

The Science of Poop

How do animals get rid of things they eat?

Overview

This activity compares human and other animals' excretory systems and then outside to look for signs of animal excretion.

Background

All living organisms need food to grow and survive. Animals have digestive systems, composed of numerous body parts and organs, that get food into their body, digest the food, absorb the nutrients that are needed, and eliminate any unneeded materials (as poop! Also called feces or scat). The digestive system works with other body systems to get nutrients distributed to all parts of the body whereas the excretory system filters metabolic waste products through the bloodstream and removes them from the body.

In humans, our lungs excrete carbon dioxide as we exhale, the kidneys filter out nitrogenous and other waste products and excretes them as urine, and our skin sheds excess salt through sweat.

In animals, the main excretory products are ammonia, carbon dioxide, urea, uric acid, guanine, and/or creatine. Based on the excretory product, five modes of excretion are known in the animals. They are:

- **Ammonotelism** — excretion of ammonia; fish and many aquatic animals including crustaceans and sponges
- **Ureotelism** — excretion of urea; mammals, most amphibians, sharks, some bony fish
- **Uricotelism** — excretion of uric acid; birds, insects, reptiles and land snails
- **Aminotelism** — excretion of amino acids; some molluscs and echinoderms
- **Guanotelism** — excretion of guanine; spiders, some reptiles, birds, and earthworms

Animals also have different excretory organs that are adapted to eliminate their waste products. For example, we (and other vertebrates) have kidneys. Insects have Malpighian tubules, and earthworms have nephridia. The waste products of digestion- scat- can tell us what animal was there and give insights into its diet, behavior and habitat.

Scat Facts

- Bears are omnivores, meaning they eat both meat and plants. Their scat often has remnants of berries and seeds that they like to eat.
- Deer scat is shaped like small pellets due to the size of the opening of their colon.
- Everyone who has cleaned a windshield knows that birds' waste has brown and white parts. The excretory and digestive wastes of birds are eliminated together. The white part is uric acid and the black part is digested matter (poop).
- Wombat poop is shaped like a cube! This is likely due to the dry environments that they live in. No moisture is left in their feces.
- Cougars, cats, dogs, foxes, and wolves have tubular scats that may have remnants of their diet in it, such as hair or bones.
- Scientists can learn about the diet of extinct animals by studying their fossilized poop, called coprolites.
- River otter poop includes pieces of crab shells, fish bones and other aquatic animal parts, which are deposited on land. Research shows that otter scat provides important nutrients to rocky coastal island soils, much like how dead salmon fertilize forests.
- Owls are unable to digest the fur, feathers, and bones of their prey. Rather than eliminating them as scat, their digestive system creates compact "owl pellets" that they spit up through their mouth, with soft fur and feathers on the outside of the pellet, and skulls and other bones on the inside.

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Get Started

Part 1 – Comparing Systems

1. Draw outlines of different types of animals (human, fish, frog, bird, snake, insect, various marine invertebrates, etc.).
2. Have participants choose one of the animal outlines and research the excretory systems for that animal. Illustrate and label it inside the outline of their animal.
3. Display the sketches and have participants take an exploratory walk to view all the different body systems that these creatures have to remove digestive or metabolic waste.
4. Discuss the advantages of the system for the life and habitat of that type of animal.

Part 2 – Digestive Detectives

1. Go outdoors in nearby nature and look for signs that animals have been feeding, such as holes on leaves, chewed mushrooms, browsed twigs and stems, bark beetle tunnels on downed logs. Also look for animal scat. Remember: don't disturb or handle scat, but take a close look to see the shape, size, and if you can tell what was eaten (can you see fur, bones, plant matter?).
2. Look for tracks of animals and use field guides to try to identify them. Treat all of the observations that you make as evidence that can help you to solve the mystery of who has been feeding, digesting and/or excreting nearby.

Reflect

- What can we learn about an animal by its scat?
- Create a tune about local animals' poop such as the "Scat Rap". Add more ideas or look for more variations if this song:

It starts with an "S" and ends with a "T".
It comes out of you, and it comes out of me.
I know what you're thinking, but don't call it that,
Be scientific, and call it SCAT.
Down by the creek on a hollow log
Scat full of berries and bones of frogs
Fresh last night, out with the moon
Hunting crawdads, it was a big raccoon.
If you want to find out what animals eat,
Take a good look at what they excrete.
Stuck in the scat are all kinds of clues,
Parts of the food that their bodies can't use.

More Ideas

- **Owl Pellets** — Dissect an owl pellet to see what is was eating.
- **Make models of different kinds of animal poop** — Use play dough, clay or use different types of candy to represent different types of animal scat.
- **Insect poop** — Insect scat is called frass. Worm scat is called castings. Go outdoors to look for evidence of insect poop.

Resources

Field ID Cards

- ***Tracks and Scat ID Cards***. HCTF Education.

Books

- **Jurassic Poop: What Dinosaurs (and Others) Left Behind.** Jacob Berkowitz. Kids Can Press, 2006
- **Poop: A Natural History of the Unmentionable (Animal Science).** Nicola Davies. Candlewick, 2011.
- **Poodunnit: How to Track Animals by their Poop, Footprints and More!** Carleton books, 2020.
- **Who Pooped in the Park: Tracks and Scats for Kids** (Series, with animals specific to various National Parks in the USA). Gary D. Robson and Steve Kemp.
- **Tracks, Scat and Signs**. Leslie A. Dendy. Young Naturalist Field Guides, Gareth Stevens Publications, 2000.
- **Whose Poop is That?** Darrin Lunde. Penguin Random House, 2017.
- **Track that Scat!** Lisa Morlock. Sleeping Bear Press, 2012.

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