NORTHWEST HORTICULTURAL COUNCIL
105 So. 18th Street, Suite 105
YAKIMA, WASHINGTON 98901 USA
(509) 453-3193 FAX (509) 457-7615
www.nwhort.org

March 18, 2013

Ms. Michelle Arsenault
National Organic Standards Board
USDA-AMS-NOP
1400 Independence Avenue, SW
Room 2648-So, Ag Stop 0268
Washington, DC 20250-0268

Docket: AMS-NOP-12-0070

RE: Crops Subcommittee – Tetracycline

Dear Ms. Arsenault:

The Northwest Horticultural Council represents the growers and shippers of conventional and organic deciduous tree fruit, specifically apples, pears and cherries, of the Pacific Northwest states of Washington, Idaho and Oregon. We are writing this letter on behalf of the apple and pear growers who have the potential to suffer devastating losses due to fire blight because of the proposed expiration of oxytetracycline. Approximately, ten percent of the commercial Pacific Northwest apple and pear crop is organic and its loss would result in significant impact on the industry. We encourage the retention of oxytetracycline on the NOP list until more viable/proven alternatives are identified. Arbitrarily established expiration dates do not provide a solution for the industry. Our industry is actively funding research to look for effective alternatives to antibiotics that can be registered for use in apples and pears which might also be organically approved.

We request that oxytetracyline remain under review through the sunset provision in accordance with the Organic Food Protection Act until viable alternatives are commercialized and proven.

You are aware that fire blight, a zero-tolerance disease which commonly affects young crops, is caused by the bacterium *Erwinia amylovora*. It is one of the most serious and economically damaging diseases of pears and apples and can seriously adversely affect our export markets. For several years Washington State University has surveyed growers with the most chilling response being that over 67% of growers could not control fire blight without antibiotics. The survey indicates that in an extreme year, 67% of the organic crop could be lost if oxytetracycline was not available. Not just for a season, but for up to 5 years, while orchards are replanted. David Granatstein, Sustainable Agriculture Specialist from Washington State University, proposes that if American organic growers exit the market, it is likely that organic apple and pear production would move oversees. [1] [2] Ninety-three percent of these growers requested that an extension beyond 2014 be pursued. The 2012 questions are posted at the end of this document.

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[1] Granatstein, David, Washington State University Organic Grower Meeting, 2010.
[2] David Granatstein joined Washington State University originally as Project Manager for the Northwest Dryland Cereal/Legume Cropping Systems Project in 1989, one of the first USDA Sustainable Agriculture Research and Education (SARE) Projects in the West. He spends a significant portion of his time in support of the expanding organic farming sector in the state and is helping to

We bring to your attention why oxytetracycline should be maintained:

- Oxytetracycline ***is*** naturally occurring from the streptomyces bacteria and is consistent with organic principles as researchers have documented no adverse effect on the environment from the small, infrequent amount used on trees.
- Researchers have documented that health risk from gene transference from tree use is unlikely to occur. (attached)
- Alternatives are currently being developed but not yet widely tried and tested in volume, most environmental conditions and under high fire blight pressure. What may work in California may not work in Michigan.
- Employment of IPM tools and models, while they help, may not be enough to save an orchard.
- Organic tree fruit production would be threatened in the U.S. resulting in the local organic supply being diminished.
- Apple and pear production could move oversees.

As the NOSB supports organic growers and the organic process, these reasons add credence to why the NOSB should consider its decision to expire tetracycline. We ask that you reevaluate the expiration of oxytetracycline and return it to the sunset process in accordance with the Organic Food Production Act.

Thank you for the opportunity to comment. Please feel free to contact the Northwest Horticultural Council if you require additional background information.

