

## THE ROLE OF MICROORGANISMS IN THE ENVIRONMENT AND HUMAN LIFE

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**Annotation:** Bacteria (translated from Greek means "sticks") are the simplest, most common organisms that have existed on Earth for about 3.5 billion years, but at the same time are constantly developing. They live in water, soil, air, inside and on the surface of animal and plant bodies. Bacteria can only be seen under a microscope.

**Keywords:** bacteria, microorganisms, cocci, lactobacillus.

**Relevance:** The topic is very relevant, because in our lives we often hear from adults: do not eat unwashed fruits, pick up some kind of bacterium or wash your hands before eating, otherwise there are a lot of infectious microbes on your hands. It seems that bacteria are only harmful to humans, but my project helps to conclude that bacteria are not only bad, but also good.

For many centuries, humanity has not only had no protection against infectious diseases, but also did not recognize them as a disease at all. It was believed that they were "God's punishment for sins." The only advantage was that they tried to isolate such patients. Doctors of that time noticed that isolation thereby prevents the spread of the disease. This made it possible to consider the spread of infection as a disease. Thus, the Italian physician Girolamo Fracastoro was the first to suggest that the disease passes from the patient to the healthy through objects and can be transmitted at a distance. He even hypothesized that there are small organisms that can move through the air, once in a certain environment, they begin to reproduce there. Thus, they are carriers of infection. But it was only with the invention of the first microscope that it was scientifically proven that bacteria really exist.

The scientist made a number of discoveries unique for his time.

1. Small living creatures (bacteria) live everywhere and can be transported by air.
2. When the liquid is heated, the "animals" stop moving, and after cooling they did not come to life again. This means that they can exist at a certain temperature, its change can lead to their death.
3. Small creatures have different shapes: some are round, others are in the form of sticks, curls. Some of them live alone, some form pairs, groups. Some of them are not moving, others are moving.
4. The scientist really wanted to make a description of the organs, but because of the small magnification he did not succeed. But in order to calculate the size, he came up with the idea of comparing the size of the "animals" with the size of a grain of sand.

The discoverer of the world of bacteria was Anthony Leeuwenhoek, a Dutch naturalist of the 17th century, who for the first time created a perfect magnifying glass microscope that magnifies objects 160-270 times.

Leeuwenhoek went down in history as the discoverer of the amazing world of bacteria and as the greatest experimenter of his time. Today, microbiology has made great strides in the study and description of bacteria, but there are still many unexplored species that are unsolved mysteries from the world of bacteria.

Today we know that bacteria are everywhere - in the air, water, food, the bottom of the ocean, hot springs, deep inside the earth's crust, on our skin and even inside us.

Bacteria live in soil, water, the human body and animals. Diverse groups of bacteria can develop in conditions that are not accessible to other organisms. The more diverse organic compounds are contained in the medium, the more bacteria can be found in it. In uncontaminated soils and waters, a relatively small number of saprophytic forms of bacteria, microbacteria, and coccoid forms are found. Various spore-forming and non-spore-forming bacteria and specific aquatic bacteria are found in the water - aquatic vibrios, filamentous bacteria, etc. Various anaerobic bacteria live in the mud at the bottom of reservoirs. Among the bacteria living in water and soil, there are nitrogen-fixing, nitrifying, denitrifying cellulose bacteria, etc. The seas and oceans are home to bacteria that grow at high concentrations of salts and high pressure, and luminous species are found. In polluted waters and soil, in addition to soil and aquatic saprophytes, bacteria living in the human and animal bodies – enterobacteria, clostridia, etc. - are found in large numbers. An indicator of fecal contamination is usually the presence of *E. coli*.

The list of section names alone in such a menu would take more than one page: bacteria of the most unusual appearance, bacteria of all colors of the rainbow, bacteria with the most unusual diet, the most persistent, the most thrifty, the most ancient bacteria, lovers of extreme temperatures.

It seems that there is not a single place on our planet where microorganisms have not been found. To adapt to unusual habitats, they had to develop unusual functions. They learned to feed on light, oil, live in the Arctic cold and in boiling water, assemble their genome from pieces and synthesize hundreds of thousands of genomes.

Scientists know at least 2,500 species of bacteria.

