Press Release

Scientists Unravel First Termite Genome

Findings contribute to the understanding of complex social behavior in insects

A large international research team including scientists from the University of Freiburg has succeeded in mapping and analyzing the genome of a termite species. This provides opportunitiesfor comparing the genetic architecture of the termites with that of ants and honey bees, which is of special interests for researchers: Scientists have long sought to understand how the complex social organization of insect colonies functions. “Our research is the first step toward studying the general underpinnings of complex social behavior in insects,” says the Freiburg biologist Prof. Dr. **Judith Korb**. The scientists published their findings in the online journal *Nature Communications*. The project was headed by Judith Korb; Prof. Dr. **Jürgen Liebig**, Arizona State University, USA; Prof. Dr. **Erich Bornberg-Bauer**, University of Münster; and **Guojie Zhang**, China National Genebank, BGI-Shenzhen.

Termites are not closely related to the hymenopterans, a large order of insects including bees and ants, but they have a similar lifestyle: They also form colonies and a hierarchy of castes, such as workers and reproductive individuals. The researchers studied whether the evolution of social behavior in these different insect groups is based on the same molecular mechanisms. They found a conspicuous difference in groups of genes involved in the maturation of male sperm . These genes are more numerous and more active in the damp-wood termite species *Zootermopsis nevadensis* than in previously studied ant and bee species. The researchers assume that this reflects their different lifestyle: Whereas male ants and

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bees produce a large amount of sperm only once and then die shortly after mating, male termites mate with the queen of their nest several times in the course of their lives.

Another difference is that damp-wood termites have far less olfactory receptors than the highly social hymenopterans. The sense of smell generally plays an important role in communication and the recognition of nest mates for social insects, as well as in the search for food. However, damp-wood termites have a simpler lifestyle than ants or honey bees. For example, they do not leave the nest to search for food and exhibit less complex communication behavior. The lower amount of olfactory receptors reflects these differences.

However, the researchers also discovered similarities between these social taxa. Much like ants, for instance, damp-wood termites have a particularly broad range of genes that are involved in immune response. It is crucial for social insects to have an effective line of defense against infections, as germs spread easily in their densely populated colonies. In addition, the scientists found proteins that might play an important role in the development of caste-specific traits – analogous to a similar system in the honey bee.

Original publication:
[Molecular traces of alternative social organization in a termite genome]

Caption:
Scientists have mapped the genome of the termite species Zootermopsis nevadensis. The picture shows eggs, larvae, and workers. Photo: Judith Korb

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