A Solution to Varroa Mite Infestations Using RNA-interference

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Honey bees are responsible for 30% of the world's crop production and billions of dollars of the United States' agricultural income. Without the managed bee population, the global economy would lose an estimated $5.7 billion per annum. Since 2006, honey bee population has been declining at an alarming rate, and the Varroa destructor mite is the greatest contributor to this decline. This project develops a safe treatment for Varroa destructor infestations using RNA-interference, a technology that allows for the down regulation of targeted gene sequences. Two sequences, ATP-6 and cytb, from the Varroa mite genome were synthesized into dsRNA and tested on live mites via a soaking vector with the intention of down regulating mitochondrial sequences necessary for the survival of the mite. Silencing the target genes via RNAi caused a significant death rate of the Varroa mites. This project also aims to further honeybee research by identifying "housekeeping" genes in the bee genome that can be used as a standard in RNAi research to compare expression levels of Vitellogenin, a gene related to bee health and longevity. This is vital in RNAi research to ensure that the health of the bee is not negatively affected by the RNAi treatment. After verifying RNAi as an effective treatment against Varroa mites, standard curves will be used to prove the integrity of bee health during treatment. This applies not only to the current project, but also to honey bee research worldwide. Treating a colony with the dsRNA created in this project could allow for the bidirectional transfer of dsRNA from the honey bee to the mite while causing no harm to the bee. RNA-interference will be a significantly safer and more effective treatment for Varroa mites than any current chemical application.

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