Here are some groups of them:

- fermentation bacteria,
- soil bacteria,
- putrefaction bacteria,
- pathogenic bacteria.

Soil bacteria destroy annually falling leaves, turning them into humus, and then mineral salts. They destroy the corpses of small and large animals. This means that soil bacteria are the sanitarians of nature. Without their activity, fertile soil would not have been formed. Soil bacteria participate in the circulation of soil substances, improve the living conditions of other plants.

Putrefaction bacteria cause spoilage of the harvested crop, rotting of food. To avoid such losses, the harvested crop should be properly stored in cool, ventilated storage rooms. Food should be stored in refrigerators. Meat and fish are canned and salted. Fruits are dried. Jam is made from berries. Some vegetables are pickled. Sunlight, salt, vinegar, and boiling kill bacteria.

Pathogenic bacteria cause infectious diseases of humans and animals. To combat them, antibiotics, vaccinations are used, as well as work is organized to eliminate foci of infection, harden the body, observe the rules of sanitation and hygiene of the body.

### 1.6. The role of bacteria in human life

The role of bacteria in human life is huge. Lactic acid bacteria are widely used in the food industry:

➤ in the production of yogurt, cheeses, sour cream and kefir;

when sauteing cabbage and pickling cucumbers, they take part in watering apples and pickling vegetables;

They give a special flavor to the wines;

They produce lactic acid, which ferments milk. This property is used for the production of curdled milk and sour cream;

➤ in the preparation of cheeses and yoghurts on an industrial scale;

During the salting process, lactic acid serves as a preservative.

Bacteria play an important role in the human digestive process. These bacteria decompose food into particles. At the same time, they produce vitamins, proteins, and carbohydrates, which the body uses to build itself.

What is the intestine of a healthy person, that is, the population of this organ? In the intestine, 99% of microbes are selfless human helpers. They are called permanent microflora. Among them there are the main, main microorganisms – these are bifidobacteria and bacteroids. But there are also concomitant bacteria – these are E. coli, lactobacilli, enterococci. Under certain conditions, representatives of normal microflora, except for bifidobacteria, have the ability to cause diseases. However, there are more dangerous microbes in the intestine, no more than 1% of them. These are staphylococci. But while they are in the minority, they work for the good of the body. They are called opportunistic microbes. Why are we talking mainly about the intestines? The digestive tract is not homogeneous in composition and number of microorganisms.

Lactic acid bacteria include: lactic streptococci, creamy streptococci, Bulgarian bacilli, acidophilic, thermophilic grain and cucumber. Bacteria of the genus of streptococci and lactobacilli give products a thicker consistency. As a result of their vital activity, the quality of cheeses improves. They are the ones that give the cheese a certain cheesy flavor.

The study of the vital activity of microbes allowed scientists to use some bacteria for the synthesis of antibacterial drugs, vitamins, hormones and enzymes.

They help fight many infectious and viral diseases. Most often, antibiotics produce actinomycetes, less often non-micellar bacteria.

### 1.7. Harmful bacteria

Harmful bacteria inhabit the soil, reservoirs, they are in the air we breathe, inside the human body and animals, in plants and food. Many of them cause diseases in humans, animals and plants. In most cases, these microorganisms enter the human body by airborne droplets. This happens most often, but you can get infected with them in other ways. You can also get infected with parasites through other factors: stale water, poorly washed hands, expired food, certain insects, various wounds on the skin. Such microorganisms can cause significant harm to humans through any serious diseases.

Air is not a breeding ground for bacteria, so microbes stay in this environment temporarily. They get into the air from the soil. Sick people and animals spread the infection by airborne droplets. A huge number of microbes are found in enclosed spaces. Viral and bacterial infections, protozoa and fungi are transmitted through the air. They are the culprits of influenza, measles, chickenpox, whooping cough, scarlet fever, tuberculosis, diphtheria and staphylococcal infection.

The habitat of many microbes is water. Up to 1 million microbial bodies can be counted in 1 cm<sup>3</sup> of water. Pathogenic microorganisms enter the water from industrial enterprises, settlements and livestock farms. Water with pathogenic microbes can become a source of dysentery, cholera, typhoid fever, tularemia, leptospirosis, etc. *Vibrio cholerae* and the causative agent of tuberculosis can stay in the water for quite a long time.

