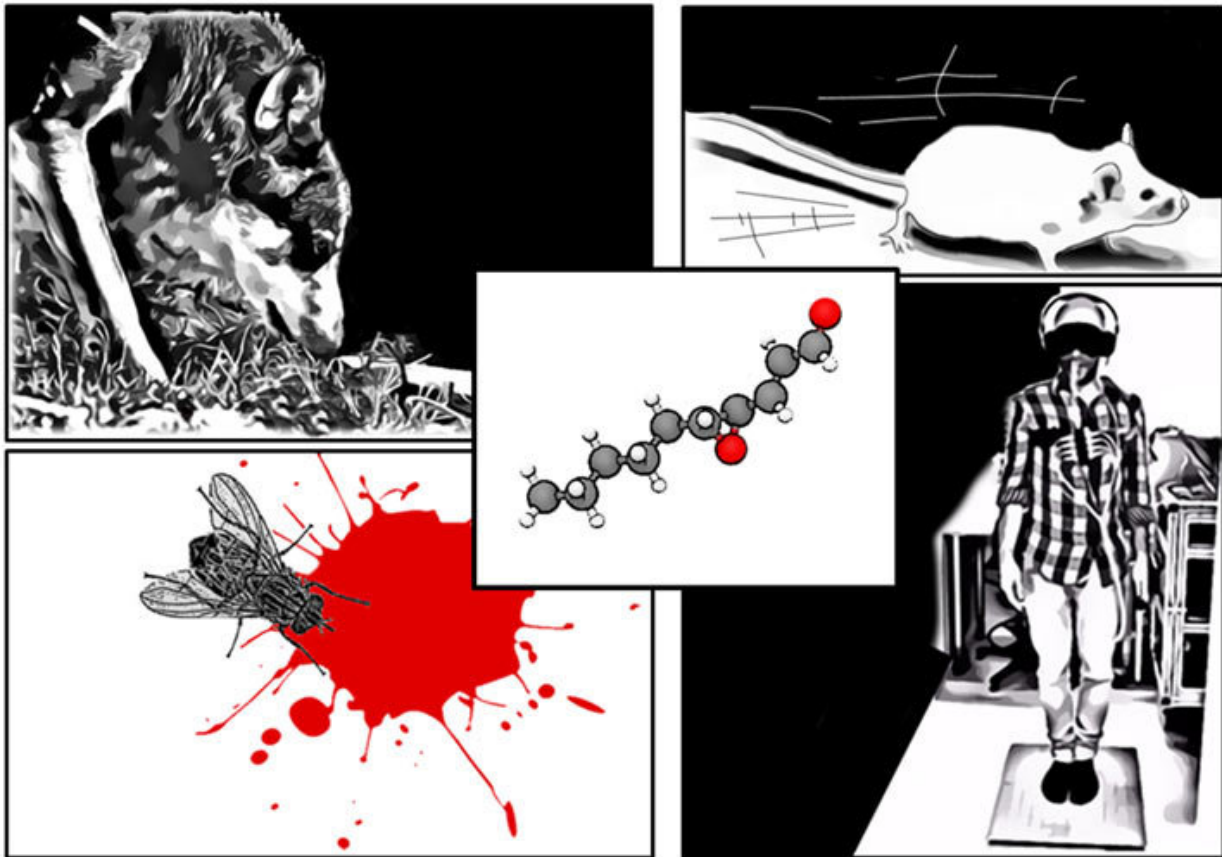


A universal food and alarm cue found in mammalian blood

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Credit: Radboud University

Predators use the smell to home in on wounded animals, whereas mammalian prey species avoid the same odour. This suggests that there

may be an old, preserved, evolutionarily food and alarm molecule within the blood odour mixture that is the signal of blood. Researchers from Radboud University report in *Scientific Reports* of 20 October that they may have found this molecule called E2D, and it seems to affect humans as well.

Like most naturally occurring odours that are important to animals, the [odour](#) of [blood](#) is composed of a mixture of hundreds of different odour [molecules](#). However, unlike other 'chemosignals' that vary between [species](#), the odour of blood seems to be universally important to animals. Now researchers may have found an old, preserved, food and alarm molecule within the blood odour mixture that is the signal of blood. "It's really special, and it smells kind of metallic," says Artin Arshamian from Radboud University (research group Culture, Meaning and Cognition) and the Karolinska Institutet in Sweden.

E2D molecule

Arshamian explains, "The name of this cue is trans-4,5-epoxy-(E)-2-decenal, a single molecule that was isolated from pig blood by our collaborator Matthias Laska from Linköping University in Sweden. In the lab, it goes by the more easily pronounced E2D." To assess behavioural responses to E2D across taxonomically distant species, the researchers worked with scientists across many disciplines and countries.

Humans and other animals

The study tested humans, wolves, mice and blood-sucking flies. The researches first showed that blood-sucking stable flies liked E2D as much as the odour of real blood. Next, they showed that when wolves smelled it on a scented log they reacted to it as if it were the real deal:

licking, biting and guarding it as if it were freshly killed prey. When they tested the smell of E2D in the prey species mice, the reactions were the same as the strong avoidance reactions induced by the full blood odour.

The researchers next extended their experiments to include humans. Here they showed that when humans smelled the E2D, they exhibited an automatic avoidance response initiated by a backward-leaning motion. They also started sweating more. However, this was not because participants thought the odour was unpleasant. In a follow-up experiment, the researchers also showed that E2D increased visual vigilance and attention. When smelling E2D, participants detected emotional visual stimuli more quickly.

One cue, two functions

Arshamian continues, "This finding is unique, as it is the first demonstration of a single [chemical cue](#) with the dual function of informing both approach and avoidance in a predator-prey predicted manner across taxonomically distant species. Importantly, it is the first known chemosignal that affects [human](#) and non-human animals alike. In humans, the effect of E2D went beyond simple peripheral responses by modulating more complex cognitive functions prototypical for a defensive system."

Shed light on human evolution

The omnipresent adaptation to E2D indicates that the selection pressure for this chemical cue is preserved through evolution. This can shed light on human evolution, our formation as a species. "Our finding in humans fits in with the paleontological data showing that early primates were small-bodied insectivores. There is no question that humans are opportunistic predators, but we probably evolved from a prey species

and some aspects of this trait lingers on," says principal investigator Johan Lundström, associate professor at the Karolinska Institutet in Sweden.

More information: Artin Arshamian et al. A mammalian blood odor component serves as an approach-avoidance cue across phylum border - from flies to humans, *Scientific Reports* (2017). [DOI: 10.1038/s41598-017-13361-9](https://doi.org/10.1038/s41598-017-13361-9)

Provided by Radboud University

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