Chapter 1

Introductory Chapter: Parasitology and Parasitism Areas of Knowledge That Must Be Constantly Studied

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http://dx.doi.org/10.5772/intechopen.85181

1. Parasitology and parasitism

Parasitology, an important part of biology, is the science responsible for the study of parasitism, that is, the relationship between parasite, host, and environment, in the understanding that parasite is that living being that is housed and/or fed by another living being during part or all of its life, generally who is staying is of different species, of greater size, and more developed structure than the host; the parasite is understood. The relationship between living beings is complex; therefore, the study of it must be constant and from different approaches, with the purpose of increasing and deepening knowledge about it [1]. So:

> *Parasitism is a form of ecological interaction, in which a member, the parasite, benefits from the use of resources gathered by another member, the host. Through its evolutionary history, the species have coexisted with populations of parasites that have regulated, along with other ecological interactions, both their sizes and their population structures and their genetic structure. Parasites have an influence on hosts, similar to that of predators, competitors and other natural enemies. In fact, the influence of a parasite on a host can affect its response to competitors and mutualists, its reaction to the physical conditions of the environment, its state of health, its reproductive capacity, its ability to obtain resources or its conservation. The essence of parasitism rests on the parasite-host interaction [2]. Thus:*
>
> *"The essence of parasitism is based on the nature of the parasitic-host relationship, that an ecological definition is the study of the relationships between the organism and its environment. However, ecologically the parasite-host relationship is a 'double-edged sword.' Because the ecology of the host can be considered simultaneously in the life cycle of a parasite, in such a way that the host is the habitat for the parasite. Many of the biotic and abiotic variants influence the ecology of the hosts, also affecting the parasite" [3].*

That is why the relationship between living beings is complex; therefore, the study of it must be constant and from different approaches, with the purpose of increasing and deepening knowledge about it. This is particularly relevant for the complex biological cycles that parasites

follow in their lives (in search of temperature, humidity, and food conducive to live, reproduce, and perpetuate the species), often marked by different evolutionary forms and reproductive or maturation stage, which also implies the passage through more than one host in many of these species and even with different degrees of specificity, ranging from those restricted to a single host species to those capable of developing into host species very far phylogenetically [4].

The foregoing highlights the universality and complexity of the health problems caused by the different species of parasites that affect communities in all countries of the world and reveals the dedication of a large number of academics dedicated to basic, clinical, and epidemiological research in pursuit of control or eradication of them [4].

Parasitology seeks to unravel, the purpose of this book, the dynamic process that is established between parasite and host, in terms of molecular matrix, parasitic adaptation, modifications induced by the host, pathogenesis, clinical manifestations, diagnosis, and treatment, among other aspects, as well as already within the vast field of ecology, the vital conditions, and the environment of obligatory or facultative parasitism, that is, protozoa, helminths, or arthropods, be monoxenous or heteroxenous parasites, both at the individual and population level [5].

The writing of this document encourages the fact that parasitic diseases are not considered as important public health problems, or as a cause of epidemiological emergencies, and because the poor and poorly served populations are the most affected, also those that do not invest enough in research of new therapeutic and diagnostic tools, because they are considered in many cases not very lucrative. This is despite the fact that parasitism is one of the most widespread lifestyles in nature, it is pointed out that practically any living organism can host some kind of parasite [6].

The sure thing is that parasitism implies some degree of loss of biological efficiency in the host that result in slight to severe damage to its structure, which of course justifies its inclusion among the great aspects or issues to be considered in biology, in the medical, and veterinary research within the framework of the great biodiversity, which are the point of origin of the approach to such fascinating life forms, perhaps one of the most striking in nature, this is particularly interesting due to the fact that parasitic diseases. The intensity, period of appearance, age groups, and even sex affect human and animal differently [7–9].

To this it is added that parasites are not kept confined in the regions where they are generally endemic, since it is known that due to incidental or accidental circumstances, these can be transported to other regions to which they can adapt and produce infections and diseases in the populations of animals and humans living there; therefore, the updating of the epidemiological behavior (always complex and dynamic) by specialists in the field is absolutely necessary and indispensable for effective intervention against its spread, or spread reduces the impact they have on animal and human welfare [10, 11].

Parasitic diseases are currently considered a serious public health problem around the world, of course, with more severe consequences in countries with less economic development and of course in the poor and rural areas of most of the countries that make up the region. In planet Earth, to the point that the incidence and prevalence of parasitic diseases are considered as

indicators of the health status of animal and human populations and the conditions in which they live, for example, in Latin America, the prevalence of parasitic diseases is persistently elevated, perhaps due to dynamic processes of repeated reinfections, where infection pressure and host susceptibility come into play [12–15].

In summary, etiological agents, biological cycles, and the processes of invasion, establishment, and propagation should be constantly reviewed, as well as the mechanisms of defense and evasion and of pathogenesis, in order to elucidate or at least try the complex parasite–host relationship, and offer a better understanding of the clinical manifestations that consent to laying the rational basis for the control of parasite. With the inescapable consideration of the epidemiological aspects, that allow to answer the where, when and why of the appearance of parasitic diseases and of the risk factors involved in the genesis of them and contribute with this in the policies and designs of effective interventions to modify the adverse health situation, this because despite the great scientific and technological advances in the field of human and veterinary medicine, the parasite, curable and preventable in its majority continue to be a serious threat to health [16, 17].

2. Globalization in the life of the human being: another reason to investigate parasitology

With the globalization of the life of the human being, its technology, its development, trade, and tourism, there has been an impressive increase in the dissemination of diseases generated by parasites, as they are not restricted by geographical barriers, to which enormously sophisticated and modern systems of air, sea, and land transportation are currently available for the movement of humans, animals, and virtually this represents a fundamental reason for the constant study of the epidemiological behavior of parasites in their daily effort to ensure their survival [11].

There are several parasite species capable of producing epidemics, especially through water and food, among which the protozoa, capable of causing giardiasis, cryptosporidiosis, cyclosporiasis, and toxoplasmosis, are favored by these routes of dissemination. Also the increase of immunocompromised individuals due to diseases such as AIDS and changes or combinations of cultural patterns regarding customs and habits in the human groups derived from displacements, for example, the practice of eating foods that are not cooked or raw, which undoubtedly they favor parasitic infection [10, 11, 18–21].

Another factor to mention in the context of globalization as a cause of dissemination of parasitic diseases is the modification that has been made to the environment and that has caused global warming within the so-called climate change that contributes to the spread of diseases transmitted by arthropods, in function of those parasites with forms or evolutionary stages or their life cycle that have a mandatory passage through the earth to complete their life cycle. However, the interconnection that characterizes humanity requires the constant updating of knowledge about parasitic diseases in order to control them and, if possible, eradicate them [11, 22, 23].

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