# Honey Bee Nutritional Study Bridge Grant: *In-Vitro* Analysis of Several Honey Bee Nutritional Supplements

**Project No.:** **07-POLL7-DeGrandi/Wardell**

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**Interpretive Summary:**

The focus of this project was to determine how well specific honey bee diet supplements support bee development and adult bee longevity as determined through, whole body protein analysis, adult honey bee longevity and hypopharyngeal gland development under controlled laboratory conditions. Newly emerged bees fed specific supplemental diets exhibited significantly different levels of body proteins over time. Bees that had higher protein levels in their bodies lived longer. In these *in-vitro* trials, there was a strong correlation between protein levels and longevity. Bees fed the nutritional supplement MegaBee and natural pollen had the highest protein levels, the greatest longevity and the most highly developed hypopharyngeal glands.

**Objectives:**

1. Conduct whole body protein analysis to determine if differences exist between bees fed different diets. Diets tested were: (1) Natural pollen mixed with drivert sugar, (2) Brewers yeast and sugar, (3) MegaBee® Patties, (4) MegaBee® Liquid, (5) BeePro®, (6) Adee diet (commercial beekeeper's personal formulation).

2. Honey bee longevity will be monitored for each diet and correlated with body proteins.
3. Extract and analyze the hypopharyngeal glands of all treatments.

