Interim Project Summary

SBIR Proposal #00-00187 Cal-Mold Inc. 10/25/02

Project Title: Innovative non-chemical control of parasitic honey bee mites.

The parasitic mite *Varroa destructor*, a large external parasite of both adult and immature bees, currently threatens domestic honey bees. We proposed to design, manufacture and test a plastic drone comb for Varroa control. Honey bee drone brood is more attractive to female mites and once infested the drone brood can be removed, thus lowering mite populations. Plastic drone comb should provide a reusable, easy to identify comb for use by beekeepers. To date, a plastic drone comb has been designed, a limited number manufactured and initial testing has been conducted on the acceptance of the comb by both honeybees and the targeted parasite, Varroa.

Cal-Mold Inc. and Dr. Jeff Pettis (USDA-ARS Beltsville, MD) worked together to design the drone comb foundation. Dr. Pettis determined an appropriate drone cell size based on a search of the existing literature and measurements made of natural comb from for numerous sources. Cal-Mold then designed and manufactured the plastic drone comb foundation and prototypes were shipped to Beltsville, MD for testing in July 2002. Plastic drone combs were placed in twenty colonies and these colonies fed sugar syrup to stimulate the bees to "draw out" the plastic foundation into drone comb. The process of drawing out the plastic foundation involves bees producing wax and adding it to the plastic foundation in the shape of hexagonal cells to complete the drone comb. Bees naturally produce combs in the spring when flowers are in bloom. The mid-summer comb production was partially successful; by feeding the colonies with sugar syrup sufficient combs were produced to then test for Varroa acceptance. Newly drawn plastic combs and natural beeswax drone combs were placed together in each of six colonies infested with Varroa. Three colonies were headed by Russian queens and three by Italian queens. Frames were removed 21 days later when sealed brood was present in both comb types. The frames were frozen and measurements made as to the amount of brood and percent of each brood type infested with Varroa. The amount of sealed brood produced did not differ between plastic ($114 \pm 28 cm^2$, mean±SEM) and beeswax ($122 \pm 31\ cm^2$) drone combs. Similarly, Varroa mite presence and reproduction did not appear to differ between the two comb types nor by bee stock, Russian versus Italian (see Table). Given the late start in the summer and the low sample size we propose to further test the plastic drone comb in the spring of 2003. Spring testing should allow us to confirm our initial findings that bees accept and build plastic drone comb and that Varroa are equally attracted to plastic drone comb; a finding crucial to the success of this product in a Varroa IPM program.

The SBIR proposal posed four technical questions to be answered in Phase I of the grant. We have addressed three of the four to date and a brief summary is listed below each question.

1. What is an appropriate cell size for use by all stains of European honey bees?
   Naturally produced drone comb was collected from five sources, measured and a mean cell size determined to be 6.9mm, Cal-Mold Inc. produced a mold insert to these specifications.
2. Will drones be reared equally in plastic versus beeswax combs when given a choice?
   Plastic prototype comb was tested in colonies in Beltsville, MD in July and August of 2002 and found to be equal to wax drone comb with regard to number of drones reared.