COOPERATIVE EXTENSION UNIVERSITY OF CALIFORNIA

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Newsletter Emailed to You

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Are Neonicotinoids Killing Bees?

That is the title of a 32-page, 8.5 x 11" publication recently issued by The Xerces Society for Invertebrate Conservation. The authors are Jennifer Hopwood, Mace Vaughn, Matthew Shepherd, David Biddinger, Eric Mader, Scott Hoffman Black and Celeste Mazzacano. Following an executive summary, which does a very good job of listing the take-away messages of the chapters, the major sections of the publication are: 1. Introduction 2. The Importance of Bees 3. What are the Neonicotinoids? 4. Routes of Neonicotinoid Exposure to Bees 5. Effects of Neonicotinoid Exposure to Bees 6. Neonicotinoid Residues 7. Recommendations for Protecting Bees and 8. Conclusions.

The authors scoured the literature for credible information (110 references listed) on the interactions of bees and neonicotinoids. They balanced the conservative and progressive opinions quite well. The five-paragraph conclusion is about a half page long. The first paragraph states that laboratory studies have demonstrated negative effects on honey bee physiology and behavior. However, field studies conducted with neonicotinoid exposures at field doses have many times not resulted in measurable colony effects. The second paragraph suggests that the old IPM practices, specifically designed to protect pollinators, no longer relate to many of the field situations. Preventing exposure to bees cannot be accomplished simply by timing judicious applications of neonicotinoids.

The third paragraph explains that levels of neonicotinoids in flowers of landscape and ornamental plants often exceed the levels found with annual agricultural crops. [Editor's note: samples of poisoned and dying honey bees, collected in suburban settings, have been shown to have only imidacloprid in them.] However, the strongest statement made in the report is: "… which suggests that non-agricultural use of neonicotinoids poses high risks to bees." [Second editor's note: With the suburban imidacloprid poisonings, with which I am familiar, the bees stopped dying in a day or two and the colonies continued to survive very well.]

The fourth paragraph suggests that many other non-target organisms (invertebrates) besides bees are likely to be injured or killed by neonicotinoid uses. The final paragraph sounds like it was written by scientists: we need more research. However, the final sentence sounds more European than American in approach: "Without clear evidence that they are not causing long-term harm to non-target species such as pollinators, the use of neonicotinoids should be restricted to applications that will not affect these vital insects." This is sometimes called the "precautionary principle" approach – unless the use is proven to be harmless, then don't use it. It is possible that, following the most recent Pelston meeting (a U.S. meeting of pesticide experts from all over the world), our EPA administrators will begin to think more along those lines. Currently, American leaning appears to be more along the lines of: if damage cannot be documented with use in compliance with the label, the use can be continued.

"Are Neonicotinoids Killing Bees?" is a very nice distillation of the concern over neonicotinoids. You can download a free pdf copy simply by going to: http://www.xerces.org/neonicotinoids-and-bees/.

Imidacloprid and Citrus

An article brought to my attention by bee broker Joe Traynor suggests that use of imidacloprid against the glassy wing sharpshooter (GWSS) is quite common. Glassy wing sharpshooter can vector Pierce's disease in orange groves. Pierce's disease is a bacterial disease that clogs up the vascular system of a citrus tree and kills it. It is not a whole lot better than Huanglongbing or citrus greening disease. With either disease an orchard can be lost if the disease gets ahead of the grower. Historically, Pierce's disease wiped out 40 percent of the citrus in Temecula, CA, years ago.

According to the article in the December 2011 edition (pages 21-22) of the American Vineyard, imidacloprid was used in many orchards, but distinctions between

foliar or soil applications were not made. In Fresno County, 275 and 457 acres were treated for GWSS during 2010 and 2011, respectively. Chemicals are not mentioned. In northern Kern County, 686 acres were treated in 2011. There were GWSS in the *Eucalyptus* around the orchards, so they received "imidacloprid and at least one foliar treatment." In southern Kern County about 16,600 acres were "authorized for treatment," when they trapped 35,433 GWSS. Beginning in the fall of 2003, there were foliar treatments on 38,769 acres of citrus. The following year, 17,758 acres were treated with imidacloprid. Those treatments reduced the GWSS enough to change to an approach of treating hot spots, only. Last year 11,713 acres were treated for the pest.

In Madera County, GWSS was first detected in urban areas in 2010. The trapping program demonstrated a total of 21 GWSS from 239 urban and 186 commercial orchard traps. That resulted in 489 treated acres in 2011. In the Coachella Valley, traps were placed in citrus and grapes, two crops susceptible to Pierce's disease. Ninety-six GWSS were found in 885 traps set out in 10,645 acres of table grapes and 12,000 acres of citrus. In 2011, 1,694 acres of citrus were treated using imidacloprid on conventionally grown citrus and PyGanic (naturally extracted pyrethrins) on organically grown citrus.

