

The Bee Line

Newsletter of the Oregon State Beekeepers Association

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Sandra Meeks

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Image above: As we continue to care for all of our bees, we have increasing concerns about pesticides and other chemicals—both inside the home/hive and in the outlying environment. As the front story and others in this issue suggest, as we increase our understanding of toxic materials and their acute as well as less obvious and less easily studied impacts—those that are sublethal, cumulative, delayed, synergistic, chronic—we can take steps toward better management for the good of all.

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PRACTICES AND PRECAUTIONS IN THE USE OF PEST-CONTROL TREATMENTS AND CHEMICALS

R. Michael Rodia, Ph.D.

I. TOXICITY AND DOSE

1. Over 500 years ago, it was recognized that *any* substance (chemical) can be toxic. At that time, it was understood that the amount (dose) of a chemical an organism (human, bee, and so forth) is exposed to determines the degree of toxicity. Some chemicals are toxic at extremely low doses while others require massive doses before toxicity occurs. Since then, we have learned that toxicity is also dependent upon how exposures occur, how long they occur, and whether or not they also involve other chemical, physical, or biological agents.

2. Toxicity may arise as the result of short-term (acute) or long-term (chronic) exposures or combinations of the two exposures. Various limits for exposures have been established. These include LCs (Lethal Concentrations), LDs (Lethal Doses), and PELs (Permissible Exposure Limits). Most of these limits have been set *without* regard to what other chemicals (toxins) or physical or biological agents may be present. Moreover, many have been set based primarily to limit acute toxicity, while limits (if any) to minimize chronic toxicity result only when toxic effects are seen after long-term, real-world exposures.

3. Toxicity studies, particularly those for chronic effects, can be extremely costly and time-consuming, and are extraordinarily difficult if combinations of toxins, other chemicals, physical and/or biological agents are involved. It should not be surprising, therefore, that even if a chemical is used as directed unforeseen damage and/or toxic effects are seen, even years after exposures begin.

4. In chemistry, there are no distinctions between chemicals produced “naturally” and those created in the laboratory. At one time, chemicals were classified as inorganic and organic. The inorganic included metals, salts, and most chemicals that did not contain carbon atoms, while the organic were chemicals that living organisms create which contain carbon atoms. Sodium chloride (table salt) was inorganic while ethyl alcohol (in liquor) was organic. Today we define chemicals according to their combinations of atoms. As in chemistry, toxicity does not depend nor is it defined by the source of the chemical. It is not the source which determines toxicity but rather the chemical and its structure.

Toxicity of a chemical is also not simply dependent upon how complex is its chemical structure. A very small chemical with a few atoms can be as toxic or more toxic than a more complex chemical containing many atoms.

II. CONSIDERATIONS

1. Only a very, very small amount of Ricin ($C_8H_8O_2N_2$), the second-most-toxic chemical for humans by ingestion, will kill. It is also highly toxic through

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MESSAGE FROM THE PRESIDENT

Where does the time go! We are back in Oregon, visiting with growers and delivering bees again, and it seems like just yesterday that we were here last year. Things are moving slowly AGAIN, but we are holding out hope for a much more bee-friendly spring than 2011.

There are a few very important things going on in the industry—one being what beekeepers will use for Varroa mite treatments this year. We are in the very unpleasant position of again trying to explain to the Oregon Department of Agriculture that *YES*, we have tons of treatments in our arsenal for mites, but what actually works and what reliably does not harm our bees is another story. They see all of these treatments listed as available to us and cannot understand the problem. There is an amitraz strip available in Canada that several state Departments of Agriculture have requested for a Section 18. My understanding is that there is *ZERO* tolerance for amitraz right now in honey. If, and that is a huge *IF*, the EPA would allow a Section 18, there will be many limitations on usage. We will keep you all posted on how this situation unfolds.

In Oregon, on a positive note, I recently attended a meeting of the Master Beekeeper Program Committee. As you have heard over and over, our goal is to educate beekeepers on proper methods of maintaining beehives. We are very excited that we now have over 140 individuals signed up for the Apprentice Beekeeper level of the program as well as over fifty mentors and instructors involved who have volunteered their time to help train the apprentices during the training period. The apprentices will be required to do field work, keep records on their attended hive(s), pass a written exam, and attend meetings and other education events during the training period. The Master Beekeeper Program Committee is now working on the requirements for the Journey Beekeeper level of the program and hopes to launch the next level at the conference in Seaside this November 1–3.

Speaking of the 2012 fall conference, our Vice President Paul Andersen is already hard at work lining up speakers for another blockbuster conference, so please mark your calendar for the date. We are very pleased that we will not conflict with the California State Beekeepers Association Convention this year [November 13–15] and look forward to seeing you all there.

