

# AMERICAN FOULBROOD

American Foulbrood (AFB) is caused by a spore-forming bacterium called *Paenibacillus larvae*. The infection begins when nurse bees feed larvae food contaminated with the spores. The spores germinate into the active vegetative form of the bacteria in the larval intestines, rapidly spreading and infecting all larval tissue. The larvae die, usually after the cell is capped. This creates unfavorable conditions for the vegetative form of the bacteria. The bacteria then form millions of infective spores in the larval remains. The dried remains of AFB infected larvae are called scale and they become “glued” to the cell.

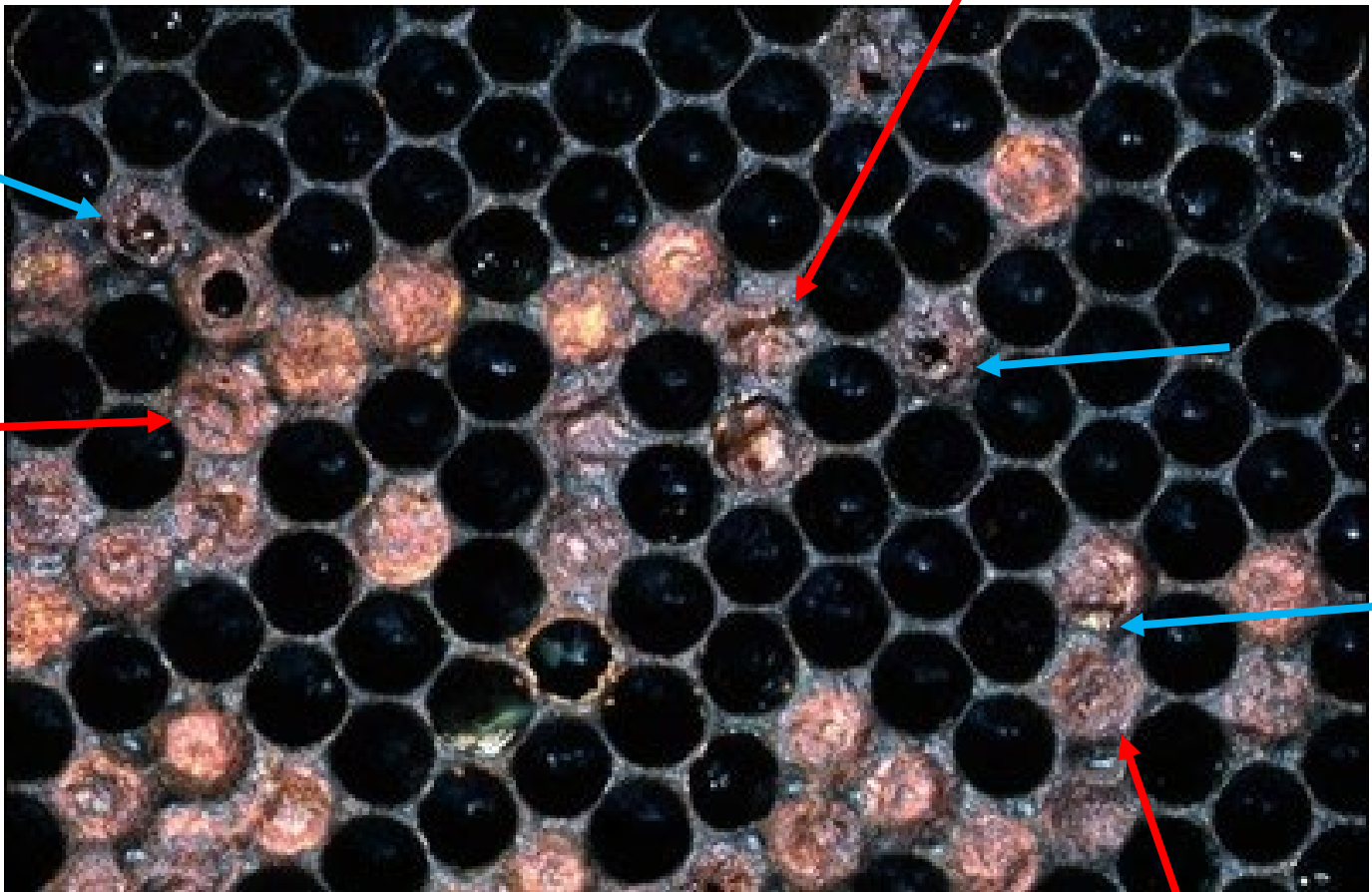


Photo Credit: Maryann Frazier, Penn State Extension

**Red arrows point to some of the many sunken (concave) cappings.**

**Blue arrows point to some of the perforations in cappings.**

As the AFB infection begins, the larvae begin to die and the cappings begin to sink. There may be perforations in the cappings as the adult bees try to remove the dead or dying larvae. The holes may be off center and irregularly shaped with jagged edges. Some cappings will look greasy or moist and slightly darker in color. If the sunken capping is removed with a toothpick,

the slimy dead larvae will be light to dark brown in color. The toothpick can be inserted into the cell and used to slowly draw out the larvae in a “snotty rope” or thread (the rope test).

As AFB spreads in a colony, the brood pattern becomes patchy (pepper pot brood pattern). The dead larvae begin to dry out and become darker until reaching the final stage. At this point it is firmly “glued” and lying on the lower side of the cell, rough, and very dark brown in color. It is now called scale and it can be difficult to see in a cell. Holding the frame so it is facing light and tilting it to help the light reflect at different angles can help. The dead pupal tongue may be visible in the cell.

Often, but not always, there is a distinctive odor coming from an infected colony.



### **Rope test**

AFB can be spread several ways:

1. Moving frames (“empty” or with brood, nectar, honey, or pollen) or equipment from an infected colony to a healthy colony.
2. Allowing bees to clean up frames after extracting honey from infected hive.
3. Using hive tools, other equipment, or gloves in infected hive and then a healthy hive without disinfecting the item.
4. Robbing and drifting bees eating infected honey (use entrance reducers).
5. Swarms. (Adult bees can carry the disease-causing bacteria, but are not affected.)

