



SCIENCE

A 'Distinctly Human' Trait That Might Actually Be Universal

Disgust is surprisingly common across nature.

By Katherine J. Wu



Sergey Taran / Alamy

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Eleven years ago, on the remote Japanese island of Kojima, a female macaque walked backwards into a stray heap of primate poop, glanced down at her foot, and completely flipped her lid. The monkey hightailed it down the shoreline on three feet,

kicking up sand as she sprinted, until she reached a dead tree, where “she repeatedly rubbed her foot and smelled it until all of the sticky matter disappeared,” says Cécile Sarabian, a cognitive ecologist at the University of Hong Kong, who watched the incident unfold. Sarabian, then a graduate student studying parasite transmission among primates, was entranced by the familiarity of it all: the dismay, the revulsion, the frenetic desire for *clean*. It’s exactly what she or any other human might have done, had they accidentally stepped in it.

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In the years following the event, Sarabian came to recognize the macaque’s panicked reaction as a form of disgust—just not the sort that many people first think of when the term comes to mind. Disgust has for decades been billed as a self-awareness of one’s own aversions, a primal emotion that’s so exclusive to people that, as some have argued, it may help define humanity itself. But many scientists, Sarabian among them, subscribe to a broader definition of disgust: the suite of behaviors that help creatures of all sorts avoid pathogens; parasites; and the flora, fauna, and substances that ferry them about. This flavor of revulsion—centered on observable actions, instead of conscious thought—is likely ancient and ubiquitous, not modern or unique to us. Which means disgust may be as old and widespread as infectious disease itself.

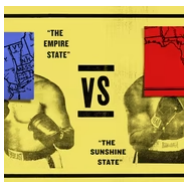
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Researchers can't yet say that disease-driven disgust is definitely universal. But so far, "in every place that it's been looked for, it's been found," says Dana Hawley, an ecologist at Virginia Tech. Bonobos rebuff banana slices that have been situated too close to scat; scientists have spotted mother chimps wiping the bottoms of their young. Kangaroos eschew patches of grass that have been freckled with feces. Dik-diks —pointy-faced antelopes that weigh about 10 pounds apiece—sequester their waste in dunghills, potentially to avoid contaminating the teeny territories where they live. Bullfrog tadpoles flee from their fungus-infested pondmates; lobsters steer clear of crowded dens during deadly virus outbreaks. Nematodes, no longer than a millimeter, wriggle away from their dinner when they chemically sense that it's been contaminated with bad microbes. Even dung beetles will turn their nose up at feces that seem to pose an infectious risk.

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If disgust behaviors are quite common among animals, it would make a lot of evolutionary sense: They guard against disease before it has a chance to begin. Discussions of immunity tend to center on T cells, B cells, antibodies, and vaccines, but those cells and molecules are not foolproof. Behaviors that help us avoid infection at all, meanwhile, can act as “a real first line of defense,” says Vanessa Ezenwa, a disease ecologist at Yale. If *fear* is what shields animals from predators—threats that tend to dwarf them in size and strength—*disgust* is its underappreciated sibling, protecting against the minuscule dangers that wriggle into bodies and destroy them from the inside out. And some version of that impulse “is probably universal, cutting across humans and nonhumans alike,” Ezenwa told me.

Many animals' reactions to grossness certainly recall our own. When Sarabian presents macaques with tasty grains of wheat, balanced on piles of faux poop, they shy away from the food; when she coaxes hungry chimps into touching wet, sticky dough during a search for bits of delicious fruit, the apes visibly recoil and refuse to proffer their hands again. During one of Sarabian's recent experiments, a mere photograph of a disease-carrying bug was enough to wig out a female ape, who turned her back to the screen and refused to reengage until the picture disappeared. Even some of the familiar facial expressions of disgust—a wrinkled nose, scrunched eyes, a mouth pinched into a slit—can be spotted in certain primates. “This may have the function of preventing things from getting into the mouth, sinuses, and eyes,” Sarabian told me. Rodents, too, seem to close off their faces to a degree when they taste the acidity of quinine—and when mice sniff out the telltale signs of infection in others of their kind, the same brain regions that are active in skeeved-out humans roar to life in them, too.

