Review: Parasite Strategies to Escape Attack by The Immune System of Their Hosts

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Abstract:
This review aims to investigate the parasitic strategies that enable them to escape attack by the immune systems of their hosts and cause infection. A parasite is a creature that obtains its sustenance and other requirements from a host, which is another organism that provides support to the parasite. Medical parasitology encompasses protozoa, helminths, and some arthropods. Parasitic diseases lead to host immune responses that expel the infesting parasites. Parasites also have improved a number of strategies to prevent host immune attacks and survive in the environment of the host. In this study, all information about the parasites abilities to avoid host complement immune attack in a hostile environment and the mechanisms of complement immune evasion is provided.

Keywords: parasites, strategies, immune system, host, immune attack.

Introduction
Parasites are eukaryotic organisms that reside on or inside a host organism and rely on the host for nourishment. Parasites possibly found in the forms (protozoa) unicellular or (metazoan) multicellular living things (Assafa et al., 2004). They can be classified in humans according to the diseases they cause into three divisions: endoparasites (protozoa and helminthes) that live inside body hosts and ectoparasites include arthropods, such as mosquitoes, lice, flies, fleas, bugs, ticks, and fleas that nutrish on host products or its blood (Chulanetra & Chaicumpa, 2021). This review epitomises the most important strategies used by many parasites to manipulate, suppress, and resist the host immune system. Below, we review some of these strategies.

Helminthes Escaping Strategies
Helminthes are a common group of parasites that live in humans and can be transmitted in different ways: by contaminating water, food, or soil, or by directly attaching to animals. This worm can be divided into two major phyla: Platyhelminthes, Nematoda, and Tap worms (Okwa, 2020). An analysis was conducted on helminths and their hosts, leading to the discovery of their processes and the heightened impact on the hosts’ immune systems. Worms influence the generation, movement, function, and development of both the adaptive and innate immune systems’ cytokines. The ways in which parasites impact the cells of the immune system are varied. Helminthes secrete the enzyme proteases that can rift or otherwise influence the activation of adaptors (ligands to hinder) secretion that attach to specific receptors on the surface of the cell, which results in an effect on enzyme cascades inside the cell. This
worm can induce the production of mucus, promote epithelial tissue cells to rotate in mucosal tissues, and change cells immune responses. helminthes are able to produce proteins like chemokines or cytokines, stop a wide range of immune factors in hosts, influence RNAs of the host's, decrease their gene expression, or cut the sequence of them to make them unusable for the host (Wiedemann & Vöehringer, 2020).

Protozoan Parasite Escaping Strategies

Several diseases caused by protozoan parasites, such as trypanosomiasis, malaria, and Leishmania, obstruct human development around the world. Protozoa cause many infections that always follow a chronic period because of the coevolution between the host immune system and parasites. Pathogenic protozoa transmission and survival depend on the ability to hedge or destroy the host’s adaptive and innate immune systems (Marela et al., 2012).

Protozoal parasite escaping mechanisms include:

- Antigenic covering, which is the parasitic ability to escape an immune system attack by coating itself with antigens.
- Inhibition of the activity of serum immune factors: protozoa acquire a coating of AG antigen-AB antibody complexes or non-cytotoxic antibodies that powerfully blocks specific antibodies or lymphocytes binding to the surface parasitic antigens.

Protozoa Location Inside Cells: The habitat of many protozoan parasites (intracellular) safeguards them from the host’s immune response. By hiding the protozoan antigens, this mechanism can prevent their discovery by the immune system.

Variation of antigens: many protozoa surface antigens vary during the period of an infection. Parasites are those having the new antigens that are able to escape from the immune attack to the original antigens. Immunosuppression: protozoan infections generally cause a degree of immunosuppression in their hosts. That will decrease the immune response and retard the detection of variants in protozoal antigens. This may inhibit the immune system’s efficiency, limit the growth of parasites, or kill them (Richard Seed, 1996).

Entamoeba histolytica Escaping Strategies

Entamoeba histolytica, a protozoan, infects 10% of the global population and leads to around 100,000 deaths annually due to dysentery. This parasite thrives in the colon by strongly adhering to mucin without causing any noticeable damage. While in a few cases, Entamoeba histolytica causes severe inflammation reactions and ulcers in the mucosa of the colon. Eh can destroy or modulate cell-resistant effects by activating the apoptosis process of neutrophils and respiratory asphyxia or the production of nitric oxide from immune cells (macrophages). Cells also trigger several cytotoxic effects that might promote cell death by apoptosis, phagocytosis, or by engulfing live cells, thus contributing to immune evasion (Begum et al., 2015).

Malaria-Escaping Strategies

Malaria is an infectious illness transmitted by mosquitoes to animals and people, caused by microorganisms known as protists belonging to the genus Plasmodium. Consider one of the most dangerous illnesses worldwide. Immune response to malaria is short-lived and slow. These parasites have developed clarified machinery to shuffle off the host immune system founded on many genetic alterations. When the parasite found in the vector host which is one of mosquito (Anopheles), Plasmodium can evade from the first immune system snare. Many types of immune barriers in mosquito body include mosquito micro biota and anti-microbial molecules for succession transportation to Anopheles. The most primal escaping strategies of parasites are the intracellular duration survive, which prevent interaction of parasites with the immune cells directly (Gomes et al., 2016).
**Leishmania-Escaping Strategies**

The intracellular obligate parasite *Leishmania* should maintain the host cell's (the macrophage) antimicrobial properties and stop the immune system from mounting a successful defense. To accomplish this, it has created a number of incredibly effective methods for controlling actions, including the presentation of antigens, the synthesis of cytokines, nitric oxide, and oxygen radicals. This is typically the outcome of interactions between less well-identified macrophage surface receptors and Leishmania cell surface chemicals, specifically gp63 and LPG, which disrupt particular intracellular signaling cascades (Olivier et al., 2005).

**Trypanosoma Escaping Strategies**

When a mammalian host is infected with African trypanosomes, the parasites are directly in contact with the immune system of humans (Onyilagha & Uzonna, 2019). Protozoan parasites are recognized for their capacity to evade immune responses by altering their surface glycoproteins, a process referred to as antigenic variation. This event is probably one of the tactics that contributed to the success of these organisms when protozoa were targeted by the immune system. The parasites capability to grow with elevated levels of interferon-gamma and prevent destruction of complement-mediated immunity can also maintain their survival (John et al., 199).

**Conclusion**

We can conclude from this review that there are many mechanisms developed by parasites in their host to evade the activity of the immune system. These strategies concentrated on immune modulation, which permitted them to progress in different hosts.

**References**