6. Purchasing or using gifted infected bees or equipment.
7. Hive may be weakened due to other stressors and then AFB infection may be able to spread in the colony.

To help prevent the spread of AFB:

1. Use entrance reducers, especially on suspect and weak hives.
2. Do not move suspect hive.
3. Do not move frames or other equipment from suspect hive into other hives.
4. Do not use frames of honey, nectar, or pollen from suspect hive to feed other hives.
5. Honey from a hive with AFB is fine for humans to eat and use.
6. Extractor and equipment used to extract honey from suspect hives must be **thoroughly** disinfected. (1part bleach to 5 parts water, allow to soak, rinse thoroughly)
7. Do not give, sell, or exchange bees or suspect equipment to others.
8. Try to prevent swarming of suspect hive.
9. Do not work other hives after checking/inspecting suspect hive unless hive tool, smoker and any equipment used is cleaned and disinfected. If clothing is dirty from the hive, change into clean clothing. Wash bee jackets, suits, veils often.
10. If you wear gloves to work bees, use disposable nitrile gloves (doubled) when working in bee yard with suspect hive. Change gloves between working in each hive (even those which appear healthy). Dispose of gloves properly by turning them inside out while taking them off and discard in trash after double bagging. If you don't wear gloves, wash and disinfect hands thoroughly between each colony, removing wax and propolis.
11. Clean hive tool and smoker thoroughly and disinfect after use in each hive in the suspect bee yard. Remember to repeat after each used, even when checking hives that appear to be healthy.
12. Clean hive tool by opening smoker and placing hive tool inside. Fire kills AFB spores. Be careful removing hot hive tool. When hive tool has cooled off, use a paper towel and wipe hive tool with bleach/water solution, chlorinated scrubbing cleaner (like Comet) or rubbing/isopropyl alcohol. Remove all wax and propolis. When smoker is cool, use a paper towel to wipe tip and bellow area with bleach/water mix or alcohol. **Avoid getting bleach/water mix, cleaners, or alcohol near the lit and/or hot smoker.**  
Consider using a fresh, clean hive tool in next hive while the other hive tool is soaking in disinfectant.
13. Continue to watch and inspect other hives in yard carefully. Open a few cells of capped brood to check the health of the larvae.
14. Call or email your PA Department of Agriculture Apiary Inspector or State Apiarist if you think you have a problem or additional questions.

