinsate may be a violation of local or national laws. If these wastes cannot be disposed by use according to label or other regulatory instructions, contact your nearest local or national waste regulatory agency for guidance.

CONTAINER DISPOSAL: Dispose of all containers as a hazardous waste. Check with the appropriate National or local agencies to determine currently applicable regulations for your area.

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14. TRANSPORTATION INFORMATION

DOT CLASS:	Not regulated
UN NUMBER:	None
IMDG CLASS (sea):	Not regulated
MARINE POLLUTANT:	No
PACKING GROUP:	None
HAZARD LABEL(s):	None
PROPER SHIPPING NAME(s):	Not regulated
REPORTABLE QUANTITY:	None

PACKAGING

GENERAL DESCRIPTION: 2 lb bags (6 per box)

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15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: This product is registered under EPA/FIFRA in the United States. It is a violation of Federal Law to use this product in any manner inconsistent with its labeling. Read and follow all label directions. This product is excluded from listing requirements under EPA/TSCA.

SARA TITLE III DATA

Section 311 & 312 Hazard Categories:

Immediate Health Hazard:	Yes
Delayed Health Hazard:	Yes
Fire Hazard:	No
Reactive Hazard:	No
Sudden Pressure Release Hazard:	No

Section 302 Extremely Hazardous Substances: None

Section 313 Toxic Chemicals: None

CERCLA/EPCRA Reportable Quantities (RQ): None

15. REGULATORY INFORMATION, cont'd

STATE REGULATIONS:

CALIFORNIA (Proposition 65): This product may contain trace amounts of respirable crystalline silica, known to the State of California to cause cancer. This product contains streptomycin sulfate, a chemical known to the State of California to cause reproductive toxicity.

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16. OTHER INFORMATION

MSDS Status:

Date This Revision: 17 April, 2007
Date Previous Revision: 12 May, 2004
Person Responsible for Preparation: Gary A. Braden

Reasons for Revision: Annual review. Formatting changes were made throughout the MSDS. No other changes were made.

DISCLAIMER: This information is provided for the limited guidance to the user. While AMVAC believes that the information is, as of the date hereof, reliable, it is the user's responsibility to determine the suitability of the information for its purposes. The user is advised not to construe the information as absolutely complete since additional information may be necessary or desirable when particular, exceptional, or variable conditions or circumstances exist (like combinations with other materials), or because of applicable regulations. No express or implied warranty of merchantability or fitness for a particular purpose or otherwise is made hereunder with respect to the information or the product to which the information relates.

ABBREVIATIONS:

ACGIH	-	American Conference of Governmental Industrial Hygienists
CERCLA	-	Comprehensive Environmental Response, Compensation, and Liability Act
DOT	-	Department of Transportation
EPA	-	Environmental Protection Agency
FIFRA	-	Federal Insecticide, Fungicide, and Rodenticide Act
IARC	-	International Agency for Research on Cancer
IATA	-	International Air Transport Association
IMDG	-	International Maritime Dangerous Goods
NTP	-	National Toxicology Program
OSHA	-	Occupational Safety and Health Agency
PEL	-	Permissible Entry Level
SARA	-	Superfund Amendments and Reauthorization Act
TLV	-	Threshold Limit Value
TSCA	-	Toxic Substances Control Act
TWA	-	Time Weighted Average (8 hour)

PEEL CORNER OF BOOKLET

10M-10-1111

Manufactured By:

VPG Voluntary Purchasing Groups, Inc.

230 FM 87
BONHAM, TEXAS 75148
EPA Reg. No. 7401-311 • EPA Est. No. 7401-TX-1
Visit Us At: www.fertilome.com

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ferti·lome®

Fire Blight Spray

- **For Apples, Pears, Pyracantha, Chrysanthemums, Philodendron, Dieffenbachia, And Roses.**
- **1 Tablespoon Makes 2 1/2 Gallons Of Spray.**

ACTIVE INGREDIENTS:
Streptomycin Sulfate . . .21.2%;
INERT INGREDIENTS: . . .78.8%
*Contains 17% Streptomycin derived from 21.2% Streptomycin Sulfate.

Keep Out Of Reach Of Children

CAUTION

See Back Panel For Additional Precautionary Statements

NET CONTENTS 2 Ozs.

STORAGE AND DISPOSAL

PESTICIDE STORAGE: Store in original container. Keep in area inaccessible to children and pets.
PESTICIDE DISPOSAL: If empty: Non-refillable container. Do not reuse this container. Place in trash or offer for recycling if available. **If partly filled:** Call your local solid waste agency for disposal instructions. Never place unused product down any indoor or outdoor drain.

