*NATURE* | NEWS

# Smelly microbes help hyenas to communicate

**Bacteria in scent glands give information about hosts' species, sex and reproductive state.**

**Brian Owens**

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Print

Hyenas such as this one at Masai Mara National Reserve in Kenya recognize each other's smell — or perhaps the smell of each other's microbiome.

*ANUP SHAH / NATUREPL.COM*

The hordes of microbes that inhabit every nook and cranny of every animal are not just passive hitchhikers: they actively shape their hosts' well-being and even behaviour. Now, researchers have found evidence that bacteria living in the scent glands of hyenas help to produce the smells that the animals use to identify group members and tell when females are ready to mate.

Kevin Theis, a microbial ecologist at Michigan State University in East Lansing, had been studying hyena scent communication for several years when, after he gave a talk on the subject, someone asked him what part the bacteria might play. "I just said, 'I don't know'," he says. He started investigating.

He found that for 40 years, scientists had wondered whether smelly bacteria were involved in animals' chemical communication. But experiments to determine which

bacteria were present had been inconclusive, because the microbes had to be grown in culture, which is not possible with all bacteria. However, next-generation genetic sequencing would enable Theis to identify the microbes in a sample without having to grow them in a dish.


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**Message scent**

Using this technique, Theis and his colleagues last year published a study[1] that identified more types of bacterium living in the hyenas' scent glands than the 15 previous studies of mammal scent glands combined. In both spotted hyenas (*Crocuta crocuta*) and striped hyenas (*Hyaena hyaena*), most of the bacteria were of a kind that ferments nutrients exuded by the skin and produces odours. "The diversity of the bacteria is enough to potentially explain the origin of these signals," says Theis.

Now, they have found that the structure of the bacterial communities varied depending on the scent profiles of the sour, musky-smelling 'pastes' that the animals left on grass stalks to communicate with members of their clan. In addition, in the spotted hyenas, both the bacterial and scent profiles varied between males and females, and with the reproductive state of females — all attributes that hyenas are known to be able to infer from scent pastes. The work is published this week in *Proceedings of the National Academy of Sciences*.[2]


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Although this work is specific to hyenas, Theis thinks that bacteria probably also have a role in chemical communication in other animals. Jerry Wells, who studies host–microbe interactions at Wageningen University in the Netherlands, agrees. He says that the work is "a striking example of how microbiota might communicate information about their hosts, and how symbiosis of microbiota can be linked to chemical signalling and animal behaviour".

And he adds that the whiff of microbes could communicate much more: "Who knows, perhaps microbiota can reveal other information about their hosts, such as health, diet, stress status and social-association patterns."

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## References


1. Theis, K. R., Schmidt, T. M. & Holekamp, K. E. *Scientific Reports* **2**, 615 (2012).
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2. Theis, K. R. *et al*. *Proc. Natl Acad. Sci. USA* http://dx.doi.org/10.1073/pnas.1306477110 (2013).
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