Hormonal control of 'appetite' in ants identified
Evolutionary function of the "love hormone" oxytocin explored

(Vienna, 26-06-2018) Ants and humans have a lot in common at the level of genes and proteins: Numerous studies have shown that ants also possess the genetic basis of a hormone system based on the neuropeptides oxytocin and vasopressin, which, for instance, contribute to the formation of social bonds and the regulation of the water homeostasis in humans. An Austrian research team led by Christian Gruber from the Institute of Pharmacology at MedUni Vienna has now elucidated the function of this signalling system in ants. The scientists demonstrate that the oxytocin-vasopressin hormone system regulates foraging, locomotor activity and metabolism in ants.

The central result of the study, which has now been published in the renowned FASEB Journal: When the researchers "switched off" the release of the oxytocin-like neuropeptide inotocin to prevent signal transduction, the ants became more active, showed higher walking activity and started looking for food. At the same time, the expression of certain metabolic genes was altered. Conversely, one could expect that with an increased oxytocin level, the activity and foraging of ants would decrease. "This notion has been studied in mammals: Mice and rats that received intranasal oxytocin administrations exhibited a long-term weight loss," reports Gruber. "Oxytocin also suppresses calorie intake in men based on a study that has recently been published – and now we may have discovered the evolutionary function of this hormone system and can try to elucidate its mechanism in detail".

Exploring 600 million years of evolution

It is fascinating that this hormone system and oxytocin-vasopressin signalling, in certain aspects, has not changed over the past 600 million years. Oxytocin- and vasopressin-like neuropeptides and their related receptors are widespread among the many thousands of insect species. The advantages of these evolutionary similarities between humans and insects could now be used biomedically. "Along the evolution of this signalling system, we were able to define biochemical details of the oxytocin-vasopressin-like hormone system in ants. It is an important discovery for biology, and there is a lot to be learned for biomedical research in the future," explains Gruber.

Recent findings in this scientific field could eventually lead to the development of an anti-obesity drug. In any case, it is thought that oxytocin influences food preference in humans through its effect on the hypothalamus and at the same time it appears to increase fat metabolism. However, there is currently no such clinical application or specific medication

available. In addition, it must be clarified whether this effect is gender-specific and whether oxytocin administration is generally suitable for long-term weight loss in humans.

The study was carried out as cooperation of MedUni Vienna, IST (Institute of Science and Technology Austria), University of Vienna and Ludwig-Boltzmann Institute for Cancer Research and has been funded by the WWTF project LS13-017 (Vienna Science and Technology Fund), led by Christian Gruber (MedUni Vienna) and Co-PI Sylvia Cremer (IST Austria).

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“Oxytocin-like signaling in ants influences metabolic gene expression and locomotor activity.” Zita Liutkevičiūtė, Esther Gil-Mansilla, Thomas Eder, Barbara Casillas-Pérez, Maria Giulia Di Giglio, Edin Muratspahic, Florian Grebien, Thomas Rattei, Markus Muttenthaler, Sylvia Cremer and Christian W. Gruber. DOI: 10.1096/fj.201800443
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Medical University Vienna - short profile

Medical University Vienna (MedUni Vienna) is one of the most traditional medical education and research facilities in Europe. With almost 8,000 students, it is currently the largest medical training centre in the German-speaking countries. With 5,500 employees,
27 departments and three clinical institutes, 12 medical theory centres and numerous highly specialised laboratories, it is also one of Europe’s leading research establishments in the biomedical sector.

About IST Austria

The Institute of Science and Technology (IST Austria) in Klosterneuburg is a research institute with its own doctoral regulations. The institute, which opened in 2009, is dedicated to basic research in natural sciences, mathematics and computer sciences. The institute employs professors according to a tenure-track model and post-doctoral students as well as PhD students in an international graduate school. In addition to its commitment to the principle of basic research, which is driven purely by scientific curiosity, the Institute holds the rights in all resulting discoveries and promotes their exploitation. The first president is Thomas Henzinger, a renowned computer scientist and former

professor at the University of California in Berkeley, USA, and the EPFL in Lausanne, Switzerland.
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