Buyer assumes all risks of use, storage and handling of this material not in strict accordance with directions given herewith. To the extent consistent with applicable law, Voluntary Purchasing Groups, Inc. (VPG) warrants that this product conforms to the chemical description on the label and that the limit of any liability incurred shall be the purchase price paid by the user or buyer.

Manufactured By:
VOLUNTARY PURCHASING GROUPS, INC.
230 FM 87 • BONHAM, TEXAS 75418
EPA Reg. No. 7401-311 • EPA Est. No. 7401-TX-1
Visit Us At: www.fertilome.com

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PRECAUTIONARY STATEMENTS • HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION: Harmful if absorbed through skin. Causes moderate eye irritation. Avoid contact with eyes, skin, or clothing.

ENVIRONMENTAL HAZARDS

This product is toxic to fish. To protect the environment, do not allow pesticide to enter or run off into storm drains, drainage ditches, gutters or surface waters. Applying this product in calm weather when rain is not predicted for the next 24 hours will help to ensure that wind or rain does not blow or wash pesticide off the treatment area. Rinsing application equipment over the treated area will help avoid run off to water bodies and drainage systems.

FIRST AID - Have the product container or label with you when calling a poison control center or doctor, or going for treatment. **In the event of a medical or chemical emergency, contact ChemTel North America 1-800-255-3924 or Worldwide Intl. + 01- 813-248-0585** ChemTel INC.	
If on skin or clothing	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15 – 20 minutes. • Call a poison control center or doctor for treatment advice.
If in eyes	• Hold eye open and rinse slowly and gently with water for 15 – 20 minutes. • Remove contact lenses if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.

DIRECTIONS FOR USE

IT IS A VIOLATION OF FEDERAL LAW TO USE THIS PRODUCT IN A MANNER INCONSISTENT WITH ITS LABELING.

1. WHAT IS THIS PACKAGE FOR?

Use this product to control ***Fire Blight and Bacterial Wilt, Stem Rot, Leaf Spot,*** and ***Crown Gall*** on Fruit Trees, Flowers and Shrubs.

2. HOW DO YOU USE IT?

FRUIT: APPLES AND PEARS (Areas Other Than West Coast): To control ***Fire Blight*** in Home Plantings, apply 1 tablespoon in 2½ gallons of water (equivalent to 100 ppm or 4 ozs. per 50 gallons of water) in foliar and blossom sprays. Make first spray at the start of blossoming period. Continue spray applications every 3 to 4 days during bloom time. Apply additional sprays every 5 to 7 days after blossom period when weather conditions favor spread of Fire Blight. Do not apply when fruit is visible.

PYRACANTHA: To control ***Fire Blight,*** apply a solution of 1 level tablespoon of **ferti-lome® FIRE BLIGHT SPRAY** per 2½ gallons of water (100 ppm concentration). Begin spraying at start of blossom period. Repeat at 3 to 4 day intervals during bloom and at 5 to 7 days intervals after bloom if weather favors Disease spread.

CHRYSANTHEMUMS (Cuttings): To control ***Bacterial Wilt,*** soak cuttings for 4 hours in a solution containing ½ tablespoon of **ferti-lome® FIRE BLIGHT SPRAY** per 2½ gallons of water (50 ppm concentration) and plant as usual.

DIEFFENBACHIA: To control ***Bacterial Stem Rot,*** spray plants at 5 to 7 day intervals with a solution of 1 level tablespoon of **ferti-lome® FIRE BLIGHT SPRAY** in 2½ gallons water (100 ppm concentration) or soak cuttings for 20 minutes in a solution of 2 level tablespoons in 2½ gallons of water (200 ppm concentration) and plant in sterile rooting medium.

PHILODENDRON: To control ***Bacterial Stem Rot,*** remove all decayed leaves and spray with a solution of 2 level tablespoons of **ferti-lome® FIRE BLIGHT SPRAY** in 2½ gallons of water (200 ppm concentration) as preventative or at first sign of water soaked leaves. Repeat at 4 to 5 day intervals.

ROSES: To control ***Crown Gall,*** remove infested Plant and cut out gall tissue. Soak root system and cut surfaces of infested area for 15 minutes in a solution of 2 level tablespoons of **ferti-lome® FIRE BLIGHT SPRAY** per 2½ gallons water (200 ppm concentration). Replant in soil free from Disease organisms, and apply ½ tablespoon per 2½ gallons water (50 ppm concentration) as foliage spray at weekly intervals.

3. HERE ARE THE RESULTS YOU SHOULD EXPECT!

When used according to directions, this product will control ***Fire Blight*** and ***Bacterial Wilt, Stem Rot, Leaf Spot,*** and ***Crown Gall*** on Fruit Trees, Flowers and Shrubs.

