

Five things dung beetles do with a piece of poo

September 18 2015, by Marcus Byrne



Dung beetle rolling in the shade. Credit: Marcus Byrne

Dung beetle behaviour has fascinated humans for thousands of years –

including the ancient Egyptians, who incorrectly believed the beetles reproduced only from males. But Egyptian observations that the beetles' ball rolling is influenced by the sun is accurate and could be the first recorded accounts of animal behaviour.

Dung beetles evolved at least 65 million years ago, as the dinosaurs were in decline, and the mammals (and their droppings) were getting bigger. There are about 6000 species worldwide, concentrated in the tropics where they feed mainly on the dung of terrestrial vertebrates.

Dung beetles have been cleaning up the planet ever since; but what on earth do they do with all that poo? Here are the top five most interesting.

Eat it

Vulgar and aggressive, but true. Dung beetles eat dung. But they are fussy eaters, picking out the big bits and concentrating on the tiniest particles, 2-70 microns big (1 micron = 1/1000 of a millimetre), which is where most of the nitrogen in dung is to be [found](#).

All organisms need nitrogen to build proteins, such as muscle. Dung beetles get theirs from dung. By eating poo, dung beetles may be selecting the cells from the gut wall of the herbivore which made it. These are a protein-rich nitrogen source.

The latest studies show that obesity and diabetes in humans might be linked to our individual gut [microbiomes](#). Dung beetles might be using their gut microbiome to help them digest the difficult components of dung.

Roll it – although only a minority do

90% of dung beetles tunnel directly beneath the dung pat and make an underground nest of brood balls in which they lay eggs. You'll never see them unless you are prepared to poke around in the stuff.

On the other hand, the rollers transport their prize on the soil surface. They use celestial cues such as the sun or the moon to keep to a straight track away from competitors that might steal their [ball](#).



Dung beetle making a packed lunch. Credit: Marcus Byrne

There is one species which has been shown how to use the stars of the Milky Way as its celestial compass, allowing it to dominate the midnight market in dung [transport](#).

Make a packed lunch

This is what the brood ball represents to the larval [dung beetle](#). Hatching from a single egg inside each brood ball, the larva eats its way around the interior of the ball.

This dung is coarse and crunchy, so the larva has chewing mouthparts not found in the adult beetle, and doesn't have the luxury of selecting what it can eat or discard, so it eats everything – several times.

Therefore, its microbiome is different from their parents', and might contain symbiotic microorganisms living in a mutually beneficial relationship with the host [larva](#).

That gives the larva access to sugars in otherwise indigestible cellulose, and may even "fix" nitrogen from the atmosphere.

Woo girlfriends

All that is needed is a small ball of poo. Place the poo at the base of a short tunnel, then retreat to the entrance where you stick your bum in to the air and release a pheromone which alerts nearby female beetles that you have a juicy prize for them. This is in return for sexual [favours](#).

Pheromones are chemical messengers, which leave the body and are often associated with sexual attraction.

But sometimes the males cheat. They make the tunnel, do the head-standing trick to lure a naïve female, who after succumbing to his wiles

discovers that males are not to be trusted – even the six-legged versions.

Chill on it

On a hot day in the [Kalahari](#) the soil surface can reach 60°C, which is death to any animal that can't control its body temperature.

Dung beetles are small, and so is their thermal inertia. Consequently they heat up very rapidly. To avoid overheating while rolling their balls in the blazing midday sun, they climb on top of the ball to momentarily cool off, before hot-footing across the sand looking for shade. Giving them chilled dung balls from the fridge allows them to roll further before going back onto the ball.

Heated balls have the opposite effect. And giving them insulating silicon boots lets them tolerate high temperatures for [longer](#), showing that the dung ball is used as a thermal refuge from the heat.

Each example shows how evolution has co-opted a single, seemingly odd behaviour of eating dung into a more sophisticated use of the same material in different roles, each of which have enhanced the animal's survival. This ranges from making nuptial gifts to thermal refuges.

Those beetles that discovered these new behaviours by accident had more offspring, bearing their slightly different genes and behaviour into the next generation. This is where they became entrenched as an evolutionary adaptation to a successful way of life at the back-end of the food chain.

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