Each type of bacteria has its own specific shape. I decided to study in more detail the bacteria that live in the human body. While researching bacteria, I learned that they can be good and bad. And I'm going to tell you about some of the species.

## **Harmful bacteria**

### **Staphylococcus aureus**

It eats the youthfulness of our skin.

Acne is most often caused by this bacterium, which lives on the skin of most people. Acne is, of course, unpleasant, but by penetrating through damaged skin into the body, this bacterium can cause more serious diseases: pneumonia and meningitis.

A natural antibiotic, toxic to these bacteria, is found in human sweat. Therefore, at least once a week it is necessary to include high-intensity exercises in training, and always use a clean towel.

### **Pseudomonas aeruginosa**

Loves showers, hot tubs and pools.

The bacterium living in warm water gets under the skin of the skull through the pores of the hair follicles, causing infection, accompanied by itching and pain in the affected areas.

Conditionally pathogenic. Depending on the conditions, they can be both beneficial and harmful.

### **E. coli**

This bacterium is considered to be the cause of tens of thousands of infectious diseases every year. But she only gives us problems when she finds a way to leave the colon. Normally, it is quite useful for life and provides the body with vitamin K, which supports heart health.

### **Helicobacter pylori**

Hunger attacks are stopped at 3 p.m.

These are another bacteria living in the digestive tract that have been developing since our childhood and help maintain a healthy weight throughout our lives by controlling the hormones responsible for hunger! You need to eat 1 apple every day. These fruits produce lactic acid in the stomach, in which most harmful bacteria do not survive.

But it is known that when multiplying in large quantities, it causes stomach ulcers.

## **1.8. Beneficial bacteria in the human body**

According to scientists, the human body contains from 500 to 1000 different types of bacteria or trillions of these amazing inhabitants, which is up to 4 kg of total weight.

Bacteria are the defenders of the human body. This group of bacteria helps humans digest and digest food, as well as form useful vitamins. Other types of bacteria can also be found in the intestinal microflora: lacto- and bifidobacteria, which improve the human immune system. The benefits of these bacteria include the fact that they prevent harmful microbes from entering.

By constantly taking pills, you can kill a large number of good bacteria, thereby reducing your immunity. Subsequently, diarrhea, constipation, vomiting and more can be observed. There is also a risk of gonorrhea, cholera and even plague.

Also without bacteria, microbes get inside animals, causing great harm to them. After eating such meat, a person himself risks contracting very serious diseases.

Streptococci, lactobacilli, bifidobacteria, enterobacteria live in the intestine. Lactobacilli and bifidobacteria make up 60% of the intestinal flora. The composition of this group is always constant, they are the most numerous and perform the main functions.

### **Lactobacillus**

Provides control in our insides.

Lactobacilli, which have been living in the human digestive tract since prehistoric times, do a great and important job. Like vampire garlic, they scare away pathogenic bacteria, preventing them from settling in our stomach and causing our intestines to upset. Pickles and tomatoes, sauerkraut will strengthen the strength of bouncers.

### **Bifidobacteria**

It lives in fermented dairy products.

Bacteria inhabit the contents of cans of yogurt, bottles of kefir, yogurt, fermented baked milk and other similar products. And these products are becoming very useful.

### **1.9. The effect of bacteria on lactic acid products**

Fermented dairy products are included in the diet of any person. Depending on the combination of genera and species of fermented milk bacteria, various fermented milk products are obtained from them. Milk is an amazing invention of nature. A person has long appreciated the nutritional and medicinal properties of milk and not only learned how to use this product, but also significantly improved it. Various fermented dairy products were produced from milk. For example: yogurt, kefir, yogurt, sour cream, cottage cheese, butter. Over time, many questions have arisen about the qualitative composition and effect of fermented dairy products on the human body.

One of the most common types of lactic acid bacteria is *Lactococcus lactis*. [*lactococcus lactis*]

The most favorable temperature for their development is +30...+35 C.

Lactic acid *lactococcus* is constantly found in arbitrarily sour milk. Under the influence of this bacterium, milk usually coagulates within the first 24 hours.

When the lactic acid content reaches 6-7 g per liter, sugar fermentation stops, since higher acidity has a detrimental effect on lactic acid *lactococcus*.

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