Case Definition

Varroosis of Honey Bees
(Monitored)

December 2023

1. **Disease Information**
   - **1.1 General Disease and Pathogen Information:** Varroosis is infestation by the ectoparasitic mite, *Varroa destructor*, of brood and adult honey bees, *Apis mellifera*. The mites are found throughout the world due to the global scale of honey bee trade and difficulty in detection. Nearly all honey bee colonies around the world are infested with *Varroa* to some degree. *Varroa* infests late-stage larval honey bees just before the brood cell is sealed for pupation. In the pupal cell, the foundress *Varroa* lays four eggs, the first of which is a male and the other three are female. Mating occurs between these siblings resulting in highly inbred populations. These *Varroa* will feed on the fat body of the pupa and cause physical damage, induce physiological changes, and transmit viruses. The male mite offspring dies before the bee emerges as an adult and the foundress with two or three daughter mites escape the brood cell with the emerging bee. In adult bees, the female *Varroa* will most commonly insert herself between the abdominal sclera and puncture the intersegmental membranes to feed on the host's fat body. Although they are mostly present on the honey bee's abdomen, the mites can also be found between a bee's head and thorax. Mites move freely between bees in the hive and can be spread between colonies by bee drift, robbing of failing colonies by other bees, or movement of infested bees and equipment by beekeepers.
   - **1.2 Clinical Signs:** A single mite can cause changes in a bee's behavior, increase its susceptibility to other diseases, and ultimately shorten its lifespan. If more than one mite enters a brood cell to complete their reproductive life cycle, emerging bees are weakened from feeding activity and virus transmission by *Varroa*. Emerging bees show severe developmental defects, such as absence of wings, shrunken wings, loss of hairs on the body, or shortened abdomens. Often, these highly impaired bees die in a few days of emergence. High rates of *Varroa*-infested brood may result in spotty brood patterns or large numbers of uncapped pupae that may have their heads chewed down by worker bees. Parasitic infestation increases with increasing brood activity and bee population growth, particularly in August and September. Early signs of infestation regularly go undetected and are often only noticed at late stages when damage at the colony level is apparent, characterized by clinical signs such as scattered brood, crawling or crippled bees, supersedure of queens, and substantial reduction of the bee population. Infestation with *Varroa* mites poses the risk of additional exposure to various honey bee viruses that can be vectored by the mites, especially variants of Deformed wing virus (DWV) and Chronic bee paralysis virus (CBPV). Honey bees from healthy colonies may rob failing honey bee colonies of their nectar and pollen resources. This as noted by a large amount of bee activity near the colony that is failing due to high *Varroa* infestation.
2. **Laboratory Criteria**
   - **2.1 Agent Isolation and Identification:** Diagnosis of *varroosis* is based upon examination of the hive debris, the brood, or the adult bees. Visual observation of *Varroa* on adult

bees is usually a qualitative sign of high infestation as most *Varroa* in the colony are in the sealed brood cells. *Varroa* on adult bees can be measured quantitatively by washing a sample of approximately 300 bees with either powdered sugar, soapy water, or alcohol (usually 30-50% ethanol or isopropanol) and counting the number of *Varroa* that are dislodged. Generally, greater than 10 *Varroa* in the sample is considered a high infestation rate. However, this threshold varies throughout the season with lower thresholds occurring earlier in the season (i.e., 3 *Varroa* in April) and among different stocks of honey bees. Examination of the brood requires a microscope and forceps for the removal of cappings and pupae to observe signs of *Varroa* infestation such as the foundress *Varroa*, eggs, offspring, and the presence of small white spots of fecal matter on the cell walls. Quantitative examination of *Varroa* infestation of honey bee brood requires inspecting 100 pupal cells or observing 30 cells infested with *Varroa* to calculate the percentage of brood cells infested with *Varroa*. Bees with crumpled or malformed wings due to DWV is a reliable indicator of high *Varroa* infestation since this virus becomes apparent in colonies with high levels of *Varroa* infestation.

2.2 Agent Characterization: Partial and whole genome sequencing are recommended for characterization. Taxonomic expertise is required for morphological validation.

2.3 Serology: NA.

3. **Case Definition**

3.1 Suspect Case: A hive experiencing colony decline and mortality or overt signs of viral infection while waiting for positive identification of the mite.

3.2 Presumptive Positive Case: Positive identification of the mite within the bee colony. *Varroa* are commonly found and morphologically distinct which makes them easy to recognize with minimal expertise.

3.3 Confirmed Positive Case: Suspect case with the taxonomic identification of *Varroa* samples collected from the affected hive.

4. **Reporting Criteria:** Varroosis is a U.S. monitored condition that is reportable monthly under the APHIS National List of Reportable Animal Diseases (NLRAD).

4.1 NLRAD reporting in accordance with the NLRAD Standards for monitored diseases; and by APHIS to the World Organisation for Animal Health (WOAH).