Bee passionate about your bees and have a wonderful summer.

Jan

2011 HONEY PRODUCTION

The 2011 USDA report on honey production (based on beekeeping operations with five or more colonies) indicates that colonies produced 148 million pounds, a reduction of 16 percent from 2010. The average per colony was

59.6 pounds with honey prices averaging 172.9 cents per pound (see: <http://usda01.library.cornell.edu/usda/current/Hone/Hone-03-30-2012.txt>). A subsequent, corrected table indicates that Oregon had 60,000 honey-producing colonies with an average production of 34 pounds per colony and average price at 174 cents per pound during 2011.



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MINIMIZING THE USE OF CHEMICALS IN BEEKEEPING

Heike Williams

Concepts for minimizing the use of chemicals

- ❖ Replace or avoid using old comb.
- ❖ Remember that miticide residues accumulate in wax
- ❖ Rotate old comb out of hives.
- ❖ Be aware of potential presence of American foulbrood scales when buying used equipment.
- ❖ Keep in mind that alternatives are not without problems (for example, wax foundation may contain residues; plastic foundation has problems with acceptance and disposal).

Consider hive placement

- ❖ Place in warm, sunny locations (some viruses transmit in damp conditions).
- ❖ Dry out equipment from dead-outs before restocking.

Queens

- ❖ Buy disease-resistant stock (for example, breeders who test for hygienic behavior, certain breeding programs like SMR queens) from different sources and try them out.
- ❖ Replace queens that show an excess amount of chalkbrood, European foulbrood, or any sign of American foulbrood.

Monitor pest infestation levels and disease

- ❖ Send samples to labs (for Varroa mite, tracheal mite, and Nosema analysis).
- ❖ Monitor Varroa mite (for example, with sticky boards, sugar roll, or alcohol wash).

Avoid treating preventatively

American foulbrood

- ❖ Tylosin. Use only in case of infestation. Feeding of trace mineral mix seems to help with American foulbrood problems (based on anecdotal evidence; not aware of any scientific studies).

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Queens, Bees, Honey & Pollination

European foulbrood

- ❖ Requeen only; clears up on its own.

Nosema

- ❖ Use of Fumagilin-B? Not sure what to recommend. One option is to learn how to test your bees for Nosema spores, then treat only if necessary.

Use nonchemical treatment methods whenever possible

Varroa mite

- ❖ Cut out drone brood; effective but also problematic; consider carefully (timing is critical!).
- ❖ Screen bottom board; controversial, but definitely useful when using sticky boards.
- ❖ Powdered sugar dusting; controversial, time intensive.

Tracheal mite

- ❖ Grease patties.

Wax moth

- ❖ Keep honey super frames separate from brood frames; store in bee-tight shed, but cold and ventilated; means use of queen excluder.
- ❖ Put (brood) comb in the freezer.

Harvest

- ❖ Avoid fume boards; use escape boards or brush method.

Use “natural” instead of synthetic chemicals

Varroa mite

- ❖ Formic acid (Mite-Away Quick Strips™).
- ❖ Oxalic acid (most effective as winter treatment; treat only once).
- ❖ Essential oils/thymol (Apiguard™, Api Life Var®).

Nosema

- ❖ Feed additives and supplements like Nozevit, Honey-B-Healthy, and Lefore's Essential Oil Patties. (Do they help bees to cope?? I don't know.)

Tracheal mite

- ❖ Formic acid (Mite-Away Quick Strips™).

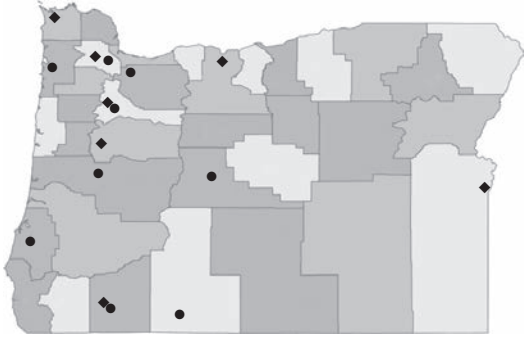
Wax moth

- ❖ BT (*Bacillus thuringiensis*) products.

Maintain high levels of nutrition

- ❖ Reduction of stress; helps bees cope better with pests and diseases.
- ❖ Sugar syrup, frames of honey.
- ❖ Pollen substitute patties.