Returning to Temecula, things have been going pretty well with suppression treatments under way in vineyards and citrus orchards. Still, they trapped 980 GWSS in 491 traps and treated a total of 762 acres with either imidacloprid or PyGanic.

Finally, nursery stocks have been given special attention since they move around. A total of 33,897 nursery stock shipments were made from quarantined areas. Only four "Notices of Rejection" were issued for viable life stages of GWSS on nursery stock.

Although this sounds like substantial use of imidacloprid on trees having flowers that will be visited by honey bees, research studies conducted by entomologists at UC Riverside did not find significant amounts of imidacloprid in the nectar or pollen (what there is of it) in samples taken from imidacloprid-treated citrus trees (personal information from Professor Joseph Morse, UC Riverside).

<u>European Grapevine Moth</u>

If you would like to spend a bit of time checking out another recently introduced grape pest that is causing local problems, look up the European grapevine moth (EGVM). *Lobesia botrana* is a bit smaller than a small hive beetle. First generation larvae feed inside flower clusters, blasting flowers. Second generation larvae feed on, and later inside, green berries, hollowing them out. Third generation larvae feed on ripening berries, webbing the berries in the clusters, contaminating them with feces, and introducing fungal infections. Extension and regulatory personnel are getting about 90 percent compliance from growers opting for chemical control and 50 percent compliance with those preferring biological control (Isomate EGVM® mating-pheromone twist ties or *Bacillus thuriengensis kurstaki*).

The current state map of infested counties and federal quarantines includes Nevada, Sonoma, Napa, Solano, Santa Cruz and Santa Clara counties. In those counties, wine producers can use locally produced grapes and grapes brought in from non-quarantined counties. Getting grapes from the quarantined areas certified for shipment

out of the counties is a major hassle. But, the moths don't care – they are reported to eat apricot, barberry, blackberry, carnation, clover, cherry, currant, Daphne, dewberry, gooseberry, grape, jujube, kiwi, olive, persimmon, plum, pomegranate, privet, and rosemary. You can look for dinky worms on your grapes or other fruits. If you find them (check out what they look like at: EGVM_Brochure_English_6_22_10_pdf), it would be a good idea to contact the ag commissioner's office. They are trying to keep this pest from spreading all over the state.

California Pesticide Use Reports

I guess it is time to harangue you again. Not Loss Reports, this time, but Use Reports. What are Use Reports? They are the state's way of documenting what quantity of registered pesticides is used in the state on an annual basis. That data is gathered, summarized and shared with whoever wishes to see it. But, don't be too eager. The reports usually run a year or two behind.

In the case of pesticide use in beehives, we have a number of registered products which should be reported on a monthly basis when they are being used in the hives. Absent that, one should submit an annual report. I have attached some help (next page) for completing that form in the data below. The form can be downloaded at: http://www.cdpr.ca.gov/docs/enforce/prenffrm/enf025.pdf.

During our attempt to get Apivar® (amitraz) strips registered for use on varroa mites in California, we met with an interesting interpretation of the facts by an agricultural commissioner's office: "Barely anyone is reporting that they are using registered materials for the mitigation of a varroa mite problem. Thus, there must not be a varroa problem." This is the way an agency is apt to make its decisions, based on the data that has been submitted to them on a pest control problem. The fact that some registered and previously registered products are no longer effective in controlling the pest is not taken into account in the data bank. So, we have some work to do.

I looked up the list of products registered for varroa mite control in California. The list contains ACTIVE registrations for about half the products that we have used over time. I put the information that is required on the Use Report form in the data (FULL width page, following). When you submit the form (data) do not report products that have an asterisk (* = INACTIVE registration) in front of them. Those registrations have expired. The first number is the California "CHEM NO." The second, longer number is the "EPA REGISTRATION NUMBER FROM LABEL." The creators of the form expect some sort of volumetric or weight amount of pesticide used in column #20. If you list the number of total strips used in the apiary, that should cover it. In theory, there should be a separate Use Report filed, within seven days after application, which lists every product used in each apiary on the date the application was made. You will need triplicate copies of the form: Ag Commissioner, Applicator, Grower. You are the "grower" and "applicator" unless you have someone else make the application.