Respectfully submitted,

NORTHWEST HORTICULTURAL COUNCIL

Deborah Carter

Deborah Carter
Technical Issues Manager

Dr. Michael J. Willett
Vice President for Scientific Affairs

cc: NHC Science Advisory Committee

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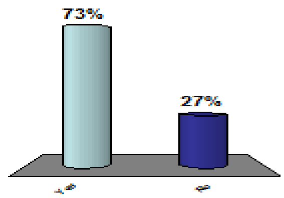
develop the BIOAg (Biologically Intensive and Organic Agriculture) program within CSANR (Center for Sustainability and Natural Resources). He is a principle investigator on the Organic Cropping Research for the Northwest grant that funds 12 different research projects in the state. And he is a principle investigator on the Climate Friendly Farming project, a 5-year multi-million dollar effort looking at how agriculture can help ameliorate greenhouse gas emissions. Prior to joining WSU, David managed an organic farm for seven years, worked in forest management, and spent a year in southern Africa with an agricultural development project. He served as on-farm research director for the Land Stewardship Project in Minnesota, where he wrote *Reshaping the Bottom Line*, an early sustainable ag book for farmers. He has been invited to Russia, Argentina, Chile, and Canada to conduct training in sustainable agriculture, and gives presentations on the topic across the US and beyond. David earned a B.S. degree in Environmental Conservation at Cornell University in upstate New York, his home area. He received a M.S. degree from WSU in soil management.

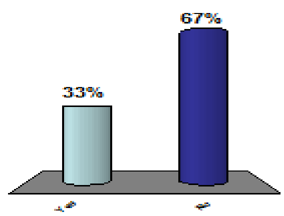
Have you tried a non-antibiotic control regime?

1. Yes
2. No



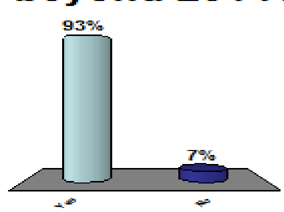
If so, was it successful?

1. Yes
2. No



Should another petition be filed with NOSB asking for extension of tetracycline use beyond 2014?

1. Yes
2. No



Appendix A

Photographs 1-4
Antibiotic Residues on Plant Tissues

Photograph 1. 200-acre Washington apple orchard devastated by fire blight, 2001. Photo courtesy of Tim Smith, WSU Extension

Photograph 2. Michigan apple orchard (cv 'Gala') killed by fire blight in 2000. Photo courtesy Mark Longstroth, MSU Extension.

Photograph 3. Pear orchard with fire blight being destroyed.
Photo courtesy of Michael Willett, NHC

Photograph 4. Pear trees with fire blight.

Antibiotics have been used to control plant diseases for over 50 years (McManus, 1999). While their use is small relative to livestock production and human exposure is miniscule relative to therapeutic use by patients, there remain questions about the fate of these materials when applied in agricultural environments, human exposure, and the risk of enhancing antibiotic resistance in human pathogens. The discussion below highlights the research done on antibiotic residues on treated plant tissues.

Many studies have examined streptomycin residues on apple and pear trees, while fewer have addressed residues of oxytetracyline. For streptomycin, the residue tolerance level on tree fruit crops is 0.25 ppm (USEPA, 2006b). Shaffer and Goodman (1969) published the first evaluation of residues of streptomycin on apple leaves and fruit. They sprayed trees up to ten times from flowering in April to early fruit development in mid-June. They detected residues on leaves during the season (detection limit of 0.1 µg/ml) and on developing fruit, but residues on fruit were below the residue tolerance within a month after the last spray (about 70 days before harvest). At harvest, residues were not detected on apple fruit, even on trees sprayed ten times with streptomycin (Goodman, 1961; Shaffer and Goodman, 1969). Subsequent studies by numerous independent investigators have corroborated their results – fruit from trees treated with streptomycin for fire blight management does not have residues near the tolerance levels permitted by governmental agencies (see, for example, Gardan and Manceau, 1984). The Environmental Protection Agency (2006b) concluded that anticipated dietary residues of streptomycin from plant agriculture were extremely low: even in worst-case scenarios with contaminated water sources and food, the dietary exposure dose would be 3,000 to 21,000 times lower than a typical therapeutic dose.