MATERIAL SAFETY DATA SHEET

In the event or a medical or chemical emergency contact ChemTel, Inc. North America 1-800-255-3924 or worldwide Intl. + 01-813-248-0585

Voluntary Purchasing Groups, Inc.
230 FM 87
Bonham, Texas 75418

Ferti-lome® Fire Blight Spray

Effective Date: May 21, 2012

1. PRODUCT AND COMPANY IDENTIFICATION:

PRODUCT: Ferti-lome® Fire Blight Spray
EPA No.: 7401-311

COMPANY IDENTIFICATION:
Voluntary Purchasing Groups, Inc.
230 FM 87
Bonham, TX. 75418

2. COMPOSITION / INFORMATION ON INGREDIENTS:

HAZARDOUS COMPONENT	CAS NUMBER	% (TYPICAL)	TLV (UNITS)	PEL (UNITS)
Streptomycn Sulfate	Not determined	Proprietary	Not established	Not established

PEL: Permissible Exposure Limit established by the Occupational Safety and Health Administration.
TLV: Threshold Limit Value recommended by the American Conference of Governmental Industrial Hygienists.

3. PHYSICAL DATA:

BOILING POINT (°F) Not determined	SPECIFIC GRAVITY (H_2O=1) 0.62	VAPOR PRESSURE (mm Hg) Does not apply
PERCENT VOLATILE BY VOLUME (%) Does not apply	VAPOR DENSITY (AIR=1) Not determined	EVAPORATION RATE (ethyl ether=1) Does not apply
SOLUBILITY IN WATER Slight	REACTIVITY IN WATER Does not apply	
APPEARANCE AND ODOR Powder with a characteristic meal-like odor		

4. FIRE AND EXPLOSION DATA:

FLASH POINT (°F) Does not apply	FLAMMABLE LIMITS IN AIR (% by volume) Lower: Does not apply Upper: Does not apply
EXTINGUISHING MEDIA Water, foam, carbon dioxide	AUTO IGNITION TEMPERATURE Does not apply
UNUSUAL FIRE AND EXPLOSION HAZARDS Not determined	
SPECIAL FIRE FIGHTING PROCEDURES Use self-contained breathing apparatus to fight fires.	

MATERIAL SAFETY DATA SHEET

In the event or a medical or chemical emergency contact ChemTel, Inc. North America 1-800-255-3924 or worldwide Intl. + 01-813-248-0585

Voluntary Purchasing Groups, Inc.
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Ferti-lome® Fire Blight Spray

Effective Date: May 21, 2012

5. HEALTH INFORMATION:

PRIMARY ROUTES OF EXPOSURE AND TARGET ORGANS Eyes and Skin		
SIGNS AND SYMPTOMS OF EXPOSURE		
(1) ACUTE OVEREXPOSURE EYE CONTACT: Possible irritation. SKIN CONTACT: Possible allergic irritation.		
(2) CHRONIC OVEREXPOSURE Not determined		
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE May cause allergic skin reactions.		
CHEMICAL/COMPONENT LISTED AS CARCINOGEN OR POTENTIAL CARCINOGEN None		
NTP ☐ YES ☒ NO	IARC ☐ YES ☒ NO	OSHA ☐ YES ☒ NO
OTHER EXPOSURE LIMITS None determined		
EMERGENCY AND FIRST AID PROCEDURES EYE CONTACT: Flush with water for 15 minutes. Seek medical attention if irritation persists. SKIN CONTACT: Remove contaminated clothing. Flush with water for several minutes. Seek medical attention if irritation persists. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician. INGESTION: Call a physician.		

6. REACTIVITY DATA:

STABILITY ☐ Unstable ☒ Stable	CONDITIONS TO AVOID Not determined
INCOMPATIBILITY (Materials to Avoid) Not determined	
HAZARDOUS DECOMPOSITION PRODUCTS Not determined	
HAZARDOUS POLYMERIZATION ☐ May Occur ☒ Will Not occur	CONDITIONS TO AVOID None

7. SPILL OR LEAK PROCEDURES:

STEPS TO BE TAKEN IN CASE MATERIAL IS LEAKED OR SPILLED Cleanup of spill may require use of personal protective equipment. See Section 8. Recover product. Shovel or sweep into a suitable, labeled container and seal.
WASTE DISPOSAL METHOD Dispose of in accordance with Federal, State, and local regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

RESPIRATORY PROTECTION NIOSH/MSHA approved respirator for dusts.
VENTILATION Use in well-ventilated area.

