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Types, Morphology and Importance of Bacteriophages

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Annotation: This article is written about small microorganisms unknown to science until recent times, and their types and importance are widely covered. Currently, it was found that there is a separate world of small pathogens of infectious diseases in nature. These causative agents pass through any bacterial filters, cannot be seen under an ordinary microscope, do not grow in nutrient media used for the growth of bacteria, and have the ability to reproduce only in the bodies of people, animals and plants. These small organisms are called filtering viruses or bacteriophages. This discovery became the basis for the emergence of a new science, the science of virology. After this discovery, scientists began to identify a series of viruses that cause various diseases in humans, animals and plants.

Keywords: viruses, prokaryotes, bacteriophage, transduction.

As we know in the organic world, there are two types of living things: acellular and cellular forms does. Viruses belong to the non-cellular form, prokaryotes and eukaryotes to the cellular form.

In the second half of the last century, many types of bacteria that cause various diseases in humans, animals and plants were discovered. Methods of isolating these bacteria and multiplying them in an artificial nutrient medium have been developed. Research has begun to combat these pathogenic bacteria and treat the diseases they cause.

Most microorganisms such as bacteria are considered prokaryotes since their organelles are not a membrane. Instead, these organisms have prokaryotic cells consisting of a nucleus, cell wall, cytoplasm, ribosomes, and cell membranes. The components making up a cell and how they are arranged is referred to as cellular organization. Therefore, these organisms exhibit a cellular organization and thus have a cellular life. Cellular life is also exhibited in plants and animals.

At the same time, microbiologists at this time focused on one thing: in humans, in animals observed (smallpox, rabies, measles, rubella, etc.), as well as in plants used to identify the causative agents of a number of infectious diseases,bacterial methods proved ineffective. The discovery of the Russian scientist D.I. Ivanovsky led the researchers to get out of such a dead end.

Since his student days, D.I.Ivanovsky began to study the causes of the "tobacco mosaic" disease observed in tobacco plants, which at that time caused great damage to farmers and caused a sharp decrease in productivity. After graduating from the university, he continued his research for several years.

As a result of a comprehensive study of this disease, D.I. Ivanovsky found out that it is caused by very small particles, specific pathogens, which are made up of bodies much smaller than bacteria.

Ivanovsky crushed the leaves of a plant infected with mosaic, and then passed the resulting mass through a special bacterial filter that does not allow bacteria to pass through (i.e. does not pass bacteria through). filtered). Clear obtained after filtration

the liquid had no particles that could be seen under a conventional microscope, that is, no particles could be seen. But when this liquid was applied to the surface of the leaves of a healthy plant and then

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sprayed, it was observed that the plant was infected with mosaic disease. The experiment was repeated many times.

Thus, in the history of mankind, it was discovered that there is a separate world of small pathogens of infectious diseases in nature, which is still unknown to science. These causative agents pass through any bacterial filters, cannot be seen under an ordinary microscope, do not grow in nutrient media used for the growth of bacteria, and have the ability to reproduce only in the bodies of people, animals and plants. These tiny organisms are called filterable viruses or viruses.

In short, this discovery became the basis for the emergence of a new science, the science of virology. After this discovery, scientists began to identify a series of viruses that cause various diseases in humans, animals and plants.

At the end of the 19th - beginning of the 20th century, it became known that there are viruses in nature that infect bacteria and cause their cells to disintegrate (lyse). These viruses are called bacteriophages - "bacteria eaters".

The phenomenon of lysis or disintegration of a microbial cell has been known for a long time. Bacterial cell disintegration, i.e. lysis, is known in advance, cell death after aging is also a normal physiological process. Cell disintegration can be caused by physical or chemical factors. In some cases, fragmentation can occur at a certain stage of the development of the germ cell, as a normal physiological process due to aging. But there is a fundamental difference between the destruction of a cell by a bacteriophage and the destruction of a cell by a chemical factor. In 1917, the French-Canadian scientist D Erell said that he was able to isolate a special lytic factor (virus) from the faecal mass of patients with dysentery, passing through bacterial filters, multiplying in dysentery bacteria and causing their lysis. To designate this virus, D'Erell was the first to propose the name bacteriophage.

The use of modern electron microscopes, as well as improved methods of preparation of preparations for electron microscopy, made it possible to study the fine structure of phages in more detail. It turns out that it is very diverse, and in many phages it has a more complex structure than that of plant viruses and a number of human and animal viruses. Different phages differ from each other not only in shape, size and morphological structure, but also in their chemical composition.

The particles (or virions) of most known phages are shaped like sperm. The structure of bacteriophages differs from viruses: they consist of a body, head, tail and the nucleic acid is DNA.

In addition, there are single-headed, tailless phages, and rod-shaped phages (rod-shaped or filamentous). Bacteriophages can not only destroy bacteria but also change their properties.

Studying the chemical composition of phages, there are only many purified preparations of phages.

It became possible due to the improvement of methods of obtaining quantities.

The main components of phages are proteins and nucleic acids.

It should be noted that phages, like other viruses, contain only one type of nucleic acid - either deoxyribonucleic acid (DNA) or ribonucleic acid (RNA).

Due to this feature, viruses differ from microorganisms, which contain both types of nucleic acids in their cells. The phage head also contains nucleic acid and a small amount of protein (about 3%).

Thus, in terms of chemical composition, phages are nucleoproteins. Because of this, depending on the type of nucleic acid contained in phages, they are divided into DNA-containing and RNA-containing phages.

Different phages have different amounts of protein and nucleic acids. In some phages their amount is the same and each of these components is about 50%.

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In other phages, the ratio between these main components may vary.

If the protein of bacterial cells is injected under the animal's skin into a vein, the animal's body begins to produce substances known as antibodies against this foreign substance. Substances that cause the formation of antibodies are called antigens. Antibodies are unique (specific) substances that are only responsible for the formation of these antibodies can react only with causative antigens.

They bind to this antigen (that is, to the antigen that causes the formation of this antibody) and neutralize or precipitate or dissolve it.

It is known that all phages have antigenic properties. After a phage is introduced into an animal's body, specific antibodies are formed in the blood serum that act only against this phage. Sera with such antibodies are called "antiphage (anti-phage) serum". After the phage is mixed with a specific antiphage serum, the phage is inactivated, that is, the phage loses its ability to lyse microbes that are sensitive to it.

Currently, phages have been identified that lyse cells of microorganisms belonging to all systematic groups, pathogenic and saprophytic (non-pathogenic) for humans, animals and plants.

At the same time, bacteriophages are used in many fields.

1. In medicine: One of the fields of application of bacteriophages is as an alternative antibacterial therapy to antibiotics.
2. In biology: In genetic engineering, they can be used as vectors for transferring genetic information from one bacterium to another (transduction).
3. In agriculture: bacteriophages can be used to fight against bacteria that are pathogenic for plants.

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