Would you trust an ant to amputate your limb? Science is showing they are skilled surgeons

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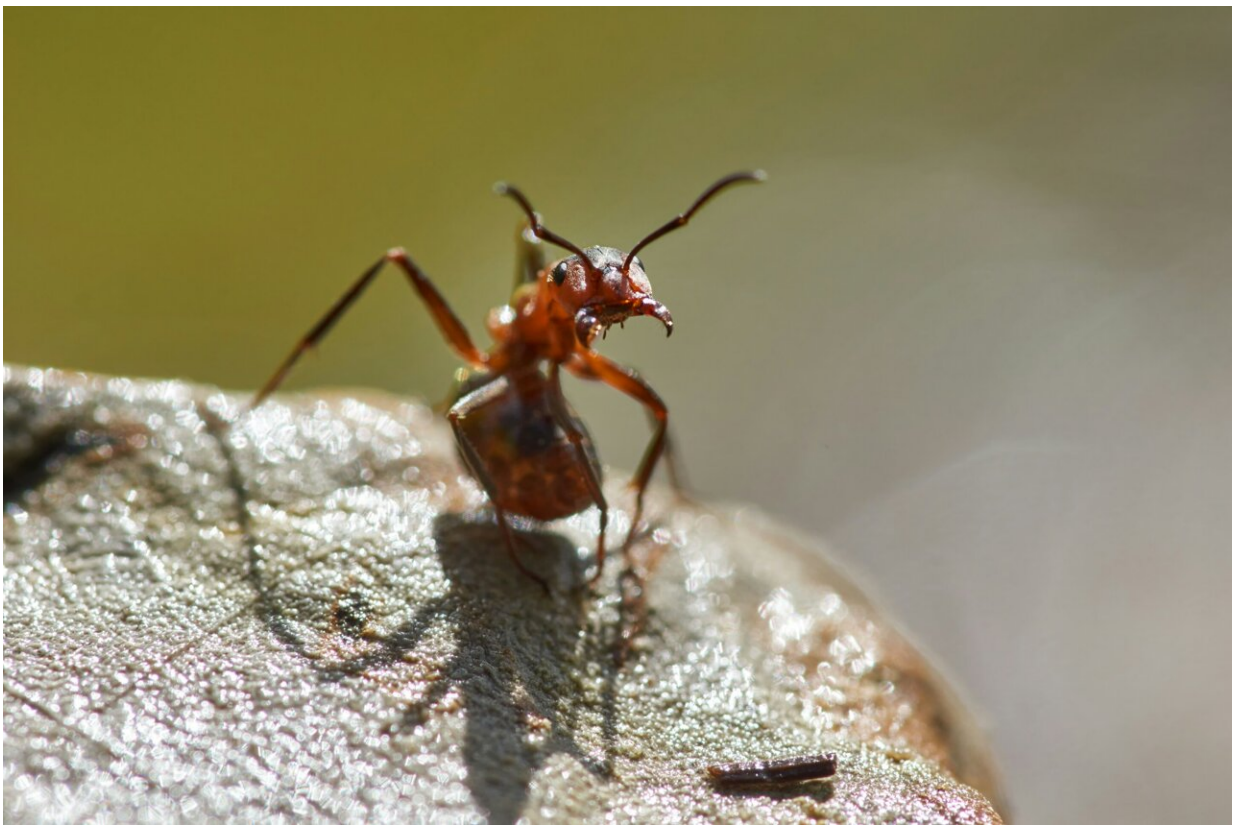

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An insect bites off another insect's leg. Is this predatory behavior, aggression, defense, competition or something else? In the case of

carpenter ants, it's for the good of the amputee and to the benefit of the colony.

A July 2024 University of Lausanne study found carpenter ants (Camponotus floridanus) carry out lifesaving amputations on their colony siblings. It is the first known example of a non-human animal amputating limbs to prevent or stop the spread of infection.

The study showed the bites were not random and resulted in a survival rate of over 90%. The three ants in the experiment that did not have their legs amputated died.

