Year Three: Evaluating the Effects of Bifidobacterium infantis Compared with Fumagillin on the Honeybee Gut Parasite Nosema ceranae and Overall Gut Microbiota

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Honey Bees are extremely important, performing 80 percent of all pollination worldwide. Their population has been rapidly declining at an alarming rate. Multiple studies have shown declining gut health as the main reason for their decreasing adaptive response to stressors like pathogens and pesticides. In the previous two years, we showed that feeding the hives with Bifidobacterium infantis, a human probiotic significantly reduced gut parasite Nosema ceranae and improved hive characteristics in the field. In continuum, our project this year was aimed to perform a controlled cage study comparing the effectiveness of B infants with an FDA approved anti fungal agent fumagilin. In addition, we wanted to show its role in improving honey bee midgut microbiota as measured using culture based studies. Our results conclusively showed a large favorable effect of B. infantis on gut microbiota when compared to those fed sugar or Fumagillin solutions. In addition, we were able to statistically show that probiotic treatment was as effective as Fumagillin in decreasing Nosema counts in the infected honey bee midguts. Contrary to Fumagillin, which may cause midgut epithelial degeneration and adversely affect gut microbiota, our probiotic solution had an added benefit of increased colony forming units of favorable gut bacteria. In addition, it was as effective as Fumagillin against Nosema ceranae infection. Based upon this pilot cage study, if large field studies confirm our findings, B. infantis has a potential to be used as the primary anti-Nosema agent and a honey bee gut microbiome enhancer for commercial beekeepers.

Awards Won: