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GENETICS OF MICROORGANISMS

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Abstract

Microorganisms, like other living organisms, carry species-specific traits from generation to generation. But under the influence of the external environment, some kind of morphological and physiological properties can change. For example, Louis Pasteur artificially created irreversible changes in the causative agent of anthrax and developed vaccines to prevent these diseases. These and similar examples showed that microorganisms can change their properties depending on the living conditions.

Keywords. heredity of microorganisms, phenotypic variability, genotypic variability, transformation, transduction, conjugation, mutations, episomes, episomes, recon, recombination, pneumococci.

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Heredity and variation are two closely related processes that form the basis of life. Currently, the genetic characteristics and variability of microorganisms are better studied than those of other organisms. In 1925, A. Nadson and C. Flippov exposed yeast to X-rays and managed to obtain new mutations, that is, mutants. After them, in 1928-1932, M. Meisel exposed yeasts to chloroform and weak cyan salts and obtained new mutations, that is, mutants. It is important to study the genetic counseling of microorganisms. Because bacteria divide quickly and their offspring are extremely numerous and small, and they take up little space, making them extremely convenient objects. For example, Escherichia coli divides every 15 minutes while multiplying, and the number of one cell progeny after 12-24 hours is 24 billion per 1 mm^3. Microorganisms differ in phenotypic (inheritable) and genotypic (inheritable) variations. These two main characteristics of a cell depend on its genotype and phenotype.

Genotype is the set of genes in a cell. It defines a whole group of properties of the organism. However, the genotype remains relatively constant under any conditions, which allows different types of microorganisms to be isolated from each other.

Phenotypic variability. Modifications are caused by the influence of various factors of the external environment, and it is usually observed that the microbe grows in different nutrient media. A change in the composition and quality of the food environment, the temperature of the pH of the environment, chemicals such as ethylamine, etc. can cause modifications. Such changes do not pass from generation to generation, that is, they are not inherited, and they disappear when the influence of the factor that caused them is stopped. Phenotype is a general complex of morphological and physiological properties in each individual. Phenotype is an expression of the external appearance of the character of the genotype under certain concrete living conditions. If penicillin is added to the medium, the cells become elongated, sometimes very elongated. The formation of spores in bacteria depends on the nature of the medium, i.e., whether it is thick or liquid, its composition, and the growing temperature. When 0.1% peptone is added to the medium, after 48 hours 100% spores are formed, when 2% peptone is added there are only vegetative forms. Many bacteria and fungi change the rate of pigment formation when grown in different media and at different temperatures, for example, the "fabulous rod" bacterium should produce a dark red pigment in the media at room temperature. . At 37 degrees, there is no such pigment. When bacteria are grown in a dark medium, the type of colonies they form can also change. Some colonies are smooth, round in shape with smooth edges, shiny and homogeneously small. Dissociation is the process by which colonies of one type of bacteria form colonies of different shapes. Genotypic variability. The genetic information of a cell is located in the genes on the chromosome, which is passed from the mother cell to the daughter cell. Genes are located on chromosomes. During asexual division, during mitosis, genes are distributed equally to two cells. Daughter cells receive the complete set of genes of previous cells and are identical.

Genotypic variability can occur as a result of mutations and genotype recombinations, conjugation, transformation, transduction.

Mutations are changes in the DNA molecule and information in it under the influence of various factors. As a result of such changes, mutations appear. Mutations are spontaneous and induced. The cause of spontaneous mutations cannot be determined, while induced mutations are known. Among the reasons that cause mutations (colchitin, ethylamine, alcohol, castor oil, mineral oils), we can give examples of sex hormones, substances that accelerate growth, and others. As a result

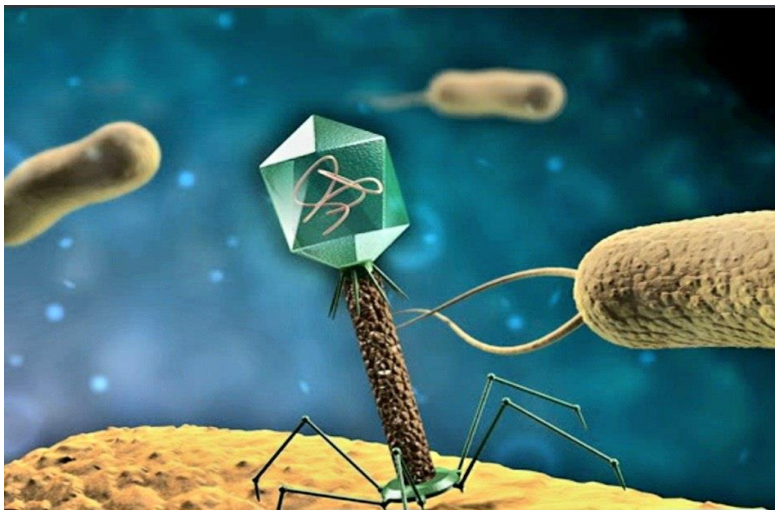
of these effects, the nucleotides are randomly rearranged and a mutant with new properties is created. If the created mutant, that is, the mutation, is useful for the organism, the mutations increase, and if on the contrary, if the created change is not useful, then we can see that the mutations die. Mutations in microorganisms are rare. For example, resistance to antibiotics, changes in the shape of colonies, formation of pigment or capsular forms becoming non-capsulated forms, changes in the formation of chyvchins, etc. For example, obtaining new strains of yeasts used in baking or obtaining strains that synthesize a large amount of antibiotics and obtaining strains that synthesize vitamin B12, oils and lipids, obtaining lactic acid-producing or active prophylactic forms against dysentery, paratyphoid and typhus, etc. are examples of mutation. In short, mutations occur as a result of genetic changes in genetic material. Transformation and transduction processes in bacteria. The transfer of a hereditary trait from the donor chromosome to the recipient chromosome is called transformation. Transformation takes place through a small strand of DNA-recon. Recon is a pair of nucleotides that can be exchanged with other elements during rwcombination. In 1928, F.I. Griffiths, who conducted such an experiment, infected mice with small amounts of non-pathogenic pneumococci of the second type. In the culture of type III pneumococci with the pathogenicity characteristic of this culture (it was known that the pneumococcus of this culture type has the pathogenicity characteristic and is surrounded by a capsule). So, the characteristics of type III pneumococci were transferred to type II pneumococci by transformation. Or white colony-forming microorganisms have been found to have the ability to form yellow colonies under the influence of the DNA of yellow-colored colony-forming saprophytic microorganisms. In 1944, O. Avery and K. Mak. Leoid, in addition to M. McCarthy and other scientists found that traits are transmitted through DNA. For example, hay fever, meningococci, pneumococci, streptococci, etc. can be transformed by means of transfer agent DNA. The transformation activity of DNA is extremely high, it usually occurs after 10-15 minutes and lasts more than 2 hours. The transformation event does not occur all the time, but occurs in a certain physiological state, that is, during the period when the cell is ready. Under the influence of high temperature, ultraviolet rays, mimetic mutagens, the transformation property of DNA decreases. For example, if transformed DNA is exposed to HNO3, it loses its activity, or its activity decreases even if the temperature rises to 80-100 degrees. The most comfortable temperature is 29-32

