Topic Page: Bacteria

Definition: **bacteria** from *Dictionary of Energy*

Ecology, singular. bacterium. a major group of living organisms that are microscopic and mostly unicellular, with a relatively simple cell structure typically contained within a cell wall and lacking a cell nucleus; bacteria reproduce by fission, and occur in spherical, rodlike, spiral, or curving shapes. They are found in virtually all environments and are the most abundant organisms. Some types are important agents in the cycles of nitrogen, carbon, and other matter, while others cause diseases in humans and animals.

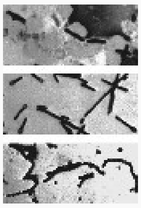

Image from: **Bacteria. Photomicrographs of 1. Bacillus...** in *Black's Veterinary Dictionary*

Summary Article: **bacteria**
From *The Hutchinson Unabridged Encyclopedia with Atlas and Weather Guide*

Microscopic single-celled organisms lacking a membrane-bound nucleus. Bacteria, like Archaea, certain fungi, and viruses, are micro-organisms – organisms that are so small they can only be seen using a microscope. They are organisms that are more simple than the cells of animals, plants, and fungi in that they lack a nucleus. Bacteria are widespread, being present in soil, air, and water, and as parasites on and in other living things. Some parasitic bacteria cause disease by producing toxins, but others are harmless and can even benefit their hosts (see symbiosis). Bacteria usually reproduce by binary fission (dividing into two equal parts), and this may occur as often as every 20 minutes. Only a few thousand species of bacteria have been grown in laboratory cultures and characterized thoroughly, although genetic analysis of crude samples suggests that many millions of species may actually exist.Certain types of bacteria are vital in many food and industrial processes, while others play an essential role in the nitrogen cycle, which maintains soil fertility. They can be the first organism of a food chain, by acting as decomposers of dead plant and animal remains. This helps to recycle nutrients.

Bacteria can be grown on the surface of agar jelly in dishes in the laboratory and have been studied in detail. This has led to the development of antibiotics, chemicals that kill or inhibit micro-organisms such as bacteria. Sometimes the chemical is not harmful to humans and so can be used to treat disease. Some antibiotics work against a range of bacteria and in many situations, such as penicillins. Others are quite specific. For example, neomycin sulphate is especially active against bacteria that cause infections of the middle ear.

Due to the widespread and sometimes careless use of antibiotics, there are increasing numbers of bacterial strains that have become resistant to these. New antibiotics or alternative treatments need to be discovered so that antibiotic-resistant bacteria can be destroyed, but this is only occurring very slowly.

Origin of antibiotics In 1928 the Scottish scientist Alexander Fleming noticed that a fungus growing on an agar plate had inhibited the growth of bacteria. Ten years later, Howard Florey and Ernst Chain isolated the chemical that was affecting the bacteria. This was penicillin, the first antibiotic and still the most widely used in the treatment of bacterial diseases. This antibiotic, and variations of it, have probably helped to cure millions of people since then. Before penicillin was available, many people died from bacteria-infected wounds. This is now far less common.

Antiseptics and disinfectants Antiseptics and disinfectants are chemicals that kill or inhibit bacteria on surfaces, such as medical instruments or the skin.

Role in food manufacture and industry Certain types of bacteria are vital in many food and industrial processes. For example, bacteria are used to break down waste products, such as sewage; make butter, cheese, and yogurt; cure tobacco; tan leather; and even extract minerals from mines. By virtue of the ability of certain bacteria to attack metal, they can also be used to clean ships' hulls and de-rust their tanks. Enzymes derived from microbes, especially from bacteria or archaea that grow in hot places, are widely used in industry. Biological detergents contain an enzyme like this, which digests protein and can work in the hot water of a washing machine. Several species of bacteria in the stomach of a bowhead whale are capable of digesting pollutants (naphthalene and anthracene, two carcinogenic fractions of oil difficult to break down, and PCBs, also carcinogenic). They are useful to humans in genetic engineering.

Structure Bacteria have a large loop of DNA, sometimes called a bacterial chromosome. In addition there are often small, circular pieces of DNA known as plasmids that carry additional genetic information. These plasmids can readily move from one bacterium to another, even though the bacteria may be of different species. In a sense, they are parasites within the bacterial cell, but they survive by coding characteristics that promote the survival of their hosts. For example, some plasmids confer antibiotic resistance on the bacteria they inhabit. The rapid and problematic spread of antibiotic resistance among bacteria is due to these plasmids.

Classification Bacteria are now classified biochemically, but their varying shapes provide a rough classification; for example, **cocci** are round or oval, **bacilli** are rodlike, **spirilla** are spiral, and **vibrios** are shaped like commas. Exceptionally, one bacterium has been found, *Gemmata obscuriglobus*, which has a nucleus. Bacteria can also be classified into two broad classes (called Gram positive and Gram negative) according to their reactions to certain stains, or dyes, used in microscopy. The staining technique, called the Gram test after Danish bacteriologist Hans Gram, allows doctors to identify many bacteria quickly.