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63211 Service Rd, Suite 130, Bend
President: Dennis Gallagher; 541.389.4776
For information, please contact John Connelly
johncobka@gmail.com

Coos County Beekeepers
Meets 6:30 PM, third Saturday (except December)
Ohlsen Baxter Bldg, 631 Alder St, Myrtle Point
President: John Gardner; 541.572.3847
Vice President: Shigeo Oku; 541.396.4016
Secretary: Bobbi Gardner; 541.572.3847
Treasurer: Jane Oku; 541.396.4016
janeoku1958@gmail.com

Klamath Basin Beekeepers
Meets 9:00 AM, last Saturday (except Nov/Dec)
OSU Extension, 3328 Vandenberg Rd, Klamath Falls
President: Tom Chester; 541.850.8384
klamathbeekeepers@gmail.com
Vice President: Chris Kerns; 541.884.8664
Secretary: Donna Schmerbach; 541.891.3066
Treasurer: Kathy Nelson; 541.882.3141
Website: www.klamathbeekeepers.org

Lane County Beekeepers
Meets 7:30 PM, third Tuesday, Trinity United
Methodist Church, 440 Maxwell Rd, Eugene
President: Judy Scher; 541.344.2114
judyscher@gmail.com
Vice President: Rita Ostrofsky; 541.685.2875
Secretary: Barbara Bajec; 541.767.9086
Treasurer: Nancy Ograin; 541.935.7065
woodrt@pacinfo.com
Website: www.lcbaor.org

Linn-Benton Beekeepers
Meets 6:30 PM, fourth Wednesday, South First
Alternative Co-op Meeting Room, Corvallis
President: Linda Zielinski; 541.929.4856
Secretary: Marie Laper
Treasurer: Suzi Maresh

Portland Metro Beekeepers

Meets 7:00 PM, second Thursday, Clackamas Community College, Clairmont Hall, Room 118, Oregon City
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 Secretary: Kat Yeager; 503.452.5010
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 Treasurer: Rex McIntire; 503.720.7958
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Southern Oregon Beekeepers

Meets 7:30 PM, first Monday, Southern Oregon Res & Ext Ctr, 569 Hanley Rd, Central Point
 President: John Jacob; 541.582.BEES
 john@oldsolenterprises.com
 Vice President: Floyd Pawlowski
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 Secretary: Michele Bashaw; 541.512.0155
 hapistitch@earthlink.net
 Treasurer: Ron Willing; 541.582.9694; rwilling@charter.net

Tillamook County Beekeepers

Meets 7:00 PM, second Tuesday, Art Space
 Hwy 101 & 5th St, Bay City
 President: Bob Allen; 503.322.3819

Tualatin Valley Beekeepers

Meets 7:30 PM (7:00 PM to socialize), last Friday
 Cameron Public Svcs Bldg, 155 N First Ave, Hillsboro
 President: Kevin Beckman; 503.539.5996
 kevin_beckman2@msn.com
 Vice President: Herb Brasington; 503.701.4180
 herb@hwbsystems.com
 Secretary-Treasurer: Jerry Maasdam
 503.648.7906; jmaasdam@mac.com

Willamette Valley Beekeepers

Meets 7:00 PM, fourth Monday, Chemeketa Community College, Building 34, Room A, Salem
 President: Richard Farrier; 541.327.2673
 Vice President: Harry Vanderpool; 503.399.3675
 shallotman@yahoo.com
 Secretary: Mike Rodia; 503.364.3275; drodia@yahoo.com
 Treasurer: Patricia Swenson; pksvenson@gmail.com
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REGIONAL NEWS**Regional Representatives
North Willamette Valley**

Rain. Sucrose syrup @\$0.42 per lb.

Rain. Hives stuffed with bees.

Rain. Few queens available.

It's springtime in Oregon. More rain.

Oregon beekeepers are not the only ones suffering from record rainfall in 2012. Many of our seed growers have yet to sink a plow in the ground as of April 8.

Radish pollination along with other seed crops in the Willamette Valley will be late this year.

Most early queen orders were cancelled from Northern California due to weather.

Out of the waiting and gloom, however, comes the attributes that define us as beekeepers. Some beekeepers are resolving to double or triple their numbers of overwintered nucs this year to combat lack of early queens. Others are putting final touches on their plans for rearing their own queens this year.

Hopes are high for a decent honey crop due to ground moisture holding through springtime.

Have you ever noticed that you feel a little bit better when you find out that others are suffering from the same problems that you are? Why is that? Maybe it is because you are a very good beekeeper who does your best to do things right, but you still encounter problems just like others. This year it is equally as comforting to hear and see the excitement for the coming season from beekeepers emerging from the rainy season. We may not be able to control the weather, but we can control our attitude.

2012 is going to be a GREAT year!!