degrees. Therefore, the activity of the transformation is affected by the composition of the environment, temperature, the physiological state of the recipient, and the polymerization and double helix of the transforming DNA. The transformation repeatability is 0.47-0.0004%. For example, the strain of pneumococci received as a donor may have magnetodissolving properties, which are insensitive to streptomensens, while the recipient does not. From these, such intermediate forms can be obtained, in which both of the above characteristics can meet, and in transformation, this characteristic is replaced by the second one. For example, extremely sensitive to antibiotics or non-susceptible strains can be obtained. This phenomenon occurs in animals and plants alike. The formation of the transformation consists of two periods. The first is the adsorption of DNA to the microbial cell and its transfer into the cell.

Transduction. Transduction is the process by which the properties of the donor bacteria are transferred to the recipient bacteria through the bacteriophage. For example, through bacteriophages, xivchins, enzyme systems, antibiotic resistance, virulence, capsule formation and other properties can be transferred. Transduction is divided into specific and non-specific types. In nonspecific transduction, any trait or multiple traits can be transferred, and the rate of replication is calculated relative to a portion of the phage. In the specific transduction, the phage participates only under the influence of ultraviolet rays, and genes close to each other are transferred. Transduction is similar to transformation, but if transformation can be stopped by affecting the deoxyribonuclease enzyme, transduction continues unabated even if this enzyme is affected, mainly because the enzyme is carried by the phage as long as it cannot affect the properties. Transformation and Transduction in Bacteria By the end of the 19th century, microbiologists began to observe the occurrence of conjugation in bacteria and named it ``conjugation'' to distinguish it from conjugation in other organisms. The genetic analysis of conjugation was determined by Liederberg and Tatum in 1947. They observed this phenomenon in an electron microscope. One of the conjugated cells was found to be elongated and the other oval. In an elongated cell, the male type is called F+ (donor), and in an oval cell, the female type is called F-(recipient). In the process of conjugation, they come closer to each other and form a bridge between them. Through the resulting bridge, information passes from the donor cell to the recipient cell in a certain order with the help of pili.

K. B. Kocikov in 1957 stated that if yeasts are grown on substrates with specific properties, certain forms will appear that will have the ability to ferment sugar, which previously could not do this. . For example, Saccharomyces globasus is one such form. It ferments sucrose, while the Saccharomyces parodopus form ferments maltose. These traits can be transmitted from generation to generation not only vegetatively, but also sexually. For example, during sexual reproduction, half of the spores that came out of the following forms digested sugar, while the other half did not. In this case, Aaccharomyces globasus has a new feature, i.e., an intervase enzyme that ferments the shamar has been formed.

Episomes. Episomes are small clusters of genes that are free from chromosomes. They can be free in the cytoplasm or attached to the bacterial chromosome. Episomes become resistant to antibiotics, and Japanese scientists were the first to study this process. In bacteriocytogenetic factors, antibacterial substances are synthesized in bacterial cells, these substances are called bacteriocins. E.coli, for example, has been found to synthesize colicin. The synthesized bacteriocins caused the death of other bacteria. Bacteriocins are adsorbed on the surface of the bacterial cell and reduce the rate of metabolism, which causes destruction. But the bacteria affect only the bacteria that favor the producer



Summary

The study of the genetics of microorganisms is important. Because there are new strains with high activity in taking antibiotics. In addition, it is important in obtaining lysine and glutamine from vitamins, hormonal preparations, enzymes, amino acids

and other substances. Bacteria, fungi and actinomycetes can be exposed to radioactive rays and chemical mutagens to change the structure of DNA in their cells and direct them to synthesize substances useful for humans. Now, knowing well the physiological properties of bacteria, being able to change them and in this way to use bacteria on a large scale in agriculture, medicine and technological processes is an important issue facing microbiologists.

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