

**A VITELLOGENIN ANTIBODY IN HONEY BEES (*APIS MELLIFERA*)**

***Characterization and application as potential biomarker for insecticide exposure***

**Running Head:** Vitellogenin as potential biomarker for insecticide exposure

Verena Christen<sup>1</sup>, Maren Susanne Vogel<sup>1</sup>, Timm Hettich<sup>1</sup>, Karl Fent<sup>1,2</sup>

<sup>1</sup> University of Applied Sciences and Arts Northwestern Switzerland, School of Life Sciences, Hofackerstrasse 30, CH-4132 Muttenz, Switzerland

<sup>2</sup> Swiss Federal Institute of Technology Zürich (ETH Zürich), Department of Environmental Systems Science, Institute of Biogeochemistry and Pollution Dynamics, CH-8092 Zürich, Switzerland

\*Corresponding author:

Prof. Dr. Karl Fent

Tel.: +41 61 467 4571; Fax: +41 61 467 47 84

E-mail: karl.fent@fhnw.ch; karl.fent@bluewin.ch

ORCID: Karl Fent: 0000-0002-3916-7196

**Acknowledgement**

We thank the Stiftung Emilia Guggenheim-Schnurr der Naturforschenden Gesellschaft in Basel, for financial support of this study.

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**Submitted 4 October 2018; Returned for Revisions 25 January 2019; Accepted 30 January**

**2019**

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## Abstract

The insect yolk precursor vitellogenin is a lipoglycoprotein synthesised and stored in the fat body and secreted into the hemolymph. In honey bees, vitellogenin displays crucial functions in hormone signalling, behavioural transition of nurse bees to foragers, stress resistance and longevity in workers. Plant protection products (PPPs) such as neonicotinoids, pyrethroids and organophosphate alter transcriptional expression of vitellogenin. To assess PPP-induced alterations on protein level, we developed a rabbit polyclonal vitellogenin antibody. After characterization, we assessed its specificity and vitellogenin levels in different tissues of worker bees. The vitellogenin antibody recognized full-length 180 kDa vitellogenin and the lighter fragment of 150 kDa in fat body, hemolymph and brain. In hemolymph, a band of approximately 75 kDa was detected. Subsequent mass spectrometry analysis (LC-MS/MS) confirmed the 180 and 150 kDa band as vitellogenin. Subsequently, we evaluated vitellogenin expression in brain, fat body and hemolymph upon 24 h exposure of bees to 3 ng/bee to the neonicotinoid clothianidin. Full length vitellogenin was up-regulated threefold in the fat body and the 150 kDa fragment in the brain of exposed honey bees, while no alteration occurred in the hemolymph. Up-regulation of the vitellogenin protein by the neonicotinoid clothianidin goes in line with the previously shown induction of its transcript. We conclude that vitellogenin might serve as a potential biomarker for neonicotinoid exposure in bees. This article is protected by copyright. All rights reserved

**Key words:** Honey bees; vitellogenin; neonicotinoids; clothianidin; antibody characterization