—Harry Vanderpool

Regional Associations**Coos County Beekeepers**

At the March meeting, President John Gardner kicked off with a presentation about the hive reduction board.

After this stimulating presentation, the group proceeded to the discussion portion of the meeting where colony collapse, pesticide use, forage, Oregon Master Beekeepers, an Audubon Society presentation, and a new neighboring beekeeper group were hot topics. Especially commented on were the use of pesticides in surrounding agricultural fields, county and state road maintenance, and forest clear-cut areas. Current weather and extensive moisture continue to affect bee colonies. Several members commented on the buildup in their hives, signaling spring activity. Unfortunately, the buildup was followed by rainy days and limited foraging. Most beekeepers in the area are continuing to feed their colonies.

A number of members asked for clarification of the Oregon Master Beekeeper Program. We discussed options and encouraged participation. Shigeo Oku shared positive feedback related to his presentation at the regular meeting of the Cape Arago Audubon Society in Coos Bay and welcomed a new member to our group from that meeting. Del and Myrna Barber announced the first meeting of Curry County Bee Friends. A front (and back) page news article "Backyard Beekeeping" in *Port Orford News* on March 21 helped to promote attendance. They reported a dozen excited Bee Friends who planned to meet again on April 19 in Gold Beach. Coos members offered their support and welcomed their neighbors' efforts. Under the business portion of the meeting, arrangements were made for delivery of bees to members. Randy Sturgill planned to pick up bee packages in California and have them available at his home in Myrtle Point during the second week in April. —*Del Barber*

Portland Metro Beekeepers

The April meeting began with a discussion of the upcoming annual Bee Day on Saturday, April 21. There are still openings to attend. We will have bee suits on loan and also bee hats for sale for those just starting out and interested in coming.

Jim Barlean led a discussion of what to do this month in the hive. He will put supers on now for the maple flow when available. Regarding queen replacement he commented, "If a queen is laying a good pattern, why get rid" of her? He then shared some of his personal queen rearing ideas. Next John Holderness gave a talk on the equipment to bring and methods of swarm catching. One of the really fun parts of beekeeping is catching a swarm, and he showed us how.

At our next meeting on May 10, Matt Reed will discuss Warré Hives. —*Paul Jarrett*

Tillamook County Beekeepers

April's meeting was well attended, with members receiving replacement bees at this time. Lots of time was spent on questions related to installing packages and caring for new nucs. Carolyn Breece and Dewey Caron come to the Coast for a workshop on May 19. Local beekeepers are looking forward to training and also learning from Carolyn about opportunities with the Oregon Master Beekeeping Program. Jim Fanjoy shared his experiences from his trip working with beekeepers in Panama. Lots of colorful photos and details of helping local farmers and small beekeepers. Jim worked with Juan Malivern and got to experience bees in the tropical climates. GloryBee donated bee veils for Jim to take South. Our meeting ended with a fantastic sunset outside our meeting room. —*Terry Fullan*

Willamette Valley Beekeepers

"Vanishing of the Bees" was shown April 12 at the Grand Theater in Salem. Carolyn Breece from Oregon State University and Mike Rodia provided background information and answered questions. The film was attended by about 250 persons with a dozen or so WVBA members there. The WVBA display and hand-out table "sold-out," and this included a copy of *Beekeeping for Dummies*. It is expected that at least a few of those attending may become beekeepers. Richard Farrier briefly discussed and passed out a hand-out covering package installation during the last meeting. He prefers to place the package inside the hive and allow the bees to exit on their own overnight. This minimizes stress and bees in the air. Get a copy of his handout for information. In any case, no matter how the package is installed, do not disturb the hive for at least seven days. Ken Vial is looking for at least four people each day to answer questions and explain beekeeping during AgFest. If interested, contact him at the meeting on April 23 or call him at 503.879.9006. It's a great opportunity to share your knowledge (and you have more than you think) with kids and their parents.

Adapted from: April 2012 *WVBA Secretary's Minutes*

KEEPING BEES IN MAY

Todd Balsiger

The summer's main nectar flow begins this month and lasts into early July. This roughly eight-week period is of critical importance for colonies to gather surplus honey and winter stores. The rest of the year, colonies mostly

lose weight. As beekeepers, we try to protect and maintain a strong field force during this time. This is a dynamic period in bee management with many overlapping tasks. Consider the following:

