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Ecological Concept of Healthy Lifestyle

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Annotation:

This article analyzes ecological concept of parasitism. The life cycles of parasites have been studied. Ultrastructural studies have forced us to reconsider and deepen many ideas about the organization and physiology of parasites. Particular attention is paid to the consideration of key concepts of parasitology (types of parasitism, natural focality of diseases, routes of human infection, etc.). Taking into account the current epidemiological situation, the most medically important representatives are considered: features of their structure, biology, and lifestyle.

Keywords: Healthy lifestyle, epidemiology, vital activity, life cycles.

As is known, parasitology is closely related to epidemiology and epizootology, which study the general patterns of development of infections and invasions, explore the ways of penetration of the parasite into the host body and the conditions under which diseases develop, as well as the causes of asymptomatic parasite carriage . When establishing ways and means of penetration of parasites into the host's body, the study of carriers of the pathogen, mainly insects and ticks, is of particular importance.

To develop measures to combat parasites, it is necessary to have an accurate knowledge of all aspects of the life activity of the parasites themselves, and first of all their systematic position, anatomy, histology and embryology, their physiology and ecology (including life cycles). It is very important to know the host range of the parasite, the life cycle of the latter, the mutual influence of the parasite and the host and their geographical distribution.

The study of the life cycles of parasites is of paramount importance both for understanding the historical paths of formation of a particular group of parasites, and for combating parasitic diseases through the influence of the pathogen at certain phases of its development. In this regard, the study of the life cycles of parasites in time and depending on the life cycle of the host, various conditions and changes in the external environment in which the host lives is of particular importance.

The word “parasite” is Greek and literally means one who feeds at the expense of another or others (raga - around, sitos - food).

Thus, in Russian this term can be most accurately conveyed by the word “ parasite ”. For a long time, parasites were considered to be very special, self-generating creatures, which gave them a mysterious, mystical meaning. Subsequently, when it was realized that parasites are not something special, but have many common features with free-living organisms, a clear definition of the concept of “parasite” was required.

The first such attempt belongs to R. Leuckart . In his opinion, parasites in the broad and true sense of the word are all those creatures that find food and shelter on another living organism. Parasites include not only visceral worms and forms related to them, but also creatures that are akin to some free-living animals, with the exception of the type of their food. Thus, the main factors in defining a parasite were the type of food and the use of another organism as a home. Clarifying the concept, R. Leukart pointed out that the boundaries of parasitism are violated, however, by animals that, such as leeches, are parasites only in relation to some animals, namely only when they obtain food substances from larger and stronger organisms, then how in relation to their equals and the weakest they behave like real predators. The parasite is always smaller and weaker than the host animal; not being able to overcome the latter, he is content to feed on its juices or solid components, depending on his needs.

The definition of the concept of “parasite” given by the founder of modern parasitology R. Leukart has become firmly established in biology, and most modern parasitologists adhere to it to a greater or lesser extent. It was from these positions that the concept of parasitism was interpreted by the founder of Russian helminthology, Academician K. I. Scriabin, who believed that parasitism is a type of biological relationship between organisms when one of them - a parasite - lives temporarily or permanently on the surface of the body or in the depths of organs and tissues another - the owner, eating at the expense of the latter and not providing him with any service in return.

Due to the inadequacy of the definition of a parasite based on the nature of its diet and habitat, which seemed to some researchers to be insufficient, some authors subsequently tried to improve it, supplementing it by introducing into the definition the sign of harmfulness (pathogenicity) of the parasite for the host. E. Minchin was the first to introduce the concept of harm to the host into the definition of parasitism at the beginning of the 20th century. Attempts to further complicate the definition of the parasite, undertaken in the first half of the last century by N.A. Kholodkovsky , a domestic microbiologist who studied the causative agent of cholera, were severely criticized by the famous domestic parasitologist V.A. Dogel .

Let us quote from V. A. Dogel containing the essence of the additions and “improvements” to the definition of parasitism made by N. A. Kholodkovsky , and criticism of these changes: “...parasitism consists not only in the fact that a guest (parasite) finds shelter and food, but also in that which feeds on the body itself and the juices of the owner, causing him direct physical harm.” The unsuitability of such an addition (N.A. Kholodkovsky) to the definition is especially clearly visible from the fact that in relation to most parasites, especially those found in wild animals, the presence of harm brought to the host by the parasite has not been proven, and sometimes even unprovable. This lack of evidence of harm to individual parasite-host pairs may also reflect the current state of our knowledge. A typical example of their limitations are lichens, which are described in all biology textbooks as a symbiosis of heterogeneous organisms - a fungus and an algae. From a modern point of view, this pair of organisms is not in a symbiotic relationship, but was formed on the basis of parasitism. The parasitic fungus completely blocks the possibility of sexual reproduction of the algae, “allowing” the latter to reproduce exclusively asexually, vegetatively.

