

**OR026**

*How much protein is good for honeybees?*

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Pollen is the natural source of protein for bees, essential for growth, brood rearing, and gland and ovarian activation. It is assumed that pollens of high protein content are best for bees. Recent colony declines around the world have drawn attention to malnutrition in honeybees and its interactions with pesticides and disease. We are investigating the importance of protein to carbohydrate (P:C) ratio in honeybee nutrition and the implications for stress resistance. Bees on an imbalanced diet must eat more to obtain deficient nutrients, thereby ingesting excess amounts of other nutrients and incurring fitness costs such as reduced lifespan. We tested the effect of different protein sources and P:C ratios on food consumption and survival of caged worker bees (*Apis mellifera scutellata*): under these brood-free conditions consumption is directly related to worker needs. When offered complementary agar-based diets containing casein and sucrose, bees selected a carbohydrate-biased intake target (P:C 1:6.5). Although protein improved their survival when challenged with the dual stressors of nicotine and cold, caged workers given a choice did not shift their intake towards higher protein. However, bees offered casein hydrolysate, which is easier to digest than casein, adjusted their intake to consume less protein. Taking protein breakdown even further, we fed bees liquid diets composed of specific proportions of essential amino acids (eAAs) and sucrose: their intake target was more carbohydrate-biased because amino acids are assimilated more efficiently. However, there were survival costs of overconsuming eAAs, and antioxidant supplementation did not improve survival on these diets. Pollens vary greatly in protein content and amino acid composition, and dietary diversity is essential to avoid nutritional deficiencies and to dilute toxins. Surprisingly, individual honeybee foragers do not appear to select pollens of high protein content; however, pollen quality affects the probability of attracting other foragers to the pollen source.