Remember, AFB can be found in equipment, honey, wax, pollen, etc. Adult bees do not appear to show symptoms, but can carry the AFB spores and spread it to the larvae during

feeding. Ten spores of less can cause an infection. The vegetative form of the bacteria can be killed with antibiotics, but the spores found in scale (the hardened remains of dead, dried larvae in the cell) are extremely difficult to kill. These spores can remain viable and “come back to life” for at least 80 years. Extreme weather conditions (heat, cold, desiccation, etc.), antibiotics, and chemical disinfectants will **not** kill these spores. Fire kills both the vegetative form and the spores and is often the recommended method to treat an AFB problem in a bee yard. Irradiating equipment will also kill the spores.

In 2018, Dr. Meghan Milbrath, from Michigan State University, wrote an excellent guide: “Diagnosing and Treating American Foulbrood in Honey Bee Colonies”. It is well worth printing and reading.

[https://static1.squarespace.com/static/56818659c21b86470317d96e/t/5ad797d9aa4a996c2d3fe5da/1524078557790/AmericanFoulbrood\\_Milbrath\\_2018.pdf](https://static1.squarespace.com/static/56818659c21b86470317d96e/t/5ad797d9aa4a996c2d3fe5da/1524078557790/AmericanFoulbrood_Milbrath_2018.pdf)

**Please contact your regional PA Department of Agriculture Apiary Inspector or State Apiarist if you think you have a problem and would like to arrange for an inspection. Contact information is on the last page.**