PROTECTIVE GLOVES Rubber gloves
EYE PROTECTION Chemical splash goggles (ANSI Z87.1 1979)
OTHER PROTECTIVE CLOTHING OR EQUIPMENT Not determined

9. SPECIAL PRECAUTIONS:

PRECAUTIONS TO BE TAKEN IN HANDLING & STORING Keep containers closed when not in use. Store away from food, feed, and seed.
OTHER PRECAUTIONS Do not get in eye, on skin or clothing.

10. TRANSPORT INFORMATION:

Not regulated by DOT or IMDG.

11. OTHER INFORMATION:

The information contained within was obtained from authoritative sources and is believed to be accurate for the manner in which the product is intended to be used. Other uses could result in ramifications, which are not included within this document.

FireWall™

17 WP

Fungicide/Bactericide

This document has been prepared to meet the requirements of U.S. OSHA Hazard Communication Standard, 29, CFR 1910.1200.
The information contained herein is for the concentrate as packaged unless otherwise indicated.

MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME: FireWall™ 17 WP fungicide/bactericide
PRODUCT NUMBER: 1004
EPA REGISTRATION NUMBER: 80990-4
ACTIVE INGREDIENT: Streptomycin Sulfate
CAS NUMBER: 3810-74-0
CHEMICAL NAME: *O*-2-deoxy-2-methylamino-alpha-L-glucopyranosyl-(1->2)-*O*-5-deoxy-3-C-formyl-alpha-L-lyxofuranosyl-(1->4)-N^3,N^3-diamidino-D-streptamine-sulfate (2:3)
ANSI COMMON NAME: Streptomycin
MOLECULAR FORMULA: $C_{42}H_{84}N_{14}O_{36}S_3$ (streptomycin sulfate)
CHEMICAL CLASSIFICATION: Antibiotic
USE: Control of bacterial diseases on agricultural crops and ornamental plants.
MANUFACTURER:
AgroSource, Inc.
P.O. Box 1341
Mountainside, New Jersey 07092-0341
U.S. A.
General Information:(908) 931-9001

EMERGENCY TELEPHONE NUMBERS:
IN CASE OF EMERGENCY CALL INFO TRAC
(800) 535-5053 or (352) 323-3500

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

Component	%w/w	CAS Number	OSHA PEL**	ACGIH TLV**
Streptomycin (Sulfate)	17	3810-74-0	Not Established	Not Established
Quartz		14808-60-7	0.1 mg/cu m Respirable Dust	0.1 mg/cu m Respirable Dust
Inert Ingredient		Not Available	3 mg/cu m Respirable Dust	3 mg/cu m Respirable Dust
Inert Ingredient		Not Available	10 mg/cu m Total Dust 5 mg/cu m Respirable Dust	10 mg/cu m Total Dust 5 mg/cu m Respirable Dust

Unidentified inert ingredients are proprietary and/or non-hazardous.
** Permissible Exposure Limits (PEL) & Threshold Limit Value (TLV) are 8-hour time weighted average (TWA).

SECTION 3 - HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

IMMEDIATE CONCERNS:

- Free flowing light gray to tan powder
- Thermal decomposition and burning may form toxic by-products
- For large exposures or fires, wear personal protective equipment

POTENTIAL HEALTH EFFECTS: Effects from over exposure may result from either swallowing, inhaling or coming into contact with skin or eyes. Symptoms of streptomycin sulfate exposure include nausea, vomiting, dizziness/tingling of the face. Exposure may cause allergic reaction and anaphylaxis to occur in sensitive individuals. Eye contact may cause eye irritation. Streptomycin sulfate may cause sensitization. As with other antibiotics, it has the potential to change the micro flora of the intestine and allow overgrowth of non-susceptible organisms. Streptomycin sulfate can cause kidney damage and loss of hearing. Ear damage may manifest itself with symptoms of nausea, vomiting and vertigo. Streptomycin sulfate can cross the placental barrier and could cause hearing damage in the fetus.

MEDICAL CONDITIONS AGGRAVATED: Excessive exposure to any dust may aggravate pre-existing respiratory conditions. May cause allergic reaction and anaphylaxis to occur in individuals with allergic history.

SECTION 4 - FIRST AID MEASURES

EYE CONTACT: If in eyes, hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.

SKIN CONTACT: If on skin or clothing, take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes.

INHALATION: If inhaled, remove to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor immediately for further treatment advice.

INGESTION: If swallowed, call a poison control center or doctor immediately for treatment advice. Have the person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

NOTES TO PHYSICIAN: In case of significant overexposure by accidental ingestion, monitor serum aminoglycoside concentration. Monitor renal and eighth cranial nerve function carefully. Obtain baseline serum creatinine and BUN in all cases of suspected toxicity. Be alert for possible intestinal obstruction.