Recently, a study (published as two papers) reported that streptomycin may be detected in a portion of apple fruit harvested from orchards exposed to multiple applications of the antibiotic. One paper presented the methods used to quantify antibiotics in apples (Bohm et al., 2010) and the second presented preliminary data on antibiotic detection in apples (Mayerhofer et al., 2009) in Austria. The latter study was reported in a research letter and assessed apples collected from orchards that were untreated or orchards treated one to three times with streptomycin during bloom to late bloom. Apple fruit were collected about three months later and tested for streptomycin. The level of detection was 2 µg/kg (0.002 ppm or 2 ppb) and the limit of quantification was identified as 7 µg/kg (0.007 ppm or 7 ppb).

From non-treated orchards, none of the 14 apples tested had detectable levels of streptomycin. From orchards treated once, twice or three times, 4 of 11 fruit, 1 of 5 fruit, and 15 of 25 fruit, respectively, had detectable levels of streptomycin (presumably between 0.002 to 0.007 mg/kg), but the concentration was too low to quantify the antibiotic. An unspecified number of apples from orchard(s) treated three times with streptomycin had concentrations of streptomycin that could be quantified (≥0.007 mg/kg). They reported that the highest concentration of streptomycin detected was 18 µg/kg (0.018 ppm), well below the EPA tolerance of 250 µg/kg (0.25 ppm).

The amount of antibiotic in positive apples was below the minimum inhibitory concentration (MIC) for gut flora, strongly suggesting that any antibiotics transferred to the gut would have negligible impacts on gut flora. There is no universally agreed upon value for acceptable daily intake (ADI) for streptomycin. The Austrian ADI for streptomycin is 0.03 mg per kg of body mass per day (0.03 ppm). Thus, for a 100 kg person, 3 mg streptomycin consumed each day would be expected to have no appreciable effects on health over their lifetime. Assuming that all apple fruits contained the maximum streptomycin residue detected in the study (18 µg per kg fruit or 0.018 mg per kg fruit), a person would need to eat 166 kg of fruit or >1,000 apples (fruit weight of 150 g) each day. Furthermore, in rare situations when streptomycin is administered to humans, it is delivered intravenously. Streptomycin is ineffective when taken orally by humans. All together, this means that the selection of streptomycin-resistant human gut flora due to consumption of apples containing trace amounts of streptomycin is extremely unlikely.

Even though antibiotics may be detected on plant surfaces for up to a month after application using sensitive analytical chemistry methods, antibiotics lose activity rapidly and their capacity to inhibit bacterial growth is lost within a week after application. Thus, although antibiotics may be detected on plant surfaces with analytical methods, they may no longer be active as agents to select for antibiotic resistant bacteria. In a laboratory experiment, streptomycin no longer prevented fire blight 5 days after spraying apple flowers (Vanneste, 1996). Stockwell et al. (2008) treated trees in a screenhouse with streptomycin and/or oxytetracycline. Under conditions where trees were protected from rain and ultraviolet irradiation from sunlight, growth of *E. amylovora* (the causal agent of fire blight) was suppressed for only 4 days after antibiotic treatment (55). The persistence of antibiotics is probably even lower under fully exposed conditions (Brink et al., 1945). In a study of potential plant uptake, no oxytetracycline uptake was found using soil drench or foliar spray on coconut palm (McCoy, 1976). Direct injection into the trunk did produce detectable levels in leaves (up to 20 μg/g) with a half-life of two weeks.

Christiano et al. (2010) conducted an extensive study of the stability of oxytetracycline (applied at 300 μg/ml a.i.) on peach leaves. At least 50 ppm oxytetracycline (0.06 μg/cm leaf surface) on leaves was required to control bacterial spot of stone fruits. Oxytetracycline was thermostable on leaves, but rapidly degraded when exposed to natural sunlight, with 44% degradation within 1 day and 92% within 4 days, and to levels near the detection limit (50 ppb) by a week after application (8). Oxytetracycline was not rainfast on leaves: 2 minutes of simulated rain (44 mm/h) reduced residual concentrations of oxytetracycline by 67%, and after an hour of simulated rain the material was near the detection limit. The authors concluded that the oxytetracycline concentrations on trees in orchards would be insufficient to suppress the pathogen *X. arboricola* pv. *pruni* after 2 days under full sunlight, 4 days under overcast skies, or 2 minutes during a heavy rainstorm (Christiano et al., 2010).

