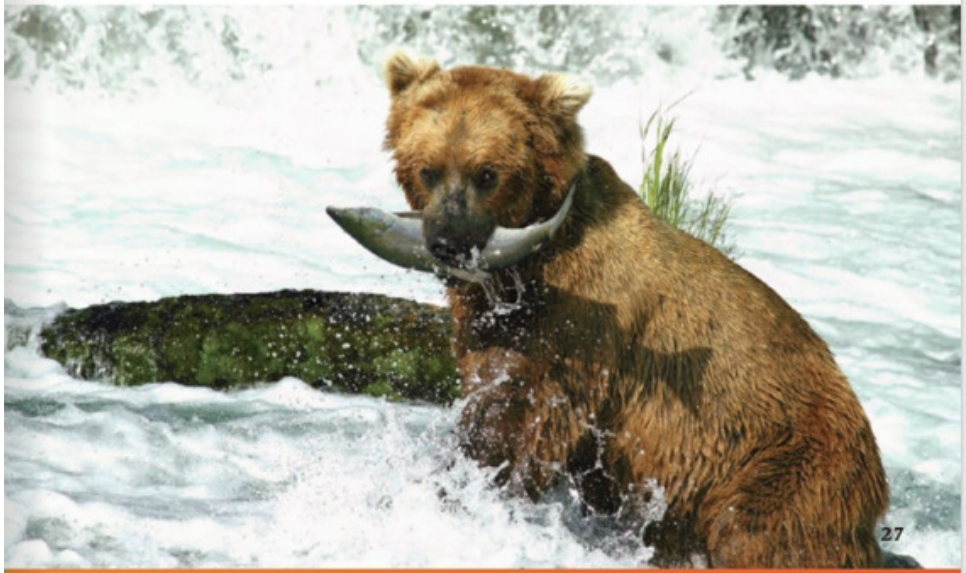
Getting Nutrients

All animals, fungi, and many bacteria consume other organisms to get the nutrition they need to live and survive. These organisms are called heterotrophs. Plants, algae, and some bacteria produce their own food, so they do not need to eat other organisms. These producers are called autotrophs. Heterotrophs get their nutrients by eating other organisms or parts of organisms, alive or dead, for food.

Food is important for two reasons. It provides building blocks for growth, development, and system repair. And food is the source of energy that organisms need to live.

Autotrophs produce their own food.

Heterotrophs consume plants and other animals.



An adult butterfly

Butterfly Nutrition

Butterflies start life as a tiny egg. When the egg hatches, the tiny larva, called a caterpillar, must eat. Every kind of butterfly has a particular kind of plant that it uses for food. Painted lady larvae feed on mallow plants. The mallow plant is an autotroph. It produces food from carbon dioxide (CO_2), water, and sunlight. The leaves are made of **carbohydrates**, lipids, and proteins, nutrients that the caterpillar needs to live. The caterpillar nibbles off bits of leaf with its biting jaws and swallows them. The caterpillar's gut digests the leaf bits. **Digestion** releases the nutrients that the caterpillar uses to grow. The caterpillar grows and grows, laying in a supply of fat.

When the caterpillar reaches full size, it finds a proper location, attaches itself, hangs down, and pupates. Inside its protective covering, the caterpillar changes into its flying phase. The insect does not eat during this change. It uses energy and matter stored in its body to construct wings, legs, and a new system for feeding.

Butterfly life cycle

After a couple of weeks, the hard outer **membrane** splits. The adult butterfly climbs out and flexes its wings. After pumping fluid into the wing veins, the new painted lady can fly. The adult needs to feed in order to survive. The painted lady's **digestive system** has changed completely. The painted lady no longer has biting jaws for nibbling on leaves. Its mouth has changed into a long, thin tube called a proboscis. The tube is used to suck sweet nectar from flowers. Nectar is a good source of sugar. Sugar provides energy for the butterfly. Flying requires a lot of energy, so access to an energy-rich food source improves the butterfly's chances of survival.

While the butterfly is going about its business, all of the other organisms in the ecosystem are going about their business, too. Animals in the ecosystem are looking for food. The blue jay is always alert for his next meal. If he spots a painted lady larva munching on a mallow leaf, he will likely swoop down and gobble it up.

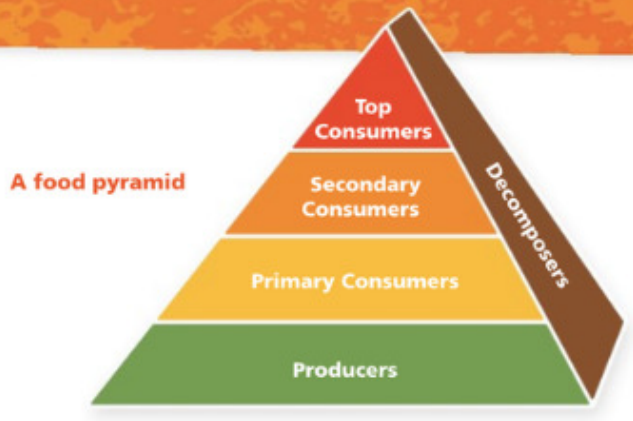
Blue jays eat butterflies.