SECTION 5 - FIREFIGHTING MEASURES

EXTINGUISHING MEDIA: Water, CO_2, dry chemical

FIRE FIGHTING PROCEDURES: Wear full protective equipment including self-contained breathing apparatus. Evacuate non-essential personnel. If water is used to fight a fire, build a dike and collect the runoff. Do not use contaminated buildings and equipment until decontaminated.

FIRE AND EXPLOSION HAZARDS: None known. As with all dry powders, it is advisable to ground material equipment in contact with dry material to dissipate the potential buildup of static electricity.

FLASH POINT: Not Applicable

AUTO IGNITION TEMPERATURE: Not Available

FLAMMABILITY: Not Available; Limits - Not Applicable

HAZARDOUS DECOMPOSITION PRODUCTS ASSOCIATED WITH FIRE: Irritating and possibly toxic oxides of nitrogen, carbon and sulfur.

SECTION 6 - ACCIDENTAL RELEASE

SPILL AND DISPOSAL PROCEDURES: Control the spill at its source and prevent it from spreading, contaminating soil, or entering sewage or drainage systems or bodies of water. Clean up spills immediately and use suitable protective equipment (Section 8). Keep unnecessary persons away. If emergency response personnel are unavailable or unwarranted, clean up a solid spill by carefully sweeping up the material (avoid creating dust) and using a proper tool to place it into an appropriate disposal container. If liquid, cover the spill with an absorbing material and follow the same procedure used for a solid spill. Scrub the area with a hard water detergent. Pick up liquid with absorbent material and follow the same procedure used for a solid spill. Dispose of or treat all spill residues according to applicable local, state and federal regulations (Section 13). Use suitable protective equipment (Section 8). Follow fire prevention procedures (Section 5).

SECTION 7 - HANDLING AND STORAGE

ENGINEERING CONTROLS: Local exhaust ventilation sufficient to control dust is recommended.

HANDLING PROCEDURES AND EQUIPMENT: Avoid generating dust. Use respiratory protection in the absence of adequate ventilation controls (Section 8). Wash skin thoroughly after shift exposure. Keep containers closed when not in use. Clean up spills promptly (Section 6).

HANDLING AND STORAGE: Store in a cool, dry place and protect from moisture. Avoid contact with skin or eyes. Do not breathe dust or spray. Do not ingest. Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Do not store food, beverages or tobacco products in the storage area. Protect containers from damage. Use entire contents of packages, do not store open packages. Keep out of reach of children and domestic animals. For agricultural crop and ornamental plant use only.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

NOTE: The following recommendations are for manufacturing, formulating or packaging the product. See the product label for commercial application procedures.

INHALATION: Use MSHA/NIOSH approved dust/mist respirator with any R, P, or HE filter. Do not breathe dust or spray.

SKIN CONTACT: Wear chemical resistant (e. g. nitrile or butyl) gloves, coveralls, socks and chemical resistant footwear. For overhead exposure, wear chemical resistant headgear.

EYE CONTACT: Safety glasses required. Use chemical splash goggles if potential exists for direct exposure to dust, splashes or sprays. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

INGESTION: Prevent eating, drinking, tobacco usage and cosmetic application in areas where there is potential for exposure. Wash thoroughly with soap and water after handling.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Free flowing, light gray to tan powder

ODOR: Odorless or a slight fermentation-like odor

MOLECULAR WEIGHT: 1457.3 (streptomycin sulfate)

SOLUBILITY IN WATER: Streptomycin sulfate is soluble in water (>20g/l).

PH: 6.3 +/- 0.8

VOLATILE COMPONENTS (% w/w): < 8% (water)

DENSITY (lb./cu ft): 41.2 loose, 56.2 compacted

BOILING POINT (degrees C/degrees F): Not applicable

FREEZING POINT (degrees C/degrees F): Not applicable

MELTING RANGE (degrees C/degrees F): Not available

VAPOR PRESSURE (mm Hg @ degrees C/degrees F): Not applicable

SECTION 10 - STABILITY AND REACTIVITY

STABILITY: Stable under normal storage and use conditions. Hygroscopic; moisture can cause decomposition.

HAZARDOUS POLYMERIZATION: Should not occur.

HAZARDOUS DECOMPOSITION: High temperatures can cause decomposition to potentially toxic gases.

INCOMPATIBILITIES: Unstable in strong acids and alkalis.

STORAGE CONDITIONS: Hygroscopic, protect from moisture using airtight containers.