Residue data for oxytetracycline were reported by the US EPA (2005) as part of the process to allow the material to be used on apples. Field trials were conducted in various parts of the country. Oxytetracycline was applied at rate from 0.5 to 11 times the proposed seasonal rate of 1.53 lb a.i./acre, and at 49-60 days before harvest. The Limit of Quantification was 0.013 ppm. Most samples were at or below this limit, while the highest residue level detected was 0.252 ppm. There was no dose response to increasing rates in the residue data. No data were reported for trees treated only once or twice during bloom, which is the most common use pattern in the western US (Stockwell and Duffy 2012).

Governmental regulations established by the US Environmental Protection Agency restrict the level of permissible pesticide residues on conventional managed crops. For oxytetracycline, the residue tolerance level on tree fruit crops is 0.35 ppm or 0.35 mg oxytetracycline per kilogram fruit. (USEPA, 2006a; USEPA, 2008). In a risk assessment study (USEPA, 2008), the Environmental Protection Agency states that typical pharmaceutical oxytetracycline exposure to humans would be 50,000 to 200,000 times greater than the theoretical dietary exposure (i.e. combined food and potentially contaminated water sources) associated with the application of oxytetracycline in plant agriculture. The agency concluded that the potential dietary exposure of humans to oxytetracycline used in plant agriculture would result in no harm compared with its pharmaceutical usage (USEPA, 2008).

The following puts the permitted residue level of oxytetracycline on fruit in context of oral therapeutic doses of tetracyclines for humans. For humans, tetracyclines are administered at doses between 1000 mg to 2000 mg daily for at least a week (http://www.drugs.com/dosage/tetracycline.html) or a minimal exposure of 7,000 to 14,000 mg during a prescribed cycle. To date, there are no reports of fruit with residues at or above the permitted tolerance for oxytetracycline at 0.35 mg/kg fruit. Nonetheless, even if fruit contained the permitted tolerance for oxytetracycline, a person would need to consume about 2,857 kg of fruit in a single day (or 28 times their body weight for a 100 kg person) to be exposed to the minimal daily therapeutic dose of tetracycline. The U.S. Apple Association estimated that the average U.S. consumer eats about 16.5 pounds (7 kg) of fresh-market apples and 33.3 pounds (15 kg) of processed apples, for a total of 49.8 pounds (22 kg) of fresh apples and processed apple products in a year (http://www.usapple.org/consumers/all-about-apples). Obviously, the annual consumption of apples and apple products by the average consumer is 130-fold less than the amount of apples with oxytetracycline residues that would need to be consumed in a single day to approach a minimal oral therapeutic dose of tetracycline.

In the Code of Federal Regulations (21CFR556, Sec. 556.720: Tetracycline), the acceptable daily intake (ADI) for total tetracycline residues (chlortetracycline, oxytetracycline, and tetracycline) is 25 micrograms per kilogram of body weight per day. The ADI is an estimate of the amount of a substance which can be ingested daily over a lifetime by humans without appreciable health risk. For a 100 kg person, the ADI for tetracyclines is 2.5 mg. If a person ate fruit with oxytetracycline residues of 0.35 mg/kg fruit, then they would need to consume 7 kg of fruit daily or 47 apples (150 g) each day to reach the ADI.

Overall, the potential that daily consumption of apples from trees treated with oxytetracycline during bloom, even if the fruit had the maximum permissible levels of residues of the antibiotic, would exert impacts on health or lead to selection of tetracycline-resistant bacteria in humans is improbable.

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- *Drafted by , Virginia Stockwell, David Granatstein, and Matt Grieshop, on behalf of the Organic Tree Fruit Industry Work Group; revised September 2012.*