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Fat and happy? The impact of Lotmaria passim on honey bee nutrition and lifespan

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Lotmaria passim is a recently characterized yet commonly encountered digestive tract parasite of the honey bee(Apis mellifera L.) that has been linked to increased colony mortality as well as changes in individual honey bee behaviour, physiology, longevity, and overall health. Despite these negative effects, no management strategies exist for this parasite because of its recent characterization. We conducted two laboratory experiments in an effort to develop accessible management strategies for beekeepers to combat this parasite and improve the health of their bees. In the first experiment, we individually inoculated newly emerged worker bees from four commonly used stocks (both domestic and imported) with cells from a locally isolated strain of L. passimto evaluate the effect of the parasite on honey bee longevity. This was done to determine if honey bee stock selection is a viable L. passim management strategy. In the second experiment, we investigated the effect of diet on L. passim infections by manipulating the protein (pollen) and carbohydrate (sugar) quality provided to individually inoculated newly emerged worker bees. In this experiment, we quantified parasite density, as well as vitellogenin expression and hypopharyngeal gland protein content to determine if honey bees can compensate for the negative effects of infection through dietary consumption. Additionally, this experiment provides an important addition toward our understanding of how different nutritional regimes can influence infection dynamics in honey bees. The results of these two experiments have the potential to offer beekeepers around the world the first management strategies (that are also chemical-free) for one of the most prevalent honey bee parasites.