

BEE YET

Diagnostic Approach

Part 3

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In our big blue world, there are nearly 1500 different infectious diseases known to affect humans. 60% of these diseases are **zoonotic**, that is diseases that are transferred between animals and humans, and 75% of new and emerging infectious diseases are zoonotic (1). Officially, there are no zoonotic diseases in bees (with the rare exception noted in the literature of a few poor souls who decided to inject honey into themselves, which happened to be contaminated with *Paenobacillus larvae* or American Foulbrood, AFB, spores)(2). Every other domestic animal and many wild animals can transmit disease to us, so the lack of zoonotic disease in bees is

quite unique. This lack of natural, direct, zoonotic disease transmission between bees and humans allow beekeepers to enjoy a more relaxed, low-risk interaction with our bees regarding disease.

However, our bee's health and the drugs we use to treat them affects us all - humans, other animals, and our environment. The concept of human, animal and environmental health being inevitably intertwined is called "**One-Health**". Our bees' good health is vital to provide pollination services for a large portion of our food supply. The drugs and chemicals we utilize to treat bee diseases can leave residues and contaminate bee products, like honey and wax. **Antibiotic resistance** is considered by national and global health organizations to be a top priority public health crisis in the world. 700,000 human deaths are attributed to antibiotic resistance *every year* (3,4) Overuse or misuse of medications can lead to treatment resistance to the particular disease within our patient, our colonies. One should always consider the overall effects of developing treatment plans and administering drugs, medications, pesticides, home remedies - all chemicals, to your bees. Below is some guidance on how veterinarians can help beekeepers employ treatment plans.

The Development of Treatment Plans

Ideally, to have the best outcome for any patient and to avoid drug resistance, it is best to have a proven diagnosis before treating any disease. As a young veterinary student, I can remember being eager to learn about how to treat diseases - how to fix it! I would sit in lecture halls for weeks on end learning about various

pathological disorders . . . how they look, how they develop, even how they smell, but every time, near the last lecture of the term, when treatment would finally come up for discussion, the same old phrase would appear, "Treatment: Depends on the Diagnosis". Everyone wants a magic pill to fix all our issues, but it is hard to fix what you have not identified. Veterinarians *are* permitted to start treatments immediately (pending confirmatory testing) based on a tentative diagnosis, if they find it appropriate, such as in case of suspected AFB.

Define Drug Resistance

Over the years, I have found that there is some confusion about the nature of **drug resistance**. So, let us take a moment to step back and define drug resistance. Antibiotic resistance is a specific example of drug resistance, but resistance can occur with any chemical that is used to treat an infectious agent or pest. For example, there is concern about resistance development with miticides used in the treatment of varroa mites. Drug resistance means that a given population of bacteria, varroa mites, or whatever, have been exposed to a certain drug. The drug kills most of the pathogens, but a few may survive. These lucky few have a genetic predisposition that allows them to survive and go on to create the next generation of bugs. This new generation of drug resistant organisms emerge, and our drugs become less useful. Drug resistance is **not** the patient "getting used to the drug". Now that that's cleared up - A careful review of any medications previously used in your beeyard/s could inform best practice choices for your bees going forward.

Employment of IPM Practices

Integrated pest management is a practice commonly employed by beekeepers and veterinarians alike. Most diseases of animals, including bees, are not treated with drugs alone or proper treatment can be achieved without drug intervention at all. Engaging in best management practices, re-queening, proper nutrition, and sometimes just plain rest are often the best medicine.

Drugs are only one tool in our toolbox for fighting disease. In fact, of the few bee drugs that



Don't be afraid to reach out for help!
(Deidra Ressler photo)

require veterinary intervention, their effectiveness is only in part to nearly useless. Since antibiotics are not effective against AFB spores, burning is required or highly recommended for hives infected with AFB, and for *Melissococcus plutonius*, European Foulbrood (EFB), treatment with antibiotics is typically only used in severe cases and in conjunction with other IPM practices.

Good News: Most backyard beekeepers employing good biosecurity protocols should not have to use antibiotics because typically their bees are kept in one area (reducing stress and exposures). Also, luckily, AFB is a great example of an **endemic** disease. What is an endemic disease? Endemic disease is a disease that is ever present in a geographical area but typically in low, manageable levels. Due to the long surviving spores that AFB produces soil is contaminated. While data of AFB incidence can be difficult to obtain due to the stigma of this deadly disease, known prevalence data year to year only affects a small fraction of colonies. The literature supports that it is likely that many healthy hives exposed to AFB spores can manage the infection sub-clinically and remain asymptomatic.