SECTION 11 - TOXICOLOGICAL INFORMATION

FIREWALL™ 17 WP:

Ingestion: Practically Non-Toxic. Oral LD_{50} (Rat) 9,000 mg/kg

Dermal: Slightly Toxic. Dermal LD_{50} (Rat) >2,000 mg/kg

Inhalation: Slightly Toxic. Inhalation LC_{50} (Rat) >2.72 mg/l air –4 hours

Eye Contact: Mildly Irritating (Rabbit)

Skin Contact: Slightly Irritating (Rabbit)

Dermal Sensitization: No evidence of sensitization was observed (Guinea Pig). See Section 3.

STREPTOMYCIN SULFATE:

Neurotoxicity: Streptomycin sulfate neurotoxic and ototoxic.

Reproductive Effects: Streptomycin sulfate auditory nerve damage in developing fetus.

Chronic/Subchronic Toxicity: Severe allergic reactions (anaphylactic) can occur. Clinical studies reported kidney and ear damage manifested by nausea, vomiting, dizziness, numbness/tingling of the face.

Carcinogenicity: Streptomycin sulfate not listed as a carcinogen by NTP, IARC, OSHA & ACGIH

Note: Crystalline silica (quartz and cristobalite); inhalation of high dust levels can cause pneumoconiosis, silicosis or pulmonary fibrosis. Listed by IARC as a Group 2A carcinogen (lung) based on limited evidence in humans and sufficient data in animals. Listed by the NTP as a substance reasonably anticipated to be a carcinogen.

Target Organs: Streptomycin sulfate - kidney, ear, skin; Inert ingredients - respiratory system

SECTION 12 - ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE: Not available.

OTHER: This product is a pesticide. Avoid contact of spilled materials and runoff with soil and surface waterways.

SECTION 13 - DISPOSAL CONSIDERATION

DISPOSAL: Do not reuse product containers. Dispose of product containers, waste containers and residues according to local, state and federal health and environmental regulations.

Characteristic Waste: Not Applicable

Listed Waste: Not Applicable

SECTION 14 - TRANSPORT INFORMATION

U.S. DOT (Department of Transportation) CLASSIFICATION: Not regulated by DOT

SHIPPING FREIGHT DESCRIPTION: Insecticides or Fungicides, Agricultural, N. O. S.

ICAO/IATA CLASSIFICATION: Not available.

IMDG CLASSIFICATION: Not available.

SECTION 15 - REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA): Streptomycin is listed in the TSCA inventory but is exempt. Subject to FIFRA.

RCRA HAZARDOUS WASTE CLASSIFICATION (40 CFR 261): Not Applicable.

CERCLA/SARA 302 REPORTABLE QUANTITY (RQ): None

EPCRA SARA Title III Classification:

Section 311/312: Acute Health Hazard & Chronic Health Hazard;
Section 313: Toxic Chemicals- Not Applicable.

SECTION 16 - OTHER INFORMATION

NFPA HAZARD RATINGS: Health 1, Flammability 1, Instability 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Extreme)

HMIS HAZARD RATINGS: Health 1, Flammability 1, Reactivity 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4- Severe)

IMPORTANT: While the descriptions, data and information contained in the Material Safety Data Sheet are presented in good faith and are believed to be accurate as of the date indicated, AgroSource, Inc. makes no warranty with respect hereto and disclaims all liability from reliance thereon. The Material Safety Data Sheet is provided for guidance only. Many factors may affect the product during processing, application or use. Therefore, it is recommended that packagers, handlers and users test to determine suitability under their specific conditions.

FireWall is a trademark of AgroSource, Inc.

Original Issued Date: 01/16/98; Revision Date: 10/12/12; Replaces: 07/07/11

This is a specimen label, intended for use only as a guide in providing general information regarding use of this product.
As labels are subject to revision, always carefully read and follow the label on the product container.

FireWall™ 17 WP

Fungicide/Bactericide
Agricultural Streptomycin

GROUP	25	FUNGICIDE

Active Ingredient:

Streptomycin Sulfate*	22.40%
Other Ingredients:.	77.60%
	100.00%

*Equivalent to 17% streptomycin

KEEP OUT OF REACH OF CHILDREN

CAUTION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the label, find someone to explain it to you in detail.)

EPA Reg. No. 80990-4
EPA Est. No. 39578-TX-1
Product Number 1004

NOTICE: Read the entire Directions for Use and Conditions of Sale and Limitation of Warranty and Liability before buying or using this product. If the terms are not acceptable, return the product at once, unopened and undamaged, and the purchase price will be refunded.

AGRO SOURCE™

AgroSource, Inc.
P.O. Box 1341
Mountainside, New Jersey 07092-0341

REV 80990-4
(120508 1087043-3368)

FIRST AID	
Call a poison control center or doctor immediately for treatment advice.	
If On Skin or Clothing:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes.
If In Eyes:	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
HOT LINE NUMBER	
Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact InfoTrac at 1-800-535-5053 for emergency medical treatment information.	

