"Ladies choice" reigns in the greater sac-winged bat

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Greater sac-winged bat. Credit: Karin Schneeberger

Females of the greater sac-winged bat select their mating partner by smell and unerringly choose a male which differs from them the most in

genetic terms. Females with more variants of olfactory receptors of the TAAR-group have an advantage over other females. The results of this study have been released by the Nature Publishing Group in their open access journal *Scientific Reports*.

Researchers from the Leibniz Institute for Zoo and Wildlife Research (Leibniz-IZW), the University of Ulm, the Museum für Naturkunde in Berlin (Leibniz-MfN) and the Fritz Lipmann Institute on Aging (Leibniz-FLI) discovered that "ladies choice" reigns in the greater sac-winged bat. Male bats from Saccopteryx bilineata are considerably smaller than females, so they are not in the position to enforce copulation. "We know that females from other species with low birth rates (like bats) are very choosy when it comes to mate selection," says Pablo Santos, lead author of the study.

So, which general criteria do female bats use to select their partner? Since bats are nocturnal animals, males cannot impress females with complex colour patterns or bizarre courtship dances. It had already been known that Saccopteryx males, beside their mating calls, present a self-made "perfume" to the females during courtship. However, what exactly counts and what makes the males irresistible in the dark – or puts them out of the question has been a scientific mystery for more than three decades. Now it is unravelled: female bats rely on their nose and use an elaborate set of olfactory receptors.

"Male bats prepare a mixture of urine, saliva and penis secretion in two small skin bags on their wings," explains Christian Voigt, bat expert at the Leibniz-IZW. They spend up to one hour per day on cleaning and filling the bags. Owing to the body heat, the liquid begins to ferment within a short time, emitting an intense smell. Thus, each individual generates a distinctive scent, presumably revealing its MHC genotype.

"MHC genes – a group of genes encoding immune defence proteins –

play an important role in bat mate choice, as they do for humans, mice and many other vertebrates, too," states Simone Sommer, project leader, previously at the Leibniz-IZW and now at the University of Ulm.

For this study, scientists captured, sampled, measured and rereleased about one thousand free-ranging bats near a research station in Costa Rica for many years. They analysed relationships between bats, the exact composition of the MHC genes as well as the molecular structure of three olfactory receptor gene families: TAAR2, TAAR3 and TAAR8. Each of the three trace amine-associated receptor genes can occur in two variations in each individual. Females hence hold three to six different receptor types of this family in the olfactory mucosa of the nose. The more diverse the receptors are, the more sensitive the perception of smell in female bats is. "Females with many TAAR variants were best in tracing a partner with an optimal, complementary MHC gene disposition," says Santos.

The scientists concluded that TAAR genes could play an important role in olfactory mediated mate choice in mammals. Identifying the substances which attach to appropriate olfactory receptors could shed light on the communication between potential partners, not only in bats.

Saccopteryx males bring their fragrance into play by a specific mating ritual: as soon as the female is susceptible, the male hovers in front of her for two to four seconds. During this flight, the male opens his wing bags and fans his smell to her. If the female likes the candidate, mating takes place.

Saccopteryx bilineata is a neotropical bat species. The animals weigh 7 - 8 gram and live in small colonies of up to 40 individuals. Within the colony, they are divided into so-called harems: A male defends his territory in which two to eight females live. However, not all of the females are willing to mate with him, since good genes are likely to be

found elsewhere, too.

More information: Pablo S. C. Santos et al. MHC-dependent mate choice is linked to a trace-amine-associated receptor gene in a mammal, *Scientific Reports* (2016). DOI: 10.1038/srep38490

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