Male bats with high testosterone levels have large forearm crusts when females are fertile

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Adult male Trachops cirrhosus displaying the amber-colored odorous crust in the dorsal region of the middle section of the forearms. Tiny crust particles are left sometimes near the ear after the male smears the forearm. Credit: Paul B. Jones

Males may put a lot of effort into attracting females. Male peacocks

flaunt eye-catching trains, but male bats, because they are active at night, may rely on females' sense of smell to draw them in. Three years ago, Victoria Flores, a predoctoral fellow at the Smithsonian Tropical Research Institute (STRI) in Panama, discovered that male fringed-lipped bats often have a sweet-smelling, crusty substance on their forearms. Because only males had crusts and primarily exhibited these crusts during the putative reproductive season, Flores speculated that crusts might play a role in mating. Now Mariana Muñoz-Romo, postdoctoral fellow at STRI and National Geographic Explorer, and her colleagues have evidence to prove it.

To make the crust, males scratch their whole body with the claws on their hind feet, nibble on their claws and then spit a sticky yellow substance onto their forearms. Females do not do this.

"It is one thing to assume that because only males have a particular feature, it must have to do with mating, but when we measured the size of the smelly crusts on males' forearms, quantified their testosterone levels and the size of their testes, we found that all of these factors are related," Muñoz-Romo said. "Males with the highest testosterone levels and the largest testes have the largest crusts on their forearms, which makes us pretty sure that this trait is associated with reproduction."

Muñoz-Romo measured testosterone levels in plasma samples from wild bats at INDICASAT, Panama's Institute for Science and Technology. She also looked at the time of year when the males have enlarged crusts and whether it corresponds to the time when females are fertile, another signal that crusts and mating go arm in arm.

"There are actually very few studies that measure testosterone levels, female fertility and one of these male-only traits in mammals, and to the best of our knowledge this is the first study like this in bats," Muñoz-Romo said.

One of the reasons why studies of this kind are so rare is that it can be difficult to tell if females are in estrus. In this case, researchers sampled vaginal cells to find out if females were fertile. Most baby fringe-lipped bats are born at the end of Panama's dry season in May. Most of the males had enlarged crusts about five months earlier, during the mating season.

Testosterone is the most important male hormone, and in humans it is often associated with natural body odors. "Our results suggest that crust size is indeed determined by testosterone levels—males with higher levels of testosterone and larger testes produce bigger crusts," said Rachel Page, STRI staff scientist and co-author of the study. "All of these factors combined suggest that odorous crusts play a critical role in courtship and mating."

More information: Mariana Muñoz-Romo et al, The crust of a male: does size matter when females are fertile?, *Behavioral Ecology and Sociobiology* (2020). DOI: 10.1007/s00265-020-02914-0

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