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Colony Collapse Disorder

 In October of 2006, beekeepers in the United States started reporting losses of 30 to 90 percent of adult worker bees in their hives. This unusually high disappearance rate came to be known as Colony Collapse Disorder (CCD). Colony Collapse disorder is thought to affect an adult bee’s ability to navigate, causing them to leave the hive to find pollen and never return. CCD occurs when low to no adult worker honeybees, a live queen, and no dead honeybee bodies are present in the hive. Honeybees (*Apis mellifera*)are responsible for pollinating over 30% of world crops and over 100 different types of flora. One out of every three mouthfuls in the human diet is directly or indirectly benefited from honeybees (Agricultural 2012). For the past six years, bee populations have been suffering from CCD. Though scientists have been researching the causes of colony collapse disorder since it became a problem, no direct cause has been linked to every case of CCD. Scientists have been researching four possible types of causes: Parasites, Pathogens, Management stressors, and Environmental stressors.

Varroa mites (*Varroa destructor)* are one of the possible parasites responsible for CCD. Varroa mites are external honeybee parasites that attack both adults and the brood (youth). A female mite will enter the honeybee and lay eggs. The female and her eggs with feed and develop on the maturing bee. The mites suck the blood from the honeybee, weakening and shortening the victim’s life span. Left untreated, an infestation of Varroa mites will wipe out a hive. If hives are not checked for mites, mortality can often be confused with lack of a queen or winter mortality. Varroa mites spread from colony to colony by being carried by a honeybee (Bessin 2012). Another possible parasite cause is the tracheal mite (*Acarapis woodi*), which infests the respiratory systems of adult honeybees. *Acarapis woodi* are responsible for causing acarine disease or acariosis. Bees affected by this disease cannot fly, have disjointed wings, and distended abdomens. (Beekeeping 2012).

Several pathogens including Nosema disease and Israeli Acute Paralysis Virus have been suspected of being the culprit behind CCD. Nosema disease is an infection in the digestive tract in honeybees and is caused by the microsporidians *Nosema apis* and *Nosema ceranae.* The disease attacks the lining of the intestine in worker bees, queens, and drones. In a colony with a slight infection, the losses are small, but if a severe infection breaks out, Nosema disease weakens the hive, increases the mortality of adult bees, and reduces honey yields. (Hamdan 2012). Israeli Acute Paralysis Virus is an infection carried by the varroa mite. IAPV presents with honeybees suffering from shivering wings, which then progresses to paralysis, followed by death just outside the hive. Prior to 2007, IAPV had not been found in the United States (Virus 2007). Thus far, scientists have not been able to identify one single pathogen linked to all cases of CCD.

Management and environmental stressors have also been implicated in having a role in Colony Collapse Disorder. Among the management stressors that could be possible contributors are poor nutrition due to apiary overcrowding and increased migratory stress. As a result of declining honeybee population, healthy hives are being transported across greater distances across the country. This amount of transportation can put stress on the honeybees. Many environmental stressors center on pollen and nectar. Stress can be caused by pollen and nectar scarcity, lack of diversity in nectar and pollen, and pollen and nectar with low to no nutritional value. Other stressors include limited access to water or access to contaminated water, and accidental or intentional exposure to pesticides (ARS 2012).

Since 2006, colony collapse disorder has rapidly spread throughout the world. Cases of CCD have been reported as far as Canada, Europe, Australia, China, and Brazil. The United States Department of Agriculture recognized the worrisome nature of the CCD outbreaks and is now the leading federal response to this issue. In 2007, the USDA established the Colony Collapse Disorder Steering Committee with representatives from several government agencies and academia. Several other organizations and companies have supported the fight against CCD including the Environmental Protection Agency, Haagen Dazs, Burt’s Bees, American Beekeeping Federation, and the Eastern Apiculture Society (Flottum 2008).