

Cassandra Uthoff (MOLTOX): Impact of Acute Pesticide Exposure on Honeybee Worker (*Apis mellifera*) Behaviour and Gut-Brain Molecular Changes

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Authors: Cassandra Uthoff, Abdulrahim T. Alkassab, Beatrice Engelmann, Ulrike-Rolle Kampczyk, Sven-Bastiaan Haange, Jens Pistorius, Andreas S. Thum, Nico Jehmlich, Martin von Bergen

Abstract: Honeybee colonies, as superorganisms, depend on effective communication and coordination that can be disrupted by pesticides on multiple levels. To understand this, we studied the molecular changes in the gut and brain of workers, along with in-hive behaviour investigations. We found effects of worker behaviour after one-day exposure in an in-hive feeding experiment to SIVANTO® Prime (Flupyradifurone), Cantus® (Boscalid), and Click Pro® (Terbutylazine and Mesotrione) at environmentally relevant concentrations. SIVANTO® Prime significantly decreased colony maintenance behaviours, but increased allo-grooming shortly after exposure. Cantus® increased resting behaviour, whereas Click Pro® decreased brood care, mainly by reducing larval feeding. To unravel the mechanism by which pesticides affect the brain, we analysed the global proteome and amino acid and biogenic amine levels of exposed bees from the same colonies. We found significant changes in levels of neurotransmitters such as GABA and serotonin. Furthermore, a multi-omics approach was used to investigate structural and functional changes in the gut microbiome and lining to better understand the sub-lethal effects of pesticides on the microbiome-host relationship. Together, this gives us insight into structural and functional changes in the gut microbiome and brain function of worker bees pre- and post-exposure, while also examining behavioural phenotypes in nucleus colonies.

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