Food — Chemical Energy

Introduction

Everyone knows that the real reason to eat isn't simply for pleasure. Eating is what provides our bodies with the energy to live. The attractive colors, aromas, flavors, and textures of favorite foods aren't really important to the solid necessity of eating for survival. They do play a role, however, since they provide variety and make eating a lot more enjoyable.

Where does energy in food come from?

The **food chain** for humans begins with plants. Under ordinary growing conditions, plants require soil, water, air and sunlight. All of these conditions must be present for optimal growth of the plant. Of these elements, the energy source is sunlight, or solar energy, which is used by the plant leaves to combine chemicals from air and water.

Carbon dioxide from air and hydrogen from water are combined to form **carbohydrates**. These carbohydrates, stored in the plant's leaves, stems, and roots, are the major energy source for the animals (including humans) who eat them.

Plants get their food from the soil which supplies chemicals for making proteins, vitamins and minerals. When we, in turn, eat plants, our bodies use these proteins, vitamins and minerals as building materials for bones, muscles and all the rest of our physical parts.

It's the carbohydrates, though, that we use for energy. Our bodies break down the carbohydrates into three fuels: **glucose** is the fuel we use for a constant level of energy,.**glycogen** provides an extra rich fuel for sudden emergencies, and **fat** is a long-term storage fuel.

All three fuels are necessary to provide the heat that keeps our bodies operating at a constant temperature of 98.6°F (37°C). These fuels also provide the energy for your heartbeat, breathing, walking, talking and other physiological functions.

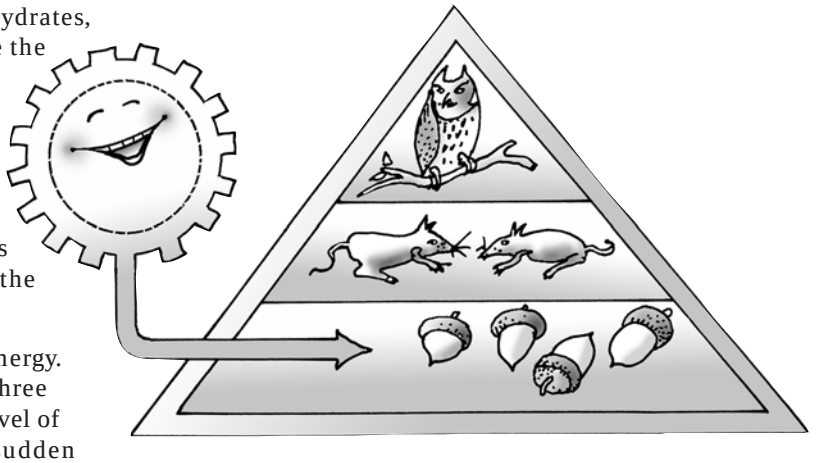
When we eat beef, fish, poultry and other meats, we are really eating plants that have been converted to another form. The energy is still there.

What is the food chain?

An **ecosystem** contains one or more communities of living **organisms**. All the organisms living together in a certain area make up a community. Organisms are generally classified into three groups based on how they obtain food. (1) Organisms containing chlorophyll are **producers** because they produce food by photosynthesis—plants and some simple organisms are producers. (2) Organisms that eat other organisms are **consumers**—animals and some simple organisms are consumers. (3) Organisms that cause the decay of dead organisms are **decomposers**—fungi and most monerans are decomposers.

The consumers in a community depend on producers and other consumers for food. For example, mice eat acorns and owls eat mice. The oak trees on which the acorns grew are producers. The mice that eat the acorns are consumers. The owls that eat the mice are consumers also. When the oak trees, mice, and owls die, decomposers will cause the decay of their bodies.

The acorns, mice, and owls in a community form a food chain. A food chain is a series of producers, consumers and decomposers.



Energy pyramids show that the food energy in one level of a food chain is greater than in any level above it.

Food chains exist in communities because all organisms need energy. Food contains stored energy that organisms can use to carry on their life activities. All of the energy used by organisms comes originally from the sun. The sun's energy is stored in the food that producers make by photosynthesis. When a consumer eats a producer, some of the energy is passed to the consumer. The energy is passed through the food chain as one consumer eats another.

The flow of energy through a food chain can be shown as an **energy pyramid**. The energy pyramid is divided into levels that represent producers, consumers, and decomposers. Producers are always at the base of the energy pyramid. Consumers make up the upper levels and

decomposers are shown at the top. The energy from food in each level of a pyramid is always less than the energy in the level below it. This is because as energy is passed from one organism to another, most of it is used or lost.

In the acorns—mice—owls food chain, acorns from oak trees form the base of the energy pyramid. The oak trees produce acorns that provide food (energy) for the mice. Only about 10 percent of the energy in the acorns is passed to the mice—the rest is used or lost. Only a small part of the energy in the mice is passed to the owls—the rest is used or lost. Thus, many acorns are needed to support small populations of mice and owls.

How is energy used to make food and deliver it to us?

The days are long gone when most people grew their own food and survived independently. Today, much of what we eat comes from other people and places and is the result of a complex series of events.

A good example of a staple crop is corn.

Corn requires many chemicals from the soil, so farmers must keep fertilizing the soil to replace important chemicals. Usually, fertilizers made from natural gas are used.

Farm machinery, of course, burns gasoline or diesel fuel to do the plowing and planting. If rainfall is poor, farmers may need to irrigate, which requires electricity to run the irrigation pumps. Pesticides made from petroleum keep the corn healthy.

Then, fuel-burning machinery picks the corn which is transported by truck or rail to where it is sold. Since this may be thousands of miles away, the fuel (and energy used) is often substantial.

Once the corn gets to you, other forms of energy may be necessary to husk it, clean it and cook it to your taste.

Meanwhile, energy is being used to produce and ship many other types of foods which will eventually end up on your table.

And the entire process has only one purpose: to give you energy to survive.

(*Adapted from Energy Readings, part of the New York Energy Education Project, with permission of the New York Power Pool.*)