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If the roots of disgust run this deep in evolutionary time, some hygienic tendencies are probably hardwired into DNA. Newborn humans don't need a formal lesson in revulsion to grimace, gape, and gasp when something bitter is placed on their tongue. Pedro Vale, an evolutionary ecologist at the University of Edinburgh, has found evidence that the degree to which fruit flies avoid disease-causing microbes may be coded into their genes. And in the same way that some people can be more fastidious or slovenly, animals can display a wide range of comfort with grit and grime, sometimes in ways that seem to be influenced by sex and age. Across several species, females are more hygiene-conscious than males, possibly because it's far riskier for them to acquire infections that could be passed on to their offspring. And juvenile monkeys and kangaroos may be more contamination-conscious than adults because parasites hit them especially hard.

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But disgust can also be learned. Clémence Poirotte, of the German Primate Center, and Marie Charpentier, of the Institute of Evolutionary Science of Montpellier, have found that certain mandrills—the blue-and-red-faced monkeys of Rafiki fame—are more cagey about grooming sick family and friends, while others hardly mind. Those tendencies, Poirotte told me, seem tightly tied to families' maternal lines, a hint that the monkeys are inheriting their hygienic habits from their moms. We humans seem to learn similar lessons in childhood: Prior to preschool age, many kids aren't all that bothered by the sight or smell of poop. It's their parents who seem to drill that aversion into them, and cement it for life.

The potential perils of ignoring the ick factor are clear: infection, disease, death; felled families, epidemics, population declines. But many animals—humans sometimes among them—don't always heed the omens of *blech*. For years, Hawley, at Virginia Tech, has been trying to suss out why house finches won't shun other birds infected with an often-fatal bacterial infection called mycoplasmal conjunctivitis. The disease is

about as visible as it gets: “It’s pink-eye to the extreme,” Hawley told me. “These birds just look awful.” And yet, the finches don’t seem to care; some males even seem to prefer the company of ailing birds.

Then again, perhaps the cost of evading illness is just too high to pay. Squeamishness, as protective as it can be, can also come with major drawbacks—which is probably why so many animals seem willing to bend or break their codes of hygiene.

Sometimes, the calculus comes down to calories: The macaques on Kojima, often unwilling to consume grains of wheat that have touched poop, will still try to snarf down feces-contaminated peanuts—a favorite fatty, energy-rich food.

For other animals, it’s about the company they keep. Mandrills continue to groom infected family members; female mice may grudgingly couple up with sickly suitors when healthy ones are scarce; vampire bats—which deteriorate very quickly when starved—still share blood meals mouth to mouth during disease outbreaks. And although human mothers reliably find soiled diapers to be quite grody, they’re far less grossed out when the feces within comes from their own kid. The choice to schmooze with an infected friend or family member is always “a trade-off,” says Martin Kavaliers, a neurobiologist at the University of Western Ontario, “especially when in the wild, every individual is likely to be infected with something.” Bolder, more gregarious animals may end up with more infections. But their social lives may be richer, too.

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As much as people love to paint themselves as more civilized and sophisticated than other creatures, “I don’t think animals are in any way, shape, or form dirtier than us,” Sebastian Stockmaier, a biologist at the University of Tennessee at Knoxville, told me. Some of the animals we most associate with filth and squalor are actually very proactive about public health, says Aram Mikaelyan, an entomologist at North Carolina State University. Infected honeybees willingly exile themselves to keep the rest of the colony safe; ants groom away each other’s fungal spores, carry corpses out of the nest, and designate latrines far away from kitchens to avoid contaminating their food. Termites may build their nests out of feces—but the bricks are antimicrobial,

and are arranged to keep those homes well ventilated with fresh air. Many people, meanwhile, can't even be bothered to wash their hands after they use the bathroom.

Humans have made it awfully easy to avoid confronting the sensations of *yuck* that other creatures clue into every day, Mikaelyan told me. We mask bodily stink with deodorant; we scent our clothes with sprays and perfumes. We mist our homes with air fresheners to comfort ourselves about not cleaning them as often as we should. It seems a very different system from what evolution might have dreamed up, all those eons ago. But while humans fuel entire industries by covering up what's gross, plenty of other animals are sticking to what they know best: simply keeping the disgusting stuff out.
