

The hidden secrets of insect poop

August 16 2017, by Prayan Pokharel



Monarch caterpillars feeding on milkweed leaves and dropping their faces (taken in the laboratory facility). Credit: Prayan Pokharel, Author provided

Insect defecation may not seem like one of the pressing scientific inquiries of our time, but in fact the faeces of these wee creatures serves an extraordinary variety of functions in bug and human life.

Unlike most animals, many [insect species](#) actually [use](#) their excrement. They utilise it as their home, for feeding, in predator-prey interactions, for hygiene, habitat location, shelter construction, for reproduction and physical or chemical defence against natural enemies. (Kids: don't try this at home.)

For members of our own species, insect faeces may even have important and largely unlocked medicinal properties. Let's take a look.

A home and a soulmate

For some bugs, their excrement provides a home. Larvae of *Chelymorpha alternans*, commonly known as tortoise beetles, [shroud themselves](#) for protection with [faecal coverings](#) in the form of coatings, faecal cases or [faecal shields](#).

For others, it's a deterrent to enemies. The pine weevil (*Hylobius abietis*) actually deposit faeces adjacent to each of its egg as [anti-feedants](#).

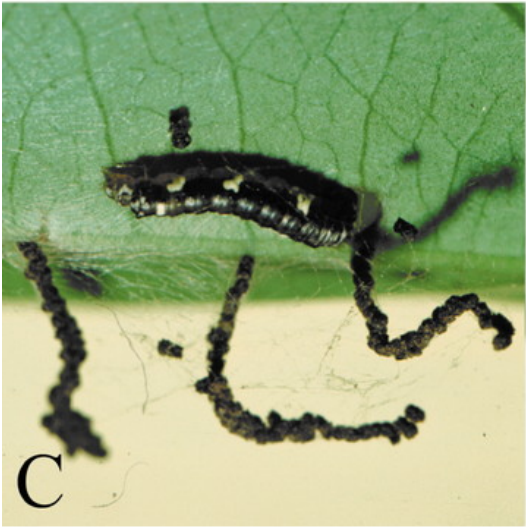
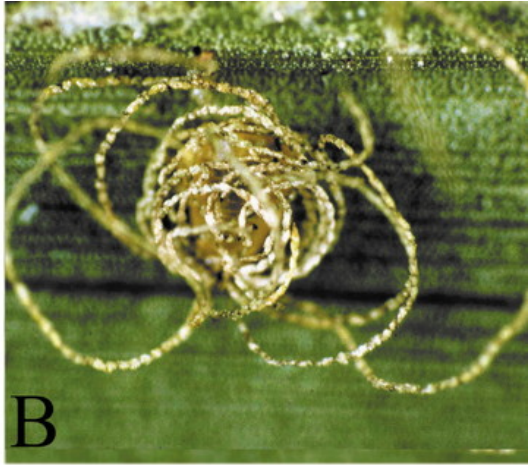
Insect waste also plays an important role in species reproduction, as it may affect mate attraction, parental care and even paternity assurance. For example, virgin boring beetles, *Hylotrupes bajulus*, use [faecal volatiles](#) to meet their partners, increasing the opportunity to mate.

Cockroaches, a bug notorious for their chutzpah and for thriving in dirty environments, use the personal scent of their faeces to [locate and return](#) to resting sites.

This is actually useful news for citydwellers trying to keep their houses cockroach free: track down roach droppings (little black or brown specs that look like a pepper flake), and you'll find out where the roaches are congregating.

Poop is healthy and nutritious

Just as farmers use cow manure as fertiliser, ants [spread their faeces around](#) to cultivate a garden of fungi for munching on. Fungi evidently thrive on the chewed-up leaves that ants defecate. It's the circle of life in action.



Weiss MR. 2006.
Annu. Rev. Entomol. 51:635-61

Different faecal structures of A. Cassidine beetle larva (Coleoptera: Chrysomelidae). B. Hemisphaerota cyanea larva (Coleoptera: Chrysomelidae). C. Monoloxis flavicinctalis (Lepidoptera: Pyralidae). D. Callicore pitheas larva (Lepidoptera: Nymphalidae). E. Chrysoesthia sexgutella (Lepidoptera: Gelechiidae). F. Hispine beetle (Coleoptera: Chrysomelidae). Credit: Weiss, 2006

Insects aren't the only ones who use bug excrement – we humans do, too. The faeces of silkworm (*Bombyx mori*) have [pharmacological properties](#) that give it analgesic, anti-pyretic, and anti-inflammatory applications in herbal medicine.

Termites, *Coptotermes formosanus*, employ faeces to build secure homes by mixing poop into the wall of the nest. These wood-eaters harbour a diverse gut microbiome that assists in digestion of cellulose in their diet, and a 2013 [study](#) showed that this [bacterial community](#) provides the termites with a natural antimicrobial that averts pathogens.

A prior [study](#), from 2000, had previously showed that the bacteria isolated from the termites, *Neotermes castaneus* and *Kaloterme flavicollis*, produces [centrin](#), a protein linked to cell division. This protein can aid researchers in understanding its role in the runaway [cell division](#) that occurs in cancers, leading some scientists to believe the centrin could be a [target](#) for anticancer drugs.

A number of [studies](#) have also observed that the black garden ant, *Lasius niger*, creates unique defecation zone within their nests. The ants keep most waste – such as dead members of the colony, debris from nest material and food scraps outside – but defecate inside, usually in the

corner of their chamber.

You may prefer a bathroom with a flush toilet, but some insects can thrive in noisome environments where the pathogen load in the surrounding is relatively high. [No pathogens can harm](#) them. Indeed, the [indigenous microorganisms associated with insect faeces](#) may actually [defend some species against](#) potential new pathogens.

A [recent study](#) shows that the larval faeces of the Mediterranean flour moth, *Ephestia kuehniella*, for example, exhibits antimicrobial activity against a broad spectrum of bacteria.

Can poop save lives?

This has potentially interesting consequences for medicine. The [lack of new antibiotics](#) and [multi-drug resistant infections](#) are making doctors and patients anxious, and there's some fear of an [antibiotic apocalypse](#). The anti-pathogenic properties of insect faeces may prove useful to discover new antimicrobials and probiotics.

But don't start adding bug-poo powder to your morning smoothie just yet. Compounds found in the faeces of some bugs – including [roaches](#) like *Periplaneta americana* and [silverfishes](#) like *Lepisma saccharina* – can produce allergic reactions in some people, and even cause asthma.

Given that bug faeces can serve as everything from a bug babysitter to a human allergen, the realm of [bacterial community of insect](#) is an important area of [study](#) by entomologists, evolutionary and molecular biologists. Their research may even lead to innovations in antimicrobial properties that can succour in the imminent fearsome post-antibiotic era.

Reports say [antimicrobial resistance](#) will kill 300 million people and cost the global economy of US\$100 trillion by 2050. Perhaps a little

defecation could help?

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