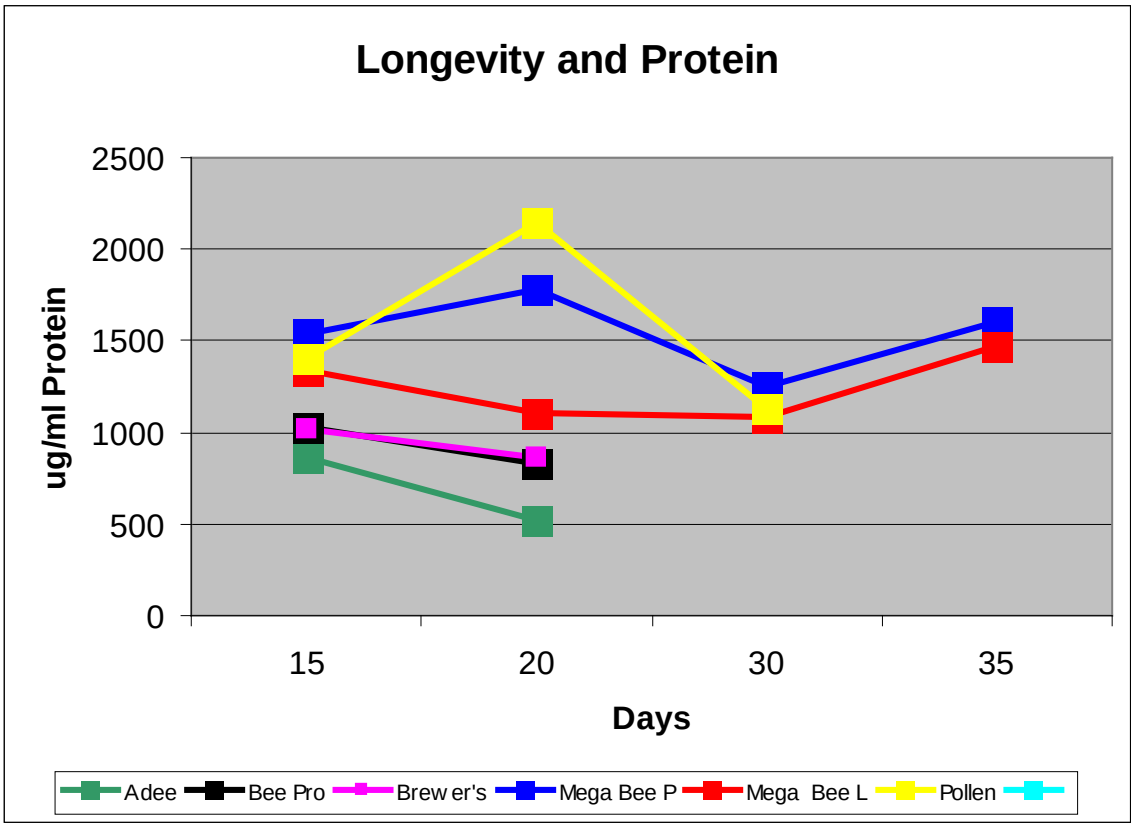
**Materials and Methods:**

We followed the procedural methods for a caged longevity study as described by Schmidt et.al.(1987). Sixty newly emerged bees were placed in Plexiglas and screen feeding cages (9 x 6 x 15 cm). Each cage was provided with water and a 3.5 by 7 cm strip of honey bee foundation wax on which the bees are intended to cluster. The bees were fed their respective diets *at librum*: Adee diet, BeePro, Brewers Yeast (equal parts drivert sugar and water to make a patty), MegaBee Patty, and MegaBee Liquid. The diets were prepared according to manufacturer's recommendations. BeePro was purchased from the manufacturer as a pre-made patty with no pollen included. The Adee diet was prepared by the producer. Water and 50% sugar syrup was provided as needed to all cages. All cages were placed in an environmental room at hive temperature and controlled humidity (32-34° C and 52% RH). Diet was replaced as needed, consumption noted, and mortality counted on Mondays, Wednesdays, and Fridays. Weekly mean survivorship of the treatments will be recorded.

To evaluate the hpopharyngeal glands, the bees head was removed and placed in a wax dissection dish. Micro-surgury scissors were used to open the head from the mandible to the top of the eye exposing the glands. The hypopharyngeal glands were removd with forceps and placed in PBS isotonic buffer until photographed.

**Results and Discussion:**

Bees fed natural pollen, MegaBee® Patty and MegaBee® Liquid had higher body protein levels, maintained these higher protein levels over time and lived longer than bees fed the other diets. Bees fed Brewers yeast, the Adee diet and BeePro® lost protein over time and were significantly shorter lived. Adult bee protein levels have been linked to longevity through complex storage proteins (Amdam et.al 2006, and Robinson et.al. 2007). The results indicate that increasing protein levels in adult bees has the potential to significantly lengthen adult bee longevity.



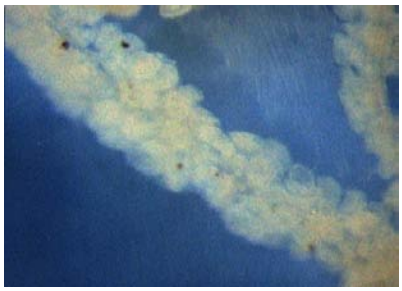

MegaBee supported hypopharyngeal gland development longer than other diets including natural pollen. We feel this may be in part due to the small, consistant, size of MegaBee particles; making the proteins more easily digested and absorbed. Many beekeepers have questioned weather brewer's yeast could be a longterm supplement to stimulate brood production in honey bee colonies. The data here indicate that short term benefits may bee seen from brewer's yeast, but by itself, brewer's yeast does not support long term protein buildup in the developing bees or sustained stimulation of the hypopharyngeal glands.

With honey bee colonies collapsing across the country, extending the longevity of adult honey bees through supplemental feeding may be one way to minimize or reverse the impact of colony collapse on bees exposed to migratory, pesticide, or other forms of stress.

What this study demonstrates to beekeepers is that it is important what protein supplement you feed to your colonies. Just because the bees eat the protein supplement does not mean that the product is the best for long term development and longevity of the adult bees.

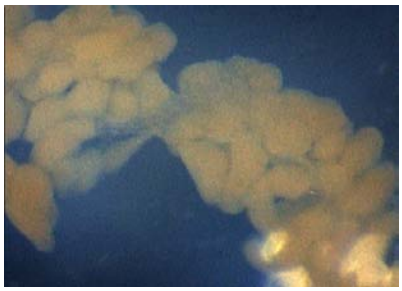
Further studies will be conducted in the field to determine if the longevity of adult bees is extended under *in-vivo* conditions as was seen under laboratory conditions.

**20 day hypopharyngeal gland**

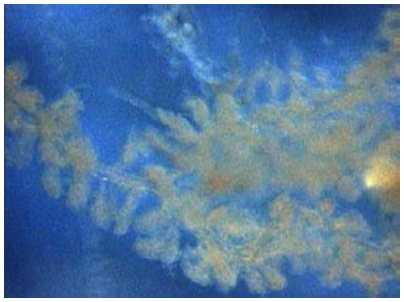


**Pollen**

**Control**



**MegaBee**



**Brewer's Yeast**

**BeePro**

**Adee**

**References:**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