Environment Bacteria cannot normally survive temperatures above 100°C/212°F, such as those produced in pasteurization, but archaea living at deep-sea hot vents in the Eastern Pacific withstand temperatures of up to 120°C/248°F. *Thermus aquaticus*, or taq, grows freely in the boiling waters of hot springs, and an enzyme derived from it is used in genetic engineering to speed up the production of millions of copies of any DNA sequence, a reaction requiring very high temperatures. Certain bacteria can respond to harsh environmental conditions by forming tough, inactive survival forms known as spores, which will germinate when conditions improve. Spores can be resistant to traditional sterilization methods and have been used as bioweapons (see anthrax).

Interaction between bacteria Certain bacteria can influence the growth or activities of other bacteria; for example, lactic acid bacteria will make conditions unfavourable for salmonella bacteria. Other strains produce nisin, which inhibits growth of listeria and botulism organisms. Plans in the food industry are underway to produce super-strains of lactic acid bacteria to avoid food poisoning. Certain bacteria communicate their presence to other members of their species, so they can ensure they start certain activities, like bioluminescence, or establishing an infection, only when a sufficient number of them is present. This phenomenon is known as quorum sensing.

An estimated 99% of bacteria live in ‘biofilms’ rather than in single-species colonies. These are complex colonies made up of a number of different species of bacteria structured on a layer of slime produced by the bacteria. Fungi, algae, and protozoa may also inhabit the biofilms.

Prehistoric bacteria Bacteria have populated our planet for well over 3.5 billion years, but their precise origins are open to debate, as fossil evidence of early evolution is rare and difficult to interpret. Precursors of a group now known as cyanobacteria (formerly called blue-green algae) were responsible for the development of photosynthesis and the oxygen content of our atmosphere.

Bacterial spores 40 million years old were extracted from a fossilized bee and successfully germinated by US scientists in 1995. Likewise in 2000, bacterial spores isolated from a salt formation in New Mexico, USA, were brought to life by US bacteriologists. The bacteria, *Bacillus permians*, were 250 million years old. It is hoped that prehistoric bacteria can be tapped as a source of new chemicals for use in the drugs industry. Any bacteria resembling existing harmful pathogens will be destroyed.

In 2005 scientists discovered live bacteria in ancient deep-sea sediments. Samples from the Pacific Ocean were obtained that were up to 400 m/1,312 ft below the sea bed and up to 16 million years old. It was estimated that 10–30% of the cells in the samples were composed of live bacteria, able to live without sunlight.

essays

Antiseptics, disinfectants and antibiotics

Bacteria and the Carbon Cycle

Biology

Disease

Infectious diseases in developing countries

Causes and spread of diseases

Disease-causing pathogens

Drug: Drug-resistant Bacteria

Prevention of food poisoning

Methods of food preservation

Bacteria and viruses in the body

Immunity: T and B cells and monoclonal antibodies

Defence mechanisms, immunization and medicines

Immune system: lymphocytes and phagocytes

Growth of micro-organisms and sterilization

Micro-organisms and disease

Penicillin: Discovery

didyouknows

bacteria

bacteria: navigation

bacteria: quanitity

bacteria: simplest organism

weblinks

Antibiotics: How Do Antibiotics Work?

Bacterial Evolution: Score one for Punk Eek

Bad Bug Book – Hepatitis A Virus

Bad Bug Book – Streptococcus

Bugs in the News!

Microbe Zoo

animations

white blood cells fight infection

APA

Chicago

Harvard

MLA

---

bacteria. (2018). In Helicon (Ed.), *The Hutchinson unabridged encyclopedia with atlas and weather guide*. Abington, UK: Helicon. Retrieved from https://search.credoreference.com/content/topic/bacteria

---

© RM, 2018. All rights reserved.

APA

bacteria. (2018). In Helicon (Ed.), *The Hutchinson unabridged encyclopedia with atlas and weather guide*. Abington, UK: Helicon. Retrieved from https://search.credoreference.com/content/topic/bacteria

Chicago

"bacteria." In *The Hutchinson Unabridged Encyclopedia with Atlas and Weather Guide*, edited by Helicon. Helicon, 2018. https://search.credoreference.com/content/topic/bacteria

Harvard

bacteria. (2018). In Helicon (Ed.), *The Hutchinson unabridged encyclopedia with atlas and weather guide*. [Online]. Abington: Helicon. Available from: https://search.credoreference.com/content/topic/bacteria [Accessed 19 September 2019].

MLA

"bacteria." *The Hutchinson Unabridged Encyclopedia with Atlas and Weather Guide*, edited by Helicon, 2018. *Credo Reference*, https://search.credoreference.com/content/topic/bacteria. Accessed 19 Sep. 2019.