California Pesticide Notices of Intent

Harangue number two! If you wish to play by all the rules, you should be submitting a Notice of Intent at least 24

2195	Wellmark International	Apistan	2724-406-AZ	strip number	10% a.i.
991	Vita	Apiguard	79671-1-AA	50 g per treatment	25% thymol
3208	NOD Apiary Products	MAQS	75710-2-AA	Strip number	46.7% a.i.
6071	Beta Tech Hop Products	Hopguard §	83623-50001-EE	Strip number	16% a.i.
1074	Mann Lake Ltd.	Mite-a-thol	61671-1-AA	Packets	100% a.i.
5230	Dadant & Sons	Sucrocide	70950-2-AA-2205	Aqua. Concent.	40% a.i.
5230	Natural Forces, LLC	Sucrashield	70950-2-AA-84710	Aqua. Concent.	40% a.i.
1596	Dow AgroSciences	M-Pede	62719-515	Aqua. Concent.	49% a.i.
484	D&D Holdings	Phostoxin Pellets §	72959-5-AA	Pellets	55% a.i.

§ See special instructions – Notice of Intent, below

** Currently "Inactive"*

*165	Bayer Healthcare	Checkmite+	11556-99024-EE	Strip number	10% a.i.
*5784	Wellmark International	Hivastan	2724-8010-EE	Strip number	0.3% a.i.
*991	Chemicals Laif	Api Life VAR	73291-5007-EE	Tablets	74% a.i.
*3208	Apicure, Inc.	Apicure	72839-1-AA	Pads	65.4% a.i.

hours before you make applications (treatments) that have to be reported under "Restricted Materials." Currently, the only chemicals California beekeepers use that meet that criterion are aluminum phosphide and Hopguard (any Section 18 or 24-C product). The Notice of Intent form is identical to the Use Report form, with tiny exceptions in red print reminders at the bottom. You will need triplicate copies of that form: Ag Commissioner, Applicator, Grower. You are the "grower" and "applicator" unless you have someone else make the applications. The Notice of Intent form can be downloaded at: http://www.cdpr.ca.gov/docs/enforce/prenffrm/enf126x.pdf.

Additional Surveys – Pesticides

It was only a few months ago when I suggested in the Jan/Feb newsletter that beekeepers are being "surveyed to death." And, then, here come a couple more. This time, however, you might REALLY want to take advantage of the opportunities.

Unlike the former EPA bee loss form, the first alternative is specifically designed to ask for information that beekeepers consider important concerning their colony damage and losses to pesticide applications over the 2011 beekeeping season. To save quite a bit of time, many of the questions have potential answers given, and you just click on the circle or box (yes, this is an online survey, but you can fill out the form, print it – I hope – and mail it to: Susan Kegley, Pesticide Research Institute, 2768 Shasta Road, Berkeley, CA 94708). The URL to this survey is: https://docs.google.com/spreadsheet/viewform?formkey=dDhCLXpnaHdHV1JyMFBRck1iVFNobEE6MQ.

Titled "Beekeeper Survey for Pesticide-Related Bee Kills," the form shows that Darren Cox, a commercial beekeeper who runs Cox Honeyland, Logan, Utah, is listed as a contact, should you wish to know more about how this survey was developed. Darren has been deeply involved in discussions between the beekeepers and EPA on honey bee/pesticide issues. He can be reached at: coxhoney@gmail.com.

The following text is included at the beginning of the survey: "This survey was developed by beekeepers to gather information that will be used by the US EPA Pesticide Program Dialogue Committee, Pollinator Protection Workgroup. The overarching goal is to determine whether specific crops pose greater or lesser hazards to bees. This will help the Committee provide recommendations to the EPA to better protect honey bees from pesticides."

"Most of the questions focus on acute bee kills caused by high doses of pesticides, including insecticides, fungicides and herbicides. When deciding what constitutes an acute bee kill, please consider only events in which your bees were exposed to high levels of pesticides, and died soon thereafter." Only one question at the end asks about hive dwindling and/or loss over time that might be related to pesticide exposure. You, as a beekeeper, have valuable experience working with your bees that will help provide on-the-ground information to improve pesticide regulation to protect pollinators. We are grateful for your participation in this survey.

The second survey is being coordinated by The Center for Food Safety. It is titled "Beekeeper Abnormal Mortality Report Form – Spring 2012." This survey is "open ended." You fill in the answers by hand (or computer) with no choices preprinted on the form. There are 19 specific requests for different information about each loss.

In this case, a hard copy form should be mailed back to: Peter Jenkins, The Center for Food Safety, 660 Pennsylvania Ave. SE, Suite 302, Washington, DC 20003. The form also may be filed electronically at: http://www.centerforfoodsafety.org/beekeeper-abnormal-mortality-report/.

In case the names may sound quite similar to you, The Center for Food Safety is not the same group as the Food Safety Network, the organization that made headlines by calling professionally packed, store-shelf honey not real honey.

We do not know exactly how these two NGOs (non-governmental organizations) will use the data, but the feeling of many is that pertinent data is not making its way to the EPA or it has not being taken seriously enough, when it has been received. Perhaps this will increase the emphasis.