Human Nutrition

How do *you* get your food? You are a player at all levels of a food pyramid. When you eat spinach, carrots, apples, or green beans, you are eating producers. Animals that eat producers are primary consumers, like humans and cattle. When you eat a piece of roast beef, you are eating a primary consumer.

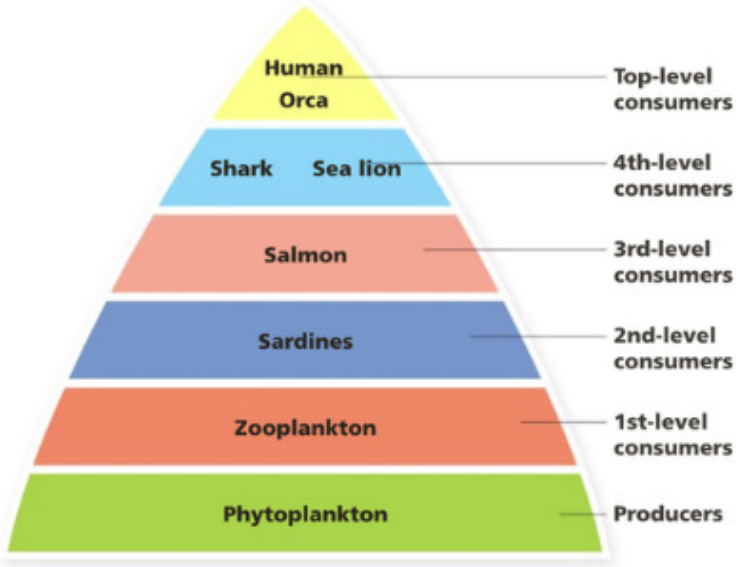
When you eat a sardine, you are eating a secondary consumer. Secondary consumers eat primary consumers. Sardines eat little primary consumers called zooplankton such as copepods and fish and crab larvae. Zooplankton eat producers called phytoplankton. If you have a piece of salmon, you are eating a third-level consumer. The salmon eats the sardine (a secondary consumer). So, when you eat the salmon, you are acting as a fourth-level consumer.

Humans eat at many consumer levels.

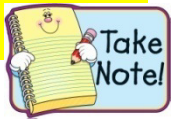


Humans are aggressive top consumers, like tigers, sharks, orcas, and eagles. But unlike those animals, we can also eat lower on the food pyramid.

How do you extract the nutrients you need from your food? You eat to feed the trillions of living cells that make up your body. The process of breaking human food into nutrients for cells is called digestion. Cells get energy and raw materials from three groups of nutrients. They are carbohydrates, fats, and proteins.



TASK: Discuss questions and record your responses in your notebooks.



"Getting Nutrients" Review

1. What is the difference between heterotrophs and autotrophs?
2. What does food provide for organisms?
3. A food pyramid describes levels in a feeding relationship involving producers, consumers, and decomposers. What information does a food pyramid describe that a food web might not?
4. What level of consumer are humans?

https://www.youtube.com/watch?v=h3ychzika4U

https://www.youtube.com/watch?v=0KbA8pFW3tg

End session

The Human Digestive System

Turning cheese, crackers, meat, vegetables, and fruit juice into nutrients for cells starts in your mouth. Your mouth is the beginning of a disassembly line for food. **Teeth** cut, mash, and grind up large pieces of food. **Saliva** mixes with the food to get it wet and to help break down the food. When you have chewed and moistened the food, you swallow it.

A wad of food, called a **bolus**, leaves the mouth and starts down the **esophagus** toward the **stomach**. Muscles along the length of the esophagus contract to push the bolus along. Your stomach is not just a place where a meal is stored. Things get rough down there. Digestive juices, including acid, are added to the food. Muscles in the stomach squeeze and mash the food. The food changes into a thick liquid called chyme.

The chyme moves into the **small intestine**, which can be 6 meters (m) long. More digestive juices are added. The small intestine has many bacteria. They attack and decompose the food you ate. Here the food changes into nutrients that your cells can use.

The small intestine is lined with millions of **capillaries**. Nutrients pass through the walls of the intestine into the capillaries. The blood carries the nutrients throughout your body, providing building blocks and energy for cells.

The last bits of the food move from the small intestine into the **large intestine** and **colon**. By this time, most nutrients are gone. Bacteria in the colon break down the remaining usable food. Water is extracted also. The remaining material contains fiber, other indigestible material, and dead bacteria. It is called feces. The feces moves into the rectum and is eliminated through the anus.

Because humans are animals, we cannot make our own food. We have to eat food to get our nutrients. Every cell in **multicellular organisms** needs nutrients. The digestive system breaks complex food sources into simple chemicals (nutrients). Those simple chemicals enter the blood and are transported to all the cells.

Food provides the nutrients our bodies need to survive.