- ❖ We need to ensure colonies continue to build up for the main nectar flow. After the maple and fruit trees bloom, there is actually a decrease in available nectar, and with poor weather colonies can still starve. Although very infrequent, in past years it has been necessary to feed well into summer to prevent starvation. Discontinue feeding prior to supering!
- ❖ It is still possible to treat for Varroa mite if your infestation rates are too high. It should be with a “soft treatment”—really the only kind I recommend—if you plan to super any time soon. I personally have used Mite-Away in May, and this worked well. I have no specific recommendations on what soft treatment to use at this time. It is a dangerous to offer advice on what mite treatment to use. They all seem to have caveats and what works in one location, say California, may cause havoc in our hives here.
- ❖ May is an ideal month to purchase queens, requeen hives, and make divisions. It is a more forgiving and easy time to work bees than April, with increased daily high temperatures and less rain. I personally purchase my queens in May when the demand has lessened and the quality of queens has improved. Divisions may not make a honey crop and may require extra feeding to ensure adequate winter stores, but I don't like replacing queens that are not well mated.
- ❖ I was once told that a good starting time to raise queens here in the Northwest is when the trailing blackberry (our native blackberry) blooms. This usually corresponds to about mid-May.
- ❖ Swarm season is at its zenith now. I share a variant of a beekeepers' proverb, mid-17th century origin: *A swarm in May is worth a load of hay; a swarm in June is worth a silver spoon; and a swarm in July is not worth a fly.*
- ❖ Continue swarm control practices. Decreasing queen pheromone production and its distribution within the hive triggers the swarm impulse. The two best ways to reduce swarming are to regularly requeen (young queens produce more pheromone) and to reduce congestion (reversing, equalizing, making divisions, checkerboarding, supering).
- ❖ Nuc boxes containing a frame or two that has had brood, another frame with a mixture of honey and pollen, and the balance in foundation are ideal for catching swarms. Swarms quickly convert foundation into beautiful drawn comb, so you may want to capitalize on this behavior. Remember, frames need to be tight together when drawing foundation—too much space and the likely result will be burr or misshapen comb. You can feed sugar water to accelerate and sustain growth, just like that for divisions.
- ❖ Consider setting up bait hives (like the nuc box above) to catch swarms. Make sure the mice can't get in!
- ❖ Visually look at colonies for health and investigate why some colonies are not keeping up with their peers. Does it have an underperforming queen? Has it become queenless and developed laying workers? Does it have a disease? Has it swarmed or is it on the verge of swarming with numerous ripe swarm cells (don't destroy all the swarm cells!)? Are they raising a supersedure queen? Take appropriate action (which may be nothing). If you don't know what to do, go to your next beekeepers' association meeting and ask.
- ❖ Look for signs that it is time to super, for example, the bees lose interest in syrup, the bees have zero robbing tendencies, or you see a new film of white wax, especially on the top bars.
- ❖ Provide abundant room for storing honey early in the season. I consider two supers as abundant. If paradichlorobenzene crystals are used for wax moth control, then air out the supers on a warm day to vaporize its residues.
- ❖ Bees generally work from the center up, so foundation centered in the hive will be drawn the fastest. I recommend ten frames when drawing foundation to prevent burr and misshapen comb. After the frames are drawn, at least for supers, I recommend nine frames to make uncapping easier.
- ❖ I recommend queen excluders (there are exceptions). I consider brood in supers as a big problem and hassle. Frames that have had brood are dramatically more vulnerable to the larvae of wax moths and require extra protection.
- ❖ Bees collect water in the summer as avidly as nectar and pollen. If appropriate water resources are absent, provide water early and let the bees train themselves to use it. This is especially important for urban settings—where your bees may end up in your neighbor's swimming pool or pet bowl instead.

QUESTIONS OF THE MONTH ? ? ?

Question

I did not have a mite problem going into winter as a first-time beekeeper. The bees swarmed several times, and the brood cycle was broken. However, I now have

a mite count of over 100 (430 collected over four days). Do you have a preferred method of treatment? I have heard mixed reviews of Quick Strips, powdered sugar, and Apiguard™ (thymol)?

Response

Dewey Caron: Numbers of mites do suggest the wisdom of treatment. YES to use of any of these three—and indeed there are mixed results with all three. Mite-Away Quick Strips™ (formic acid) would seem to be choice, but some in Oregon have lost queens (not a chance you might want to take in spring). If you use Quick Strips, air them out for a half hour after taking out of wrapping before placing them in the hive. Quick Strips work better at warmer temperatures. You will likely get a brood blast (dead brood) near the placement of Quick Strips in the brood box.

The essential oil Apiguard™ works best at moderate temperatures, which is always a problem for an early season treatment choice. Essential oils work well, but are very much temperature dependent.

Powdered sugar will knock some mites off adults, but will not work as a total season control option. You can use it 3–4 times at weekly intervals in the spring. It is a good low-tech method to choose this early in the season. Knocking mites off adults will hopefully allow the colony to grow out of a mite problem.