Photo Credit: Blue Line Honey

**Scale**

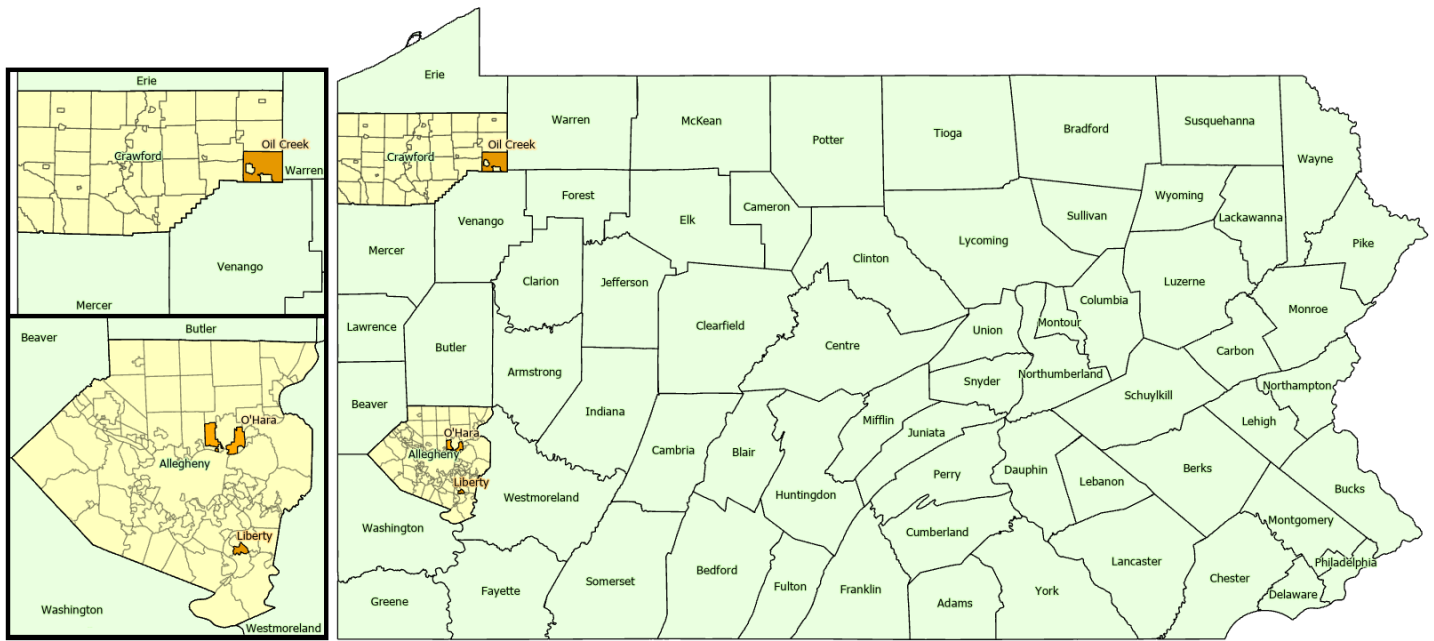


Photo credit: Texas Apiary Inspection Service

**Note perforations (holes) in greasy, sunken cappings and discolored larvae.**

## 2020 Pennsylvania Apiary Inspection Team

Name	Phone Numbers	Emails	Counties
Kent Kaster	717-956-8136 work	work email: <a href="mailto:kekaster@pa.gov">kekaster@pa.gov</a>	ERIE, CRAWFORD, MERCER, VENANGO, CLARION, JEFFERSON, ELK, FOREST, WARREN, MCKEAN
Kirstie Housner	717-956-8173 work	work email: <a href="mailto:khousner@pa.gov">khousner@pa.gov</a>	LYCOMING, POTTER, TIOGA, CAMERON, CLINTON, SNYDER, NORTHUMBERLAND, MONTOUR, PERRY, UNION, COLUMBIA
Paul Krepicz	717-956-8174 work	work email: <a href="mailto:pkrepicz@pa.gov">pkrepicz@pa.gov</a>	LEHIGH, SCHUYLKILL, NORTHAMPTON, CARBON, MONROE, PIKE, LACKAWANNA, WAYNE, WYOMING, BRADFORD, SUSQUEHANNA, SULLIVAN, LUZERNE
Bonnie Hall	717-956-8175 work	work email: <a href="mailto:bonhall@pa.gov">bonhall@pa.gov</a>	WESTMORELAND, ALLEGHENY, ARMSTRONG, BUTLER, FAYETTE, GREENE, INDIANA, LAWRENCE, WASHINGTON, BEAVER
Ken Hoover	717-956-8244 work	work email: <a href="mailto:kennhoover@pa.gov">kennhoover@pa.gov</a>	BEDFORD, BLAIR, CAMBRIA, CENTRE, CLEARFIELD, FULTON, HUNTINGDON, JUNIATA, MIFFLIN, SOMERSET
Nate Weber	717-919-0940 work	work email: <a href="mailto:nathweber@pa.gov">nathweber@pa.gov</a>	CUMBERLAND, ADAMS, DAUPHIN, LANCASTER, LEBANON, YORK, FRANKLIN
Jeff Eckel	717-956-8245 work	work email: <a href="mailto:jeeckel@pa.gov">jeeckel@pa.gov</a>	PHILADELPHIA, BERKS, BUCKS, CHESTER, DELAWARE, MONTGOMERY
Karen Roccasecca 2301 N Cameron St. Harrisburg, PA 17110	717-346-9567-desk 717-798-2822-work cell	<a href="mailto:kroccasecc@pa.gov">kroccasecc@pa.gov</a>	State Apiarist



Townships in PA where positive cases of American Foulbrood have been found as of September 24, 2020

- Counties with American Foulbrood
- Counties with no American Foulbrood detected as of September 24, 2020
- Townships with positive cases of American Foulbrood

