

# The Effect of Nosema on the Honey Bee's Brain

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In the last half decade alone, 30% of the national bee population has disappeared and nearly a third of all bee colonies in the U.S. have perished. One factor contributing to this decline is nosema, a fungal parasite. This study examined the effects of nosema on honey bee learning and behavior, brain chemistry, and if the nutritional content of pollen affects nosema infection; in order to understand and combat this deadly parasite. My hypothesis was twofold: that increasing the nutritional value of the bee's food would increase bee's resistance towards the infection. Extending their survival and that the nosema infection would affect learning, behavior, and brain chemistry. Bees were divided into four groups, no nosema exposure pollen/no pollen (control) and nosema infection also with and without pollen. The average spore count in the intestinal tracts of bees with nosema and no pollen was 69.95 spores, while the average nosema with pollen was 123.9 spores. This disproved my hypothesis as a nutrition diet did not reduce the fungal spores in their system. However nosema clearly affected the brain. Bee's tested with nosema pollen had significantly better memory response than both the controls no pollen (18.92%) & pollen (25.64%). The nosema with no pollen had (36.84%) and surprisingly bees with nosema/pollen had a better rate of memory response of (62.07%). Further, brain dissection displayed that bee's with nosema pollen had (72.59%) less amino acids in their brain in comparison to control. This implies that the bee's had mentality matured, due to changes in amino acid caused by nosema. With my findings, I will utilize the amino acids (Serine, Threonine and Tryptophan) through an improved diet, to determine if the bees can create more proteins and replenish themselves.

## Awards Won:

Arizona State University: Arizona State University Intel ISEF Scholarship