So what makes ants such advanced surgeons in the animal kingdom?

Insects aren't the only animals to treat illness and disease. Scientists have observed self-medication in a range of species including bears, elephants, moths, starlings and dolphins. Chimpanzees search for and eat specific plants to treat diseases and have recently been reported using insects to treat not only their own wounds but those of others.

However, carpenter ants may have a particular need to become surgeons.

Apart from initiating digestion, most ants' salivary secretions have antimicrobial properties, which help to control bacterial infection when they lick wounds. This is common to many groups of animals, including primates. A 2023 study of the sub-Saharan ant Megaponera analis found they licked wounds, including those of other ants, with saliva mixed with antimicrobial compounds from their thoracic metapleural glands. This is a structure unique to ants in their thorax. The saliva reduced infection of injured nest mates by 90%.

Unfortunately, almost all ants in the genus Camponotus, which carpenter ants belong to, don't have these glands. So carpenter ants may have

evolved their surgical skills as a workaround.

We don't yet know whether this behavior is unique to Camponotus floridanus, or is more common in the genus, though.

Many species have innate skills. For example, wood ants show an innate attraction to large and conspicuous objects, which can help naive ants navigate before they have learned the route home. Carpenter ants naturally burrow and have a strong bite. Stimulus such as a partly completed tunnel, or a disturbance in the nest may stimulate biting behavior.

The recent study also found the ants alter the treatment depending on where the injury is. In an experiment where the femur was damaged, the ants amputated near the body, removing the whole leg. The upper part of the leg contains a muscle mass, providing more tissue for microbial infection, so a high amputation means the patient is more likely to survive.

Ants treated damaged tibiae (a lower leg segment), which have a low post amputation survival rate, by licking. This removes debris and helps to clean up the wound to prevent infection. In the case of a femoral wound, the location of damage and possibly the shape of the target could be a stimulus for carpenter ants to bite in the right place. Something about the shape of the upper leg may trigger their compulsion to bite there.

Social skills

Scientists have long known that seemingly intelligent actions by both social and solitary insects are based on a combination of innate and learned behavior. Animals tend to gain new skills by trial and error learning, or copying others, especially those in their cohort. Social

insects are well known to collaborate to achieve tasks such as nest construction and defense. They do this by duplicating what others around them are doing, so in essence copying each other.

Injured ants release an alarm pheromone. These are compounds that raise alertness and initiate defensive behavior. Alarm pheromones are common in social insects as these also encourage assembly, which is why wasps gather round you if you swat one.

Carpenter ants' evolution as a social insect has probably encouraged them to learn skills to protect ants in their colony.

And for species like Camponotus ants that live in colonies, the spread of disease, including parasites, must be prevented or controlled. Research has shown that animals who live in tight groups, including humans, are more susceptible to outbreaks of disease than those with a more solitary existence. There are other examples of ants taking collective action for medical reasons. For instance, the invasive garden ant Lasius neglectus injects infected pupae (the insect stage between larvae and adult) with antimicrobial poison to stop fungus from spreading to the rest of the colony.

Although a carpenter ant colony may have up to 4,000 ants, most are non-fertile female workers. As they forage and fight with other colonies, they get injured and an injured ant can quickly succumb to bacterial or fungal infection. If untreated, this infection could spread into the colony. The Swiss researchers noted that more than 10% of Camponotus ants that forage in the wild bear signs of injury, so they are still important as workers.

Like other social insects, ants are well known for their high level of cooperation in the pursuit of goals such as nest building and foraging. This has led scientists to believe they have collective intelligence, which

is the ability of a group to achieve smarter outcomes by collaborating. In fact, robotics researchers at Harvard University are refining their algorithms by studying how ants work together when they build tunnels to escape confinement.

Carpenter ants' high level of collaboration in solving problems like this may have helped them develop advanced solutions to problems like the spread of disease. Their ability to perform what may be lifesaving surgery takes cooperation (at least between patient and surgeons) to another level.

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