Epigenetics of Oxytetracycline

Long ago, Dr. Christine Peng of UC Davis and I determined that oxytetracycline hydrochloride, a protein synthesis inhibitor in bacteria, could be toxic to honey bee brood if too much was used to treat colonies to prevent American foulbrood (AFB) disease or to "clean up" an infected colony. At that time, some strains of AFB were becoming resistant to the antibiotic.

We considered the loss of brood to be due to "over dosing" or "contamination" of the brood with the powdered sugar mix. We were not very concerned about the effects of the antibiotic on adult bees.

In late April of this year, Jeanne A. Zeh and colleagues in University of Nevada, Reno's Department of Biology; Program in Ecology, Evolution and Conservation Biology, conducted experiments exposing a species of Panamanian pseudoscorpion (*Cordylochernes scorpioides*) to the antibiotic. They were prompted to use the antibiotic because of statements suggesting that: "There is growing evidence that rickettsial bacteria, most notably *Wolbachia*, are pervasive inhabitants of insect cytoplasm, and assessing *Wolbachia* effects

on host phenotype typically involves treatment with tetracycline in order to cure cellular endosymbiont infection."

Since mitochondria possess bacteria-type ribosomes, tetracycline tends to inhibit mitochondrial protein synthesis. Mitochondria play a critical role in spermatogenesis, and tetracycline has been shown to cause reduced sperm counts in mammals and fish, as well as causing morphological abnormalities leading to reduced sperm mobility and viability.

In this study, the pseudoscorpions obtained their doses of tetracycline indirectly by consuming larvae of fruit flies (*Drosophila melanogaster*) which had been fed on medium containing the antibiotic. The scientists analyzed male and female pseudoscorpions. Both sexes grew normally, and females appeared to reproduce normally. The males that consumed the antibiotic had normal numbers of sperm, but had significant reduction in sperm viability. But, even more interestingly, the male offspring, from matings between treated females and treated males, also had the same reduced sperm viability problems.

I have mentioned "epigenetics" before. That is when outside influences impact the "reading" of the DNA code in a cell. Usually, it is the result of a specific spot on the code being methylated and "turned on." To go back to normal, the spot has to be "demethylated." If the code that was altered is in reproductive or mitochondrial cells, it can be passed to the next generation in the altered state.

Just as interesting is the fact that following the passage of the altered code to the son, the grandson seems to have reverted back to normal if its dad lives in an environment free of the antibiotic.

Are we inducing the same reproductive problems in our queens and drones when we use antibiotics to control certain honey bee disease organisms? Perhaps, but we were using antibiotics for a long time before we started to encounter the currently unacceptable levels of loss of queens and overwintering colonies.

To read more about this study and its statements about antibiotics being more likely to cause oligospermia (low sperm counts) in various animals, including humans, please visit the following URL: http://www.nature.com/srep/2012/120426/srep00375/full/srep00375.html.

Native Bee Publication

The United States Forest Service and the USDA Pollinator Partnership combined forces to produce a beautifully illustrated, 48-page booklet that depicts the various fundamental life histories of quite a few of our most common native bees. The text for each group covers their life cycle, their favored foods, their nesting habits, and peculiar behaviors of some of the family members.

As beekeepers, or those with an interest in honey bees, you should become familiar with other bees and bee mimics that you and your neighbors are likely to see in Your gardens and yards. You probably can "snow" any non-beekeeper you meet with all your knowledge about honey bees, but is that your instant limit on bee knowledge – one species?

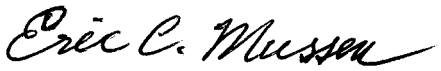
One of the best things about this publication is that is a print-for-free, pdf download from the following web URL: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5306468.pdf.

Hedgerows and Bees

Efforts have been ongoing for years to convince growers that having appropriate plantings, alongside their commercial fields could provide more biological pest control and less need for applying pesticides (as well as providing forage for pollinators). The idea has been accepted, slowly, in certain areas of the state, especially those in which there is significant organic production. A recent detailed study of hedgerows on various farms has shed some light on the possible benefits and detriments for those who have given it a try (see online issue of *California Agriculture*, Oct/Dec 2011, pages 197-201): http://californiaagriculture.ucanr.org/landingpage.cfm?article=ca.v065n03p197&fulltext=yes.

In my limited remaining space, I can repeat only that 8,045 beneficial insects (including minute pirate bugs, syrphid flies, assassin bugs, tachinid flies, big-eyed bugs, lacewings, wasps, ladybird beetles and damsel bugs) were collected from four hedgerows that also contained 2,278 pest species (including spotted cucumber beetles, *Lygus* bugs, flea beetles and stink bugs) – 78 percent beneficials to 22 percent pests.

Sincerely,



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