

## Varroa Control:

### **Researcher from Munich based siTOOLS Biotech discover a novel and powerful drug that kills Varroa destructor mites without harming bees**

**Martinsried, Germany, Jan. 18<sup>th</sup> 2018.** Scientists from siTOOLS Biotech (Munich/Martinsried, Germany) in collaboration with University of Hohenheim (Stuttgart, Germany) demonstrated that minute amounts of systemically applied Lithium salts effectively remove mites from adult bees. It is easy to apply, reasonably priced, and has the potential to become an important drug to protect honeybees from their greatest threat: the Varroa mite. The results of their joint research have now been published in Scientific Reports.

Varroa mites (*Varroa destructor*) are considered the honey bee's greatest enemy and have spread during the past 50 years over the entire planet. Upon infiltration of a colony the ectoparasitic mites cling to bees and invade brood cells to suck and feed on hemolymph ("Bee Blood"). In addition to debilitating adult bees and larvae, mites also spread deadly bee viruses and untreated colonies normally collapse within 2 – 3 years. Despite increasing colony losses strategies to combat Varroa infestation are limited to a small number of effective acaricides (mite killing drugs) and no new active compounds have been registered in the past 25 years.

An elegant new approach was proposed by scientists at the Hebrew University of Jerusalem who used RNA interference (RNAi) and fed bees RNA fragments via sugar syrup to downregulate vital genes in Varroa (Garbian et al., PLOS, 2012). The mites ingested the lethal RNAs and the number of mites decreased significantly after several weeks of treatment. Inspired by the idea Dr. Stefan Hannus, co-founder of siTOOLS Biotech, sought ways to improve the efficacy of the strategy.

To test such RNA fragments, siTOOLS initiated collaboration with Prof. P. Rosenkranz from the University of Hohenheim, a world leading expert in bee research and Varroa biology. First experiments indicated a spectacular efficacy of the test substance within days; however control experiments indicated that the effect was not mediated by RNAi. Apparently something else in the test samples was responsible for the observed activity against mites. Scientists at siTOOLS Biotech then discovered that Lithium Chloride, which was used in the production process, was the effective ingredient.

To further explore the acaricidal potential of Lithium compounds as well as the mode of action a joined research project, Beepax, was initiated and funded by the Bavarian Research Foundation. The exciting findings of siTOOLS Biotech and the University of Hohenheim have now been published in the January 12<sup>th</sup> publication of scientific reports (Ziegelmann et al., Sci. Rep., 2018). Single treatments with minute amounts of Lithium Chloride remove mites from adult bees under laboratory conditions. In experiments that approximate field studies 90 -100 percent of Varroa mites were wiped out over 24 to 72hours without impact on bee viability.

The discovery of Lithium salts as powerful agents against Varroa mites may be an entirely new strategy to protect bees: It acts systemically via feeding, is low-cost and will not accumulate in bees wax. At the same time further studies are required to comprehensively understand the effects on free flying colonies and to investigate possible long term side effects.

So far we consider our published results as promising and encouraging steps towards the long-sought-for agent to protect bees from Varroa mites and thus interfere with the global decline of honey bees. IP has been filed (WO 2017042240 A1) to protect the use of Lithium compounds in treatment of mite infestation of honey bees. Currently we are seeking partners to develop Lithium chloride and other Lithium salts to approved agents and make it available for beekeepers as alternative to the suboptimal existing treatments.

### **About siTOOLS Biotech**

siTOOLS Biotech GmbH ([www.sitoolsbiotech.com](http://www.sitoolsbiotech.com)) is a privately held company based in Munich/Martinsried, Germany. SiTOOLS designs, manufactures and markets second generation tools for gene function analysis, namely gene knock down by RNAi and CRISPR/Cas9 mediated gene editing. Here, siTOOLS employed its expertise in RNA biology and production to explore RNAi based approaches to combat Varroa destructor.

### **About BeePax**

The BeePax project was initiated by Dr. Stefan Hannus to bring together experts in the fields of molecular biology and apidology. The project was funded with € 300.000. - by the Bavarian Research Foundation and was joined by scientists from the University of Hohenheim (Stuttgart, Germany), the department of honey bee research and bee keeping (Veitshöchheim, Germany), University of Regensburg, department of Biochemistry (Regensburg, Germany) and siTOOLS Biotech. Aim of the project was to investigate the effects of Lithium, optimize treatment regimen and understand the mode of action.

### **About Bavarian Research Foundation**

The Bavarian Research Foundation ([www.forschungstiftung.de](http://www.forschungstiftung.de)) was founded in 1990 as non-profit foundation under public law, to support Bavaria as location for high-tech industry by fast and flexible funding of application oriented research. The foundation focusses on joined projects between academic research and the private sector. The Bavarian Research Foundation has approved 850 projects with a total volume of € 556 Mln. The annual budget is in the range of € 50 Mln. In addition the foundation awards research grants for international collaborations and (post-) doctoral students.

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### **Reference:**

<https://www.nature.com/articles/s41598-017-19137-5>.