As already indicated, there is no generally accepted definition of parasitism, but there remains a small group of researchers who continue to consider the harm caused by the parasite to the host as an essential component of this definition.

Among 59 interpretations of this concept belonging to domestic and foreign authors, summarized by V. A. Roitman and S. A. Beer , only 11 definitions of parasitism contain the concept of harm caused to the host by the parasite.

Academician E.N. Pavlovsky, when interpreting parasitism, emphasized the ecological component of this type of relationship between organisms, arguing that parasites use the host's body not only as a source of nutrition, but also as a place of permanent or temporary residence. The author postulated that the host is not the parasite's cohabitant, but the environment in which the parasite lives and to which it adapts. From this point of view, a parasite can be defined as an organism whose habitat is another living organism. In this case, it is assumed that the parasite entrusts the host with the regulation of its relations with the external environment. Thus, according to the definition of E.N. Pavlovsky, parasites are animals that live at the expense of individuals of another species, being biologically and ecologically closely related to them in their life cycle for a greater or lesser extent. Parasites feed on body juices, tissues or digested food of their hosts, and such a parasitic lifestyle is a specific species characteristic of this parasite, which repeatedly (as opposed to predators) uses its host for nutrition. In addition, parasites permanently or temporarily use the host's body as their habitat.

According to V.N. Beklemishev, a typical parasite is characterized by close cohabitation with a host, whose body is a permanent habitat for it, through which it feeds and to which it causes harm. When harmfulness occurs, we move on to various categories of indifferent symbiosis and further, to mutualism.

Thus, parasitism is primarily an ecological concept and, according to V. A. Dogel , parasites are organisms that use other living organisms as a source of food and habitat, while partially or completely entrusting their owners with the task of regulating their relationships with surrounding external environment.

Parasites - pathogens - are a collective group, the individual members of which belong to different taxa. Existence at the expense of the host organism is typical for prions , viroids , viruses, rickettsia, bacteria, and fungi. Diseases caused by prokaryotic pathogenic organisms belonging to the plant kingdom are called infectious.

As a rule, whole organisms are considered parasites, but this is not always true for viruses. Viruses belong to the system of non-cellular organisms that form an independent kingdom. In the process of penetration into the cell, the virus loses its protein shell (capsid), and only nucleic acid penetrates into the cell - viral DNA or RNA, that is, an isolated genome (individual molecules), and not the organism.

It should be noted that parasite molecules exist in nature : these are viroids - RNA molecules that, unlike real viruses, lack a protein shell. These molecules are infectious and can cause plant pathology. Under certain conditions, DNA molecules also act like true parasitic organisms. For example, plasmids are small mobile DNA fragments containing genetic material that enable gene transfer between unrelated bacteria and transfer different properties from one microorganism to another.

Plasmid- mediated transmission of antibiotic resistance in bacteria has been best studied .

In addition to the listed groups of pathogens of infectious diseases, parasites include about 55 thousand species of pathogenic protozoa, 20 thousand species of helminths, 7 thousand species of arthropods. Parasites are found among organisms of all types of prokaryotes and eukaryotes. The

object of study of parasitology is usually only parasites belonging to the animal kingdom. There are over 65 thousand species (about 7% of all animal species). Parasites belonging to other systematic groups are studied in various branches of microbiology, botany, mycology and epidemiology.

Thus, parasites are organisms that feed on individuals of another species and reside temporarily or permanently on the surface of their body or inside the body. The host organism is the first-order habitat for the parasite. The external environment in which the host lives acts on the parasite only indirectly through the host's body and is a second-order environment for it.

Parasitic organisms, with all their diversity, can be conditionally divided into several large groups that differ in their biological characteristics. The basis for this ecological classification is the nature of the spatial and temporal relationships between the parasite and the host. In accordance with the level of specialization for the parasitic lifestyle, obligate, facultative and false parasites are distinguished.

For obligate parasites, the parasitic lifestyle is an obligatory, species-specific form of existence (roundworms, whipworms, filariae, trichinae, lice, fleas, ixodid ticks, etc.). There are species that have not completely transitioned to parasitic existence, but are also capable of causing disease.

Facultative parasites lead a free lifestyle and switch to parasitism only when living conditions in the external environment worsen (intestinal eel) or when a predator attacks larger than usual prey (predatory leeches and bedbugs). Closely related to facultative parasites are false parasites (pseudoparasites) - free-living organisms that, if accidentally introduced into the body of another species, can exist in it for some time, often causing harm. For example, the larvae of house flies and some other species of flies, thyroglyphoid mites - food pests that enter the human intestines can live for several days in this unusual environment for them, sometimes causing intestinal disorders.

