

**Abstracts: Oral Presentation**

## **1.7 Consequences of a short term, sub lethal pesticide exposure early in life on survival and immunity in the honeybee (*Apis mellifera*)**

**Yahya Al Naggar<sup>1,2,3</sup>, Boris Baer<sup>1</sup>**

<sup>1</sup>Center for Integrative Bee Research (CIBER), Department of Entomology, University of California Riverside, Riverside, CA 92507, USA.

<sup>2</sup>Zoology Department, Faculty of Science, Tanta University 31527, Tanta, Egypt.

<sup>3</sup>General Zoology, Institute for Biology, Martin Luther University Halle-Wittenberg, Hoher Weg 8, 06120 Halle (Saale), Germany:

E-Mail: yehia.elnagar@science.tanta.edu.eg

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### **Abstract**

Dramatic losses of pollinating insects have become of global concern, as they threaten their ecosystem services as well as human food production. Recent research provided evidence that interactions between ecological stressors are drivers of declining pollinator health and responsible for observed population collapses. We used the honeybee *Apis mellifera* and conducted a series of experiments to test for long-term effects of a single short exposure to the agricultural pesticide flupyradifurone to a second environmental stressor later in life. To do this, we exposed individuals during their larval development or early adulthood to sublethal levels of flupyradifurone, either pure or as part of an agricultural formulation (Sivanto). We afterwards exposed bees to a second environmental stressor, infecting them with the fungal gut parasite *Nosema ceranae*. We found that pesticide exposures significantly reduced survival of bees and altered the expression of several immune and detoxification genes. The ability of bees to respond to these latter effects differed significantly between colonies, offering opportunities to breed bees with elevated levels of pesticide tolerance in the future. We conclude that short episodes of sublethal pesticide exposures during development are sufficient to trigger long-lasting effects that could contribute to the widespread declines in bee health.

## **1.8 How does the novel insecticide flupyradifurone affect honeybee longevity and behavior?**

**Ricarda Scheiner, Antonia Schuhmann, Hannah Hesselbach**

Universität Würzburg, Biocenter, Behavioral Physiology and Sociobiology, Am Hubland, 97074 Würzburg, Germany

E-Mail: ricarda.scheiner@uni-wuerzburg.de

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### **Abstract**

Flupyradifurone (4-[(2,2-difluoroethyl)amino]-2(5H)-furanone) is a new insecticide which was recently introduced to the market by the Bayer AG (Bayer AG, Crop Science Division, Monheim am Rhein, Germany). It belongs to Bayer's own new class of butenolides and is highly effective against sucking "pest" insects, especially white flies and aphids. Similar to the neonicotinoids, flupyradifurone binds to nicotinic acetylcholine receptors in the insect brain and works as a reversible agonist.

So far, very little is known about sublethal effects of flupyradifurone on honeybees. We investigated the effect of this substance on honeybee longevity, sensory responsiveness, cognition, foraging initiation and flight behavior, behavioral rhythms and motor behavior. We analyzed both effects of acute treatment and of chronic exposure.

Interestingly, chronic application of flupyradifurone in low concentrations had no significant effect on survival of honeybees in cages of 30 individuals but significantly reduced survival of bees kept individually in activity monitors, indicating that additional stress through isolation might lead to synergistic effects. Further, in four out of eight replicates, flupyradifurone-treated bees did no longer display circadian rhythms in activity monitors compared to control animals.

When honeybees were treated chronically in the hive and their flight behavior was monitored using radio frequency identification (RFID), we measured a significantly earlier onset of foraging in the flupyradifurone group. Otherwise, flight activity did not seem to be affected.