Probably the best (but more labor intensive) method to reduce mite populations in the spring is a drone sink. Grow drones in the colony with a frame of drone foundation, or if you have a standard box on top of brood boxes (versus on the bottom board), put a medium frame in place of a standard frame to allow bees to elaborate drone comb below the bottom bar to fill up empty space beneath the medium frame. When the queen lays eggs and the drone cells are capped (but before adult drones emerge), “harvest” the capped drone brood (with mites inside) and get rid of them. Replace the frame, and bees will likely allow a second harvest. An alternative is to add two medium frames in the standard box.

Question

I had two of my colonies not make it through the winter, and I have two medium boxes of honey left over. The other colonies that did make it have plenty

of honey. Can you give me some advice as to what I should do with the two extra honey boxes? I have two packages coming shortly, and I know I could feed it to them to get them started. I am not sure how to keep it until they arrive without it getting ruined by bugs, moths, mice, etc. Should I not save it for them and just harvest it for me? Do winter temperatures mess it up?

Response

Dewey Caron: If you have room in a deep freezer you could store it there. Honey will not freeze, and the temperature in your freezer will kill any wax moth eggs/Small Hive Beetle adults that may be present. I would bag it in plastic first. If you know the colonies did not die from American foulbrood, you can place those supers of honey on the colonies that are alive and they will care for them until you get your packages. Then you can give it to the package bees if you wish. If the honey is still liquid and not crystallized, you can extract it and use it for yourself as you mentioned. Winter temperatures will not mess up honey or rob it of its distinctive flavors and aromas.

THE SEARCH FOR CAUSES OF BEE LOSS

Dewey M. Caron

Honey bee populations have been suffering for at least the past ten years in the United States, but the cause of Parasitic Mite Syndrome and Colony Collapse Disorder (CCD) are still largely unknown. Pesticides are largely suspected by beekeepers as primarily or secondarily involved in colony demise. The search for colony losses has led to research looking for synergistic effects whereby 1+1 equals something different than 2—in this instance two chemicals tested/used independently while they may not be toxic individually to honey bees but together form a deadly combination.

The chemical combination might be fungicide/antibiotic plus the mite-killing chemicals many beekeepers are routinely using to control Varroa mite. To investigate synergistic effects, University of Maryland researchers pretreated healthy honey bees with the antibiotic oxytetracycline (terramycin), and then exposed the same bees to two pesticides coumaphos (Checkmite+) and fluralinate (Apistan). They found pretreated bees were much more sensitive to pesticide poisoning than were bees that had not been treated.

The team suspected that oxytetracycline may interact with specific bee proteins called *multiple drug resistance* (MDR)

transporters. To test this hypothesis, they pretreated the bees with another drug, verapamil, which is known to inhibit a particular MDR transporter. When so treated, honey bees showed increased sensitivity to three neonicotinoid insecticides + Apistan and Checkmite+, supporting the theory that MDR transporters may play an important role in CCD and synergistic effects were in fact a factor in individually “safe” chemicals becoming deadly in combination.

The pesticides that many beekeepers are most concerned about are the class called neonicotinoids, which includes imidacloprid and clothianidin. Neonicotinoids are systemic and so can be absorbed into plant tissue where they subsequently may show up in pollen and nectar, making them toxic to pollinators. They also persist in soil so that when another crop is grown on the same fields, toxic levels might still be present. The Xerces Society, the Portland-based NGO for Invertebrate Conservation, has released an excellent detailed report on potential negative impacts of neonicotinoid insecticides to honey bees and other pollinators.

Several European countries have re-examined the use of neonicotinoids in crops such as corn, canola, and sunflower. The Xerces Society report, which summarizes all of the peer reviewed research on the impact of these pesticides on bees, points out that neonicotinoids may make honey bees more susceptible to parasites and pathogens, including the intestinal parasite *Nosema*. Additionally, the report points out that neonicotinoid pesticides are sold and widely used by homeowners for use on lawns and gardens. These over-the-counter pesticides do not carry warnings on the risks of these products to bees (labels for neonics used in agriculture are not always clear on this either). Recall that in surveys by Ramesh Sagili and myself, small scale (backyard/hobbyist) beekeepers, many in urban suburban locations, suffer higher average colony losses than do the large scale commercial beekeepers.

Our bees are suffering. Is synergy part of the reason we are losing over 30 percent of colonies overwinter and colony queens are not lasting as long as they used to? We need to be better informed so we can make better decisions on how and where we keep our colonies. You can get copy of this report from the www.xerces.org website. For the report of bee losses by small scale and commercial Oregon beekeepers, see the March 2012 *American Bee Journal*.

