

11: *The World of Microbes*

Everyone knows that many organisms are too small to be seen without a microscope. We call them “**microscopic**” organisms. What is confusing to most people is that there are so many different kinds of tiny organisms. People often think that these organisms (called **microorganisms**) are all alike. They lump them together and call them “germs” to include bacteria, yeasts, algae and viruses. Although they are all small, many of these are as different from one another as an elephant is from a coconut palm. Here is a rundown of the microbes:

Bacteria are tiny single-celled prokaryotic microorganisms. (Remember that a prokaryote doesn’t have a nucleus in its cell.) They are found practically everywhere on Earth: in soil, water, air and the deep underground (as deep as anyone has ever drilled). They are also found in you: in your mouth, your nose, your ears, your stomach and your intestines, and on your skin. They are on your pillow and your towel, and even in your drinking water. Since you live in harmony with so many of these bacteria, they must be pretty friendly. In fact only a few bacteria are really troublesome, while many others are useful to us. The bad bacteria are the ones we hear most about, though. They include the disease-causing **pathogens** like those that cause whooping cough, tetanus, “strep throat,” staph infections, cholera, botulism, anthrax, meningitis and pneumonia.

Bacteria can be controlled by the use of **antibiotics**. These are natural chemicals that are produced by other



These bacteria represent the smallest of all organisms. Magnified 1000 times, they are still barely large enough to be seen clearly. A few are harmful but many others are beneficial. They are the world’s waste recyclers, taking dead plant and animal matter and using it to make their own energy by converting it to carbon dioxide and water.

microorganisms. Once these chemicals were discovered, scientists learned how to change their chemical structures so that they attack different kinds of bacteria more effectively. Many antibiotic drugs are now being used. Over the years since antibiotics were discovered, bacteria have become adapted so that antibiotics are not as destructive to them. Scientists are now in a race against these **antibiotic-resistant bacteria**, trying to develop new ways of protecting people from them.

There is a group of organisms that look like bacteria, but are actually quite different. Until recent years they were thought to be bacteria, but when their DNA was compared to bacterial DNA it was discovered that these organisms are chemically as different from bacteria as bacteria are from us. These organisms used to be called archaebacteria, but are now known simply as **archaea**, which means “ancient ones.”

Evolutionists once believed that these organisms were the first to occupy the Earth and that they were the organisms from which all others eventually evolved. This is because many of them share characteristics with plants, animals and bacteria. It is also because the archaea occupy some harsh environments thought by evolutionists to be similar to the environment of the young earth. For example, archaea live in the deep sea hydrothermal vents where temperatures can be hotter than boiling water. They are also found in hot springs, at pH values from 1 to 2 (very acidic). Now that the genomes of these organisms have been studied more extensively, however, the idea that other life forms evolved from archaea is difficult to support.

The prokaryotic organisms discussed in previous paragraphs—bacteria and archaea—are tiny, ranging in size from 0.5 to 5 micrometers. (A micrometer is one millionth of a meter, or one thousandth of a millimeter). Eukaryotic organisms (having nuclei in their cells) come in a variety of sizes. Take fungi, for instance. These include the yeasts, molds, slime molds, lichens, mushrooms and toadstools. You may recognize mushrooms and toadstools as **macroscopic** organisms (organisms that can be seen without the help of a magnifier). But yeasts are microscopic, and molds may be either macroscopic or microscopic. Even though they are small, microscopic yeasts and molds are still eukaryotic. They are 10 to 100 times larger than bacteria and archaea.