PRECAUTIONARY STATEMENTS

Hazards To Humans & Domestic Animals

CAUTION: Harmful if absorbed through skin. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Causes moderate eye irritation. Do not breathe dust or spray mist. This material is not to be used for medical, veterinary or human purposes.

Personal Protective Equipment (PPE):

Applicators and other handlers must wear:
- long-sleeved shirt
- long pants
- chemical-resistant gloves made of a waterproof material
- shoes plus socks
- MSHA/NIOSH approved dust/mist respirator with any R, P, or HE filter

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

User Safety Recommendations:
Users should:
- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

Environmental Hazards

This product may be hazardous to aquatic plants. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposal of wastes.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product through any type of irrigation system. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted entry interval. The requirements in this box apply to uses that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 12 hours.

For early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, wear:
- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves made of a waterproof material
- Shoes plus socks

Resistance Management Statements: FIREWALL™ 17 WP fungicide/bactericide contains a Group 25 (fungicide/bactericide). Fungal isolates/bacterial strains with acquired resistance to Group 25 may eventually dominate the fungal/bacterial population if Group 25 fungicides/bactericides are used repeatedly in the same field or in successive years as the primary method of control for targeted species. This may result in partial or total loss of control of those species by **FIREWALL™ 17 WP** fungicide/bactericide or other Group 25 products.

To delay fungicide/bactericide resistance consider:
- Avoiding the consecutive use of **FIREWALL™ 17 WP** fungicide/bactericide or other target site of action Group 25 fungicides/bactericides that have a similar target site of action, on the same pathogens.
- Using tank-mixtures or premixes with fungicide/bactericides from different target site of action Groups as long as the involved products are all registered for the same use and are both effective at the tank mix or prepack rate on the pathogen(s) of concern.
- Basing fungicide/bactericide use on a comprehensive IPM program.
- Monitoring treated fungal/bacterial populations for loss of field efficacy.
- Contacting your local extension specialist, certified crop advisors, and/or manufacturer for fungicide/bactericide resistance management and/or IPM recommendations for specific crops and resistant pathogens.

MIXING INSTRUCTIONS

Concentration Desired	Quantity FIREWALL™ 17 WP Per Volume of Water			
ppm*	**50 gals.**	**100 gals.**	**500 gals.**	**600 gals.**
50	2 oz.	4 oz.	1 ¼ lbs.	1 ½ lbs.
60	2.4 oz.	4.8 oz.	1 ½ lbs.	1 ⅞ lbs.
100	4 oz.	8 oz.	2 ½ lbs.	3 lbs.
200	8 oz.	16 oz.	5 lbs.	6 lbs.

*ppm = parts per million

Vegetable Crops

Crop	Disease	Recommended Concentration or Rate	Use Directions
Celery (Florida area)*	Bacterial Blight *(Pseudomonas cichorii)*	200 ppm	Apply first spray when seedlings are in the 2-leaf stage, when first true leaves appear. Apply at 4 to 5-day intervals. Continue applications until celery is transplanted in the field.
Peppers*	Bacterial Spot *(Xanthomonas campestris pv. vesicatoria)*	200 ppm	Apply first spray when seedlings are in the 2-leaf stage, when first true leaves appear. Apply at 4 to 5-day intervals. Continue applications until transplanted in the field.
Potatoes*	Soft Rot Blackleg *(Erwinia carotovora subsp. atroseptica and Erwinia carotovora subsp. carotovora)*	100 ppm	Soak cut seed pieces in solution for several minutes; plant as usual. **NOTE:** A suitable fungicide should be used as an adjunct to this treatment for the control of fungal diseases associated with potato seed pieces.
Tomatoes*	Bacterial Spot *(Xanthomonas campestris pv. vesicatoria)*	200 ppm	Apply first spray when seedlings are in the 2-leaf stage, when first true leaves appear. Apply at 4 to 5-day intervals. Continue applications until transplanted in the field.