Provision of VFDs and Prescriptions for Antibiotics

Since 2017, the FDA has required a veterinary feed directive (VFD) or prescription from a veterinarian to administer medically important antibiotics to bees. The formulary is simple and limited. There are three approved drugs for use in bees, Oxytetracycline, Tylosin, and Lincomycin, available in 11 different

Developing a treatment plan for Varroa mites is of primary importance.
(Deidre Ressler photo)



approved veterinary preparations. Only one drug, oxytetracycline, is approved for the treatment of *Melissococcus plutonius* (EFB) in either a VFD or prescription. For AFB, only oxytetracycline is approved in both VFD and prescription forms. Tylosin and Lincomycin can be used for AFB only by prescription.

Not every vet will agree to see bees. To better serve their clients, many veterinarians self-limit themselves to the species of animals they serve, because the scope of what we may cover is so vast. This is not uncommon and not intended to be exclusive. You would not call a cat clinic to see your goat, right? But how do you find a vet for bees? Here are a few suggestions. If you already have a local vet for your dog or horse or whatever, it does not hurt to ask if they are willing and able to see bees. The Honey Bee Veterinary Consortium (HBVC) <https://www.hbvc.org> has lists of vets by state that are willing to see bees. Your state's Department of Agriculture (DA) has state veterinarians who may

have contact lists of vets willing to see bees. For example, in PA, I consult regularly with the PADA on bees and compiled a list of vets interested in seeing bees.

Proper Use and Withdraw Times

I cannot stress enough the importance of proper use of medication. Labels and indications for use must be followed. It is the law, but also good practice in providing the safest course of treatment for your bees, preventing drug resistance, and preventing residues in bee products. Many drugs, like antibiotics and miticides, cannot be used when honey supers are on or must be withdrawn four to six weeks before honey supers are added. This requires careful management planning and record keeping to achieve. For antibiotics, approved indications of these drugs can be used for prevention, control, and/or treatment of disease. This is of primary importance in the management of foulbrood in migratory and/or commercial operations.





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Holistic Health Practices: Beyond Antibiotics and Foulbrood

While AFB and EFB certainly can be serious disease issues, their prevalence and overall impact pales in comparison to nearly every hive in the U.S. and much of the world being threatened by the panzootic (pandemic), varroosis. Good health requires evaluation of the whole patient. Would you only see your doctor for two diseases and treatment with three drugs? Thankfully, most backyard beekeepers may never have to deal with foulbrood, but many backyard beekeepers could use more help understanding how to manage the overall health of their bees and maintain strong colonies.

Certainly, state apiarists, university entomologists, seasoned beekeepers, and various beekeeping organizations offer many great resources for beekeeping. These groups and general beekeepers alike are still looking for more support to cover the demand for good information and services. Here's where bee savvy vets can add their abilities to partner with the industry.

I think the stage is set-up for some complimentary relationship building. Veterinarians that limit themselves to small, companion

animals would be well acquainted to the nature of the relationship backyard beekeepers have with their bees. Large animal veterinarians would be well up on the curve with working with commercial beekeeping farmers. Within the profession there are also research and lab animal vets that can fit in quite well with entomologists.

Continuing education on bee health is included in nearly every major veterinary conference in the last four years and veterinary schools across the U.S. and Canada are adding bee curriculum. Currently, I am working with a group developing a veterinary textbook series on bee health and I am writing the chapter review on registered drugs used in the U.S. and Canada for honey bees. This review will include not just antibiotics but other medications for use in bees for a variety of medical conditions.

The Best Treatment: Prevention

As I end this three-part series, I hope it gave you some insight into how veterinarians are trained to approach disease and help achieve health in our patients. And with the end, we are back to the beginning – the best treatment is prevention. Prioritizing the four key elements of

good husbandry/understanding bee biology, *Varroa* and other disease control, nutrition, queen status/genetics will go a long way in keeping the healthiest honey bees. **BC**

References and resources for further reading:

- 1) Zoonotic disease prevalence: [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5711306/#:~:text=Emerging%20and%20endemic%20zoonotic%20diseases,origin%20\(1%2C2\).](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5711306/#:~:text=Emerging%20and%20endemic%20zoonotic%20diseases,origin%20(1%2C2).)
- 2) Human cases of *P. larvae* bacteremia: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3322038/>
- 3) CDC information on antibiotic resistance: <https://www.cdc.gov/drugresistance/solutions-initiative/stories/ar-global-threat.html>
- 4) WHO information on antibiotic resistance: <https://www.who.int/news/item/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis#:~:text=By%202030%2C%20antimicrobial%20resistance%20could,die%20from%20multidrug%2Dresistant%20tuberculosis.>

Veterinary approved bee antibiotics: <http://www.farad.org/vetgram/honeybees.asp>
Great resource for best practices and management of varroa and other diseases: <https://honeybeehealthcoalition.org/>

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