When diagnosing false parasitism, it should be borne in mind that the examined feces may contain larvae that emerged from eggs laid in them by flies. Such larvae are called imaginary false parasites. Convolutions of mucus and scraps of plant tissue that look like worms or their larvae can also be mistaken for parasites. Spores of some fungi and macrophages are similar to cysts of intestinal protozoa. Such formations unrelated to animals are called omeoparasites .

Based on the duration of their relationship with their hosts, parasites are divided into temporary and stationary. Temporary parasites include two subgroups. One of them consists of animals that are least adapted to a parasitic lifestyle. They live freely in natural conditions and attack their hosts only for food (blood-sucking insects and some ticks). The duration of blood sucking varies greatly. In female mosquitoes, for example, it lasts 1–2 minutes; in the larvae of Haemaphysalis ticks concinna – 3–5 days, for their nymphs – 5 days, for adults – 8–16 days. Another subgroup includes parasites that live near the host - in his home, nest, burrow or lair. Some of them feed on the host at all mobile phases of their development, starting with the larva (bed bug, argasid mites, etc.).

Others attack the host only in the sexually mature phase (fleas). Stationary (permanent) parasites are also divided into two subgroups. One of them, the largest of them, includes periodic (phase) parasites, in the development cycle of which free-living stages are preserved. So, for example, in gadflies and Wohlfarth flies only larvae are parasites, and in blood-sucking dipteran insects - imago (sexually mature phase), i.e., a distinction is made between larval parasitism (myiases) and imaginal parasitism (intestinal helminthiasis). The organisms in which the larval stages of parasites live are called intermediate hosts. The formation of such hosts is initially associated with the accidental entry of parasite larvae into their body. As a rule, the intermediate host serves as the main or occasional prey for the definitive (primary) host, in which the sexually mature stages of the parasite live. The second subgroup consists of permanent parasites that are on the host or in his body throughout the entire development cycle (lice, scabies mites, trichina). Constant parasitism may be accompanied by a change of hosts (pathogens of malaria, filaria).

All parasites are divided according to localization into ectoparasites, which live on the surface of the host's body, and endoparasites, which inhabit its cavities, organs and cells. Most ectoparasites originate from predators. So, for example, large insects - triatomine bugs - behave like predators in relation to small insects - they eat, and in relation to large animals - like parasites - they drink blood. It should be noted that at the same time these insects are carriers of pathogenic protozoa - trypanosomes. In relation to the latter, bedbugs act as hosts for their parasites - trypanosomes. Thus, some organisms can act as different links in conjugate (interconnected) parasitic systems.

Depending on the number of hosts, parasites are divided into monogostal (from the Greek monos - one), polygostal (from the Greek polys - extensive) and stenogostal (from the Greek stenos - narrow). Monoghost parasites (monophages) are strictly specific, that is, they are confined to only one host. For example, head louse, duodenal louse , pork and bovine tapeworms in the sexually mature state are parasitic only in humans.

The specificity of polyhostal parasites (polyphages) is relative. Their hosts can be species of the same genus, family, class, or even different classes of animals. Trichinae, for example, parasitize all mammals; argasid mites - on mammals, birds and reptiles; The hosts of Toxoplasma are all vertebrates and humans. Stenohostal parasites can parasitize several host species, of which one is the main one (main), and the rest are facultative, playing a secondary role.

Parasites that undergo a development cycle with a change of hosts are called heteroxenous (from the Greek heteros - different, different and xenon - host). For example, the forest tick Ixodes ricinus in each mobile phase of metamorphosis (larva, nymph, adult) attacks different hosts. Therefore, it needs three hosts to complete its development cycle. If the parasite completes its entire life cycle on one host, it is called monoxenous (single-host). Single -host parasites include, for example, the Boophilus mite decoloratus , the larvae, nymphs and adults of which parasitize the same individual of cattle.

Parasitism, like predation, is characterized by antagonistic relationships between partners (parasite and host), but unlike a predator, the parasite does not kill its host, but uses it as a habitat and a source of food for a more or less long time. The death of the host may occur as a result of a disease caused by the parasite. However, a sharp distinction between the phenomena of predation and parasitism is impossible. For example, the horse leech is an ectoparasite for mammals, but for a newt, from which it sucks out all the blood in a short time and takes its life, it becomes a typical predator. The commensal form of dysenteric amoeba living in the human intestine, when environmental conditions change, turns into a larger tissue form that parasitizes the mucous membrane of the colon.

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