Can animals really smell fear?

Many people have backed away from an overeager German Shepherd at one time or another, convinced it was their own scent that riled him up. "He smells your fear," the proud owner will say, standing calmly next to those sharp, glistening teeth. But how accurate is this statement? Can animals really smell fear?

Some companies would like us to believe they can. "Acclimate," an anise-scented stick that resembles deodorant, is marketed as useful for reducing aggression in horses. "When you block an animal's ability to smell," its makers claim, "you will automatically block its fear mechanism."

Nancy Diehl, an equine scientist at Penn State, thinks that this statement is more than a little misleading.

There are two distinct olfactory systems, explains Diehl. The main olfactory system is involved with the conscious recognition of smells—"grandma's apple pie," says Diehl—and depends on the nose's ability to detect volatile, airborne molecules. When you smell coffee brewing, you're breathing in coffee molecules which bind to olfactory receptors in your nasal passages. Emotional states, including fear, are not typically regarded as capable of generating scent-laden molecules.

The second scent-detecting process is called the accessory olfactory system. Communication in this system begins in the vomeronasal organ, which is located above the soft palate of the mouth, on the floor of the nasal cavity. Highly specific smell molecules detected by this organ are transmitted to the accessory olfactory bulb where they are collected and processed. Nerves from both the accessory and the main olfactory bulbs project to the limbic system, the part of the brain that deals with emotional perception and response.

Instead of detecting airborne molecules, the accessory olfactory system is designed to "read" the messages of non-volatile pheromones, communicative chemicals emitted by all animals. Research suggests that pheromone molecules transmit information concerning territory, aggression, and most prominently, reproduction.

Could that snarling German Shepherd be picking up on your pheromones? Diehl acknowledges that the accessory olfactory system's role in socially useful chemical communication could suggest that fear might be communicated by smell. The fact that smells are processed and interpreted in the limbic system would seem to offer another clue, as one of the limbic system's primary organs, the amygdala, is directly responsible for perceiving and responding to fear.

On the other hand, she says, it is widely acknowledged that pheromone communication via the accessory olfactory system is possible only within animals of the same species. This limitation makes it impossible for any animal to smell fear in members of different species.

Instead, Diehl suggests that an animal's sense of fear may depend more on behavioral clues than on olfactory signals. In horses, she notes, visual and auditory stimuli play a strong role in triggering behavioral responses.

If a frightened or nervous person approaches a horse, Diehl explains, the animal's ability to perceive this fear may help it avoid rough handling. A person who has never encountered a horse will hesitate if asked to grab its reins—"He'll reach up, then back away, then reach up again." The horse learns quickly that by making small movements away from that person, it can avoid being caught and mistreated. "Any horse can do this," she says. "It's called operant conditioning."

Likewise, horses are also able to identify fearful riders from their erratic behavior. Awkward riders tend to kick too frequently and pull the reins when they shouldn't, notes Diehl, and a horse will learn to stop responding to these signals when they're delivered without rhyme or reason.

"A good horseman will say, 'Now be careful, don't let him smell your fear,'" she says, "In reality the horse is recognizing behavioral clues in people that it has seen and learned."

—Jillian Koopman

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