Citation: Hawthorne, D.J. and G.P. Dively. 2011. Killing them with kindness? In-hive medications may inhibit xenobiotic efflux transporters and endanger honey bees.” *PLoS ONE* 6(11): e26796. doi:10.1371/journal.pone.0026796.

Note: In addition to the references Dewey provides here, including the Xerces Society report *Are Neonicotinoids Killing Bees?*, additional studies that may be of interest include:

Henry, M., et al. A common pesticide decreases foraging success and survival in honey bees. *Science* 1215039 (Published online 29 March 2012).

Krupke, C.H., et al. 2012. Multiple routes of pesticide exposure for honey bees living near agricultural fields. *PLoS ONE* 7(1): e29268. doi:10.1371/journal.pone.0029268.

Whitehorn, P.R., et al. Neonicotinoid pesticide reduces bumble bee colony growth and queen production. *Science* 121502 (Published online 29 March 2012).

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Central Oregon Bee Day: May 6, 9 AM–5 PM. Please bring sack lunch or purchase nearby. Partners in Care, 2075 NE Wyatt Ct, Bend. \$5 for COBA members, \$25 for nonmembers (includes one-year membership). To register, contact beeschool@cobeekeeping.org. Limited to first 50 to sign up.

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Chemicals and Treatments—Continued from page 1

contact with broken skin or the eyes. It is derived from the common castor bean plant. Ethyl alcohol (C_2H_5OH) ingested by drinking alcoholic beverages can kill if large amounts (many drinks) are consumed in a short period of time. In addition, it has acute effects including drunkenness and hangovers. Chronic effects include liver and brain damage. It is extremely dangerous in combination with drugs. Ethyl alcohol can be produced by the fermentation of sugars or from ethylene gas.

2. Interestingly, the most plentiful chemical on the Earth is among the most toxic based on the number of people who die from exposure to it each day, month, or year. That chemical, dihydrogen oxide (H_2O), otherwise known as *water*, kills more people through overdosing (drowning) than all other chemical exposures.

3. Malathion [$(CH_3O)_2P(S)SCH(COOC_2H_5)CH_3COO C_2H_5$], an organic phosphate (nerve agent), pesticide is acutely toxic to bees and chronically toxic to salmon, but essentially nontoxic to humans, as suggested by its very high human permissible inhalation exposure levels.

4. The combination of chemical toxicity and dose is just as true for honey bees and their pests as it is for humans and other living organisms. There may be a fine line between a dose that produces a certain effect (for instance, pest control) and one that damages or kills the host acutely or chronically.

5. The use of any chemical for pest control by beekeepers must take into consideration the amounts, the duration of exposure(s), and the delivery mode or exposure route to control pests without unacceptable risks to honey bees and beekeepers.

III. PEST CONTROL TREATMENTS AND CHEMICALS

1. Definition (Broad Sense)—any chemical (substance or agent) used to remove, decrease, kill pests.

2. Use a variety of mechanisms and delivery systems to control pests.

3. Range from “nontoxic” to extremely toxic for bees and/or beekeepers.

4. Use may require minimal (or essentially no) protection up to extensive protective measures and/or environmental controls for both bees and beekeepers.

IV. PEST CONTROL DELIVERY SYSTEMS

1. The delivery systems will determine when and how a control chemical or agent is best used, how much is required, and precautions necessary for bees and beekeepers.

2. Delivery systems may utilize one or more mechanisms to enable a chemical to reach the pests. These include:

- a. Contact. Strips, wetting down, and dustings can be used.
- b. Ingestion. By incorporating the chemical into feed, patties, or “towels.” The chemical may act systemically or directly to control pests.
- c. Inhalation. Depending on the chemical, simple evaporation, heated evaporation, or forced spraying/misting can be used.

V. ESSENTIAL PRACTICES FOR USE OF PEST-CONTROL TREATMENT CHEMICALS

1. Use only as necessary. Ascertain the need for before using.

2. Use only approved chemicals *and* the delivery systems that are also approved for them.

3. Use the chemical only during the time of year or the colony’s growth cycle that the chemical is most effective and least likely to contaminate honey and/or wax.

4. Remove (if necessary) any delivery system and/or residual chemical at the end of the treatment cycle.

5. Use “soft” (least toxic, least residue) chemicals before turning to “hard” (more toxic, more residue) chemicals.

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6. Follow manufacturer's use label requirements exactly. This is a legal requirement that not only protects the colony but also the beekeeper.