Tree Fruit Crops

Crop	Disease	Recommended Concentration or Rate	Use Directions
Apples*	Fire Blight *(Erwinia amylovora)*	24-48 oz. **FIREWALL™ 17 WP** per acre per application (equivalent to 50-100 ppm at 600 gals/A)	Spray trees at 20%-30% bloom. Spray trees every 3-4 days during blossom time. Apply sprays after petal fall every 10-14 days to control twig blight. (This could mean an additional 6-8 applications after blossom sprays.) Do not apply within 50 days of harvest.
Apples (West Coast Area)	Fire Blight *(Erwinia amylovora)*	28.8 oz. **FIREWALL™ 17 WP** per acre per application (equivalent to 60 ppm at 600 gals/A)	Spray tress at full bloom. Apply at petal fall and late secondary bloom. Continue to spray at 5 to 7-day intervals to maintain disease control but not later than 50 days before harvest.
Pears*	Fire Blight *(Erwinia amylovora)*	24-48 oz. **FIREWALL™ 17 WP** per acre per application (equivalent to 50-100 ppm at 600 gals/A)	Spray trees at 20%-30% bloom. Spray trees every 3-4 days during blossom time. Apply sprays after petal fall every 10-14 days to control twig blight. (This could mean an additional 6-8 applications after blossom sprays.) Do not apply within 30 days of harvest.
Pears (West Coast Area)	Fire Blight *(Erwinia amylovora)*	28.8 oz. **FIREWALL™ 17 WP** per acre per application (equivalent to 60 ppm at 600 gals/A)	Spray tress at 10% bloom. Repeat at 5-day intervals until all late bloom is over. (This could mean 12-15 applications.) Continue to spray at 5 to 7-day intervals to control shoot and fruit infections. Do not apply within 30 days of harvest.

[* Except California]

Ornamentals

Crop	Disease	Recommended Concentration or Rate	Use Directions
Chrysanthemums*	Bacterial Wilt *(Erwinia chrysanthemi)*	50 ppm	Soak plant cuttings in solution for 4 hours; plant as usual.
Dieffenbachia Cutting*	Bacterial Stem Rot *(Erwinia chrysanthemi)*	200 ppm	Soak cuttings in solution for 20 minutes. Plant cuttings in sterilized rooting medium.
		100 ppm	To check spread of stem rot in stock plants, use 100 ppm spray every 5-7 days.
Philodendron*	Bacterial Leaf Rot *(Xanthomonas campestris)*	200 ppm	Apply as preventive or at first signs of water-soaked areas on leaf. Apply every 4-5 days.
		For curative action	Remove all rotted leaves from plant and then spray at 200 ppm every 4 days.
Roses (New Jersey Area)*	Crown Gall *(Agrobacterium spp.)*	200 ppm	Remove infected plant. Cut out gall tissue. Soak the plant root system and cut surfaces of the infected area in solution for 15 minutes. Replant rose bushes in soil free of the crown gall organisms.
		50 ppm	Use 50 ppm in watering solution and in foliar sprays applied weekly starting one week after planting as an adjunct to this treatment.

Row Crops

Crop	Disease	Recommended Concentration or Rate	Use Directions
Tobacco*	Wildfire Blue Mold *(Peronospora tabacina)*	100 ppm for preventive action	Apply first spray when plants are in the 2-leaf stage or about the size of a dime or when blue mold first appears in the area. Repeat application at 5 to 7-day intervals until plants are set in the field. Additional protection may be obtained by spraying field plants with 100 ppm in a weekly spray schedule.
		200 ppm for curative action	In locations where wildfire has been a problem in recent years or where applications have been delayed until disease appears, a spray of **Firewall™ 17 WP** resulting in 200 ppm concentration is recommended. Follow the same schedule as above.

Home & Garden

Crop	Disease	Recommended Concentration or Rate	Use Directions
Apple Trees, Pear Trees, Pyrancantha (Fire Thorn Bush) (CA)	Fire Blight *(Erwinia amylovora)* of the Rosaceae	100 ppm	Apply in foliar and blossom sprays. Apply first spray at start of blossoming period. Continue spray application every 3-4 days during blossom time. Apply additional sprays every 5-7 days after blossom period when weather favors spread of fire blight. Do not apply after fruit is visible.

[* Except California]

Use of **FIREWALL ™ 17 WP** fungicide/bactericide may cause phytotoxicity to the fruit and/or foliage of sensitive varieties of pears and apples.

Additional information regarding use of **FIREWALL™ 17 WP** fungicide/bactericide may be obtained from your local Agricultural Extension Agent or State Experimental Station.

[This product contains a chemical (streptomycin sulfate) known to State of California to cause reproductive toxicity.]

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

Pesticide Storage: Keep tightly closed and sealed. Product is moisture, temperature and light sensitive. Product is hygroscopic so protect from moisture. Store in a cool (<77°F, 25°C), dry place away from heat and open flames with minimum exposure to the atmosphere. Avoid extremes in temperature.

Pesticide Disposal: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

Container Disposal: Nonrefillable Container. Do not reuse or refill this container. Completely empty bag into application equipment, then offer bag for recycling if available or dispose of in a sanitary landfill, by incineration, or if allowed by State and local authorities, by burning. If burned, stay out of smoke.

EMERGENCY TELEPHONE NUMBER:
InfoTrac: 1-800-535-5053

Conditions of Sale and Limitation of Warranty and Liability

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