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## Life in the Food Chain

By Ellen R. Braaf

- *What do you have in common with corn, mushrooms, cows, and grass?*

Like all living things, you need energy. The energy you use to live every day travels from one living thing to another, in a **chain** that starts with the sun.

The energy in all your **food** comes from the sun, 93 million miles away. How did the sun's energy end up in the things you eat? You can thank green plants. They contain chlorophyll--a substance that traps the energy in sunlight. This energy then helps plants change water from the soil and carbon dioxide from the air into oxygen and carbohydrates that power their cells. This process is called photosynthesis.

Most plants make more **food** than they need. They store the extra in their roots, leaves, stems, flowers, fruit, and seeds. So, when you eat carrots, spinach, celery, cauliflower, bananas, or walnuts, some of the energy stored in plants passes on to you.

Certain bacteria also make their own **food**. So do most algae. Found just about everywhere on Earth--in lakes, streams, oceans, deserts, soil, boiling hot springs, snow, and ice--algae range from 200-foot-long kelp to tiny ocean plants called phytoplankton. Living things that make their own **food** are called producers. All others--including humans--are consumers. They need to eat other living things to survive.

### Living Links

**Food** chains link producers and consumers together. When scientists talk about **food** chains, they're not talking about the E-Z Burger restaurant **chain**. They mean the paths along which energy and nutrients pass from one living thing to another in our "eat-or-be-eaten" world. **Food** chains everywhere--in grasslands and deserts, oceans and tropical rainforests--begin with the producers. They are the first link.

The consumers come next, starting with the plant eaters, or herbivores, the vegetarians of the animal kingdom. Elephants grazing on grass, caterpillars munching leaves, and pandas chomping bamboo get energy directly from producers. So do the shrimplike krill that dine on one-celled plants in the ocean.

Carnivores, who consume other animals, come next. These predators get energy from plants indirectly. When an owl eats a mouse that nibbled seeds, it tops a three-link **chain**. But if its prey is a snake that ate a mouse that nibbled seeds, the snake becomes the third link, and the owl, the fourth.

Because all organisms use the energy they get from **food** to live, grow, and reproduce, only small amounts remain to pass between the living links in a **food chain**. That's why most chains are short--

usually about two to five links--and why it takes a lot of producers at the bottom of a **food chain** to support a few supercarnivores at the top. It's also why life on Earth depends on a constant supply of sunlight.

### **Isle Royale: Predators, Prey, and Producers**

On Isle Royale--a small, remote island in Lake Superior--wolves, moose, and balsam fir trees are bound together in a three-link **food chain**. Moose came to the island around 1900. These long-legged herbivores probably swam 15 miles to the island from Canada. There they found moose heaven--lots of plants and no large predators. As a result, they thrived, and their numbers grew. Many lived a long time for moose, about 17 years.

In summer, moose eat a variety of ferns, shrubs, wildflowers, leaves, and water plants. An 800-pound moose can scarf down 40 pounds of vegetation a day, packing on an extra 200 pounds in just a couple of months. That's like an 80-pound kid gaining 20 pounds over summer vacation by eating 4 pounds of salad every day.

But in winter when **food** is scarce, moose eat mostly the twigs and needles of balsam fir trees. These meals are much less nutritious than their summer fare, and the moose use up lots of energy plodding through deep snow to feed. They lose all the weight they gained in summer.

Wolves came to Isle Royale around 1950. Scientists think a mated pair probably walked across an ice bridge between the island and Canada. Wolves are the island's only big predators. Their arrival changed the lives of Isle Royale's moose forever.

### **Ups and Downs**

Scientists have been studying this isolated **food chain** for 50 years to understand how changes in one link can cause changes in another. As more moose are born on the island, they eat more balsam fir. The more they consume, the more they damage the trees. Stunted trees mean less **food**. Eventually, there's not enough **food** to support all the moose. Many starve, and their numbers decrease. With fewer moose dining on them, fir trees gradually recover.

A similar boom-and-bust cycle occurs between predator and prey. Ten times the size of a wolf, a moose has long, strong legs and a dangerous kick. So wolves prey mainly on old and weak animals. Good hunting means **food** for the whole pack. Wolves then raise lots of pups, and their numbers increase. More wolves mean more mouths to feed and more moose get eaten. However, when the moose population decreases, wolves starve.

With fewer predators stalking the moose, more survive to old age. The moose population increases, and the cycle begins again.

### **The Food Web**

In most places, many different **food** chains tangle together to form complex **food** webs. Isle Royale is no exception. Many living things are linked to its wolves, moose, and fir trees.

Moose eat other plants besides balsam fir, and wolves aren't the only animals that eat moose. While a wolf can, um, wolf down about 18 pounds of moose meat in just a few hours, foxes and ravens depend on moose, too. In fact, one raven can eat and stash away up to two pounds of meat from a wolf's kill.

Moose are also dinner for blood-sucking ticks. Scientists estimate that each winter about 80,000 of them burrow through one moose's furry coat, attach to its skin, and suck out gallons of blood. The ticks weaken the moose, making it easier prey for wolves.

### **Munch, Crunch, Lunch**

Have you figured out what you have in common with corn, mushrooms, cows, and grass? You are linked to each through a **food chain**: your cornflakes are made from a plant (yes, you got it--corn).

Mushrooms are the fungi on your veggie pizza. The ground beef in your hamburger comes from cows that graze on grass and are fattened up on corn.

Some people don't eat meat, fish, eggs, or milk. But humans are able to eat both plants and animals, which makes us omnivores, like bears, cockroaches, and crows. Our varied **food** choices make us part of many different **food** chains. Each is tangled with other **food** chains to form the complicated web of life.

## Break It Down!

The sun provides Earth with a constant supply of energy. But the elements and minerals plants and animals need must be recycled. That's the job of the decomposers--mainly fungi and bacteria. They break down complex matter from living things into simple chemicals. This makes important nutrients available to plants and other producers so they can be used again.

Every living thing dies. Without decomposers, nothing would decay. Earth would be piled high with dead plants and animals as well as the matter they produce and shed when they're alive: leaves, bark, feathers, feces (poop), hair, skin, scales, and the hard outer shells that cover insects. What a mess!