VI. USE AND PRECAUTIONS FOR FOUR TREATMENT CHEMICALS

1. Powdered sugar ($C_{12}H_{22}O_{11}$) can be used as a contact chemical to cover bees and cause Varroa mites to be dislodged. A screen bottom board is used to allow the dislodged mites to drop out of the hive and be removed. Because many Varroa mites may reside in brood cells, powdered sugar treatments must be repeated every few days to be effective. Even so, although this method has its supporters, others report it is only minimally effective. If the colony is made "broodless" by caging the queen for a period of time before using the powdered sugar, the method can be useful. Minimal or no special precautions are necessary for bees or beekeepers.

2. Thymol [$(CH_3)_2CHC_6H_3(CH_3)OH$] purified from Thyme oil or produced from m-cresol and isopropyl chloride can be used as a fumigant for Varroa mite control. Thymol combined with other "natural" ingredients is the major pest control chemical in Api Life Var® and Apiguard™. Although one (Api Life Var®) comes as a wafer and the other (Apiguard™) as a gel, both over several days, release thymol as a gas into the

hive. Although thymol is toxic to bees, at the lower concentrations controlled by the wafer and gel delivery systems, mites are killed with only minimal negative effects on colony activity or mortality.

Thyme is an herb used in cooking, but thymol is the purified and concentrated form of the chemical that occurs in thyme. It is corrosive and can cause irreversible eye damage and skin burns. It can be absorbed through the skin and if inhaled cause lung damage. Personal protection must be used and bees protected against high concentrations. Although a "natural" product, treatment residues may impart off-flavors to honey if supers are present during treatments.

3. Formic acid ($HCOOH$) is also used as a *fumigant*. Several steps are needed to convert carbon dioxide to formic acid. Previously available in Mite-Away II pads and now Mite-Away Quick Strips™, the formic acid can be released from a fiber pad or gel. If formic acid is used and it is too hot (more than 95°F) during its introduction, too much formic acid will volatilize and there may be bee and/or brood deaths. If it is too cold (less than 50°F), the treatment may be ineffective since not enough formic acid will volatilize. Quick Strips are, to some extent, less dependent on outside hive temperatures because they are placed inside the brood nest where temperatures are



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near constant. However, brood and/or queen kill can be significant, depending on conditions.

Small amounts of formic acid naturally occur in honey so contamination is not a concern. Neither does it build up a residue in wax, and pest resistance is not anticipated. It is, however, highly corrosive, capable of producing severe skin damage (not noticeable, particularly to the fingers, until long after exposure), irreversible eye damage and, if enough is inhaled, lung damage and possible death. If formic acid *liquid* is present, then protective wear is mandatory, including nonpermeable gloves such as latex, nitrile, or neoprene; eye protection (chemical splash goggles); and an acid gas cartridge respirator if formic acid vapors are also present. If little or no liquid formic acid is present, full bee suit coveralls with a hood should be adequate body (skin) protection. The Quick Strips formulation of formic acid greatly reduces the hazards it presents to beekeepers.

4. HopGuard consists of a cardboard strip wet with a complex liquid mixture of chemicals derived from hops. It is a *contact* treatment that, if used as directed, can be used any time without injury to bees or brood, or contamination of combs or honey. Because it does not kill mites in brood comb, it requires more than one treatment to bring mite levels down. Little or no protection beyond standard beekeeping wear is required; however, it can be quite messy to handle.

VII. CONCLUSION/SUMMARY

1. There are a large number of chemicals that might be used to control pests in beehives. Although some may be

“natural” and not considered “hard” pesticides, they can be hazardous to both bees and beekeepers.

2. It is important that pest chemicals be used only as necessary and as directed by product-use labels. Not only should effectiveness be of concern but also the hazards to the bee colony and beekeepers’ health and safety.

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A thatch beehive that Joy constructed in 2011.

Fascinated by wattle and daub, thatched houses of the Iron Age (in Britain and elsewhere approximately 2,300 years ago) and the insulating value of this type of architecture, I determined to learn these construction skills by building a model fashioned into a beehive. Like so many skills, you would think it easy, but that is not the case. It is very work intensive and time consuming, but also fun. Community effort was the way such huge tasks were accomplished in ages past.



The thatch beehive (second from the left) was part of Joy's History of Beekeeping display at the 2011 fall conference in Seaside.

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More Bee Chemistry: Even as beekeepers have often chosen to work with subspecies that produce *less* rather than *more* propolis, we may become more willing to work with sticky gloves, hive tools, and steering wheels given increasing evidence of its very fine properties!

See: Simone-Finstrom M.D. and M. Spivak. 2012. Increased resin collection after parasite challenge: A case of self-medication in honey bees? *PLoS ONE* 7(3): e34601. doi:10.1371/journal.pone.0034601.

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