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Research Article

An Overview of Host Microbes Interaction

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Abstract

Host-microbe interaction is a complex and dynamic process that occurs between a host organism and its associated microbes. This interaction is vital to the health and survival of both the host and the microbes. The micro biome, the collection of microorganisms living on or within an organism, plays a crucial role in host-microbe interaction. Microbes can be found everywhere, including on the surface of the human body, in the digestive tract, and in the environment. In fact, the human body is home to trillions of microorganisms, which outnumber human cells by about ten to one. These microbes are essential for various bodily functions, such as digestion, immune system development, and the synthesis of essential vitamins and nutrients.

Keywords: Microbes, Micro biome, Host microbe interaction, Digestive tract, Vitamins

INTRODUCTION

The relationship between the host and the microbes is not always mutually beneficial. Some microbes can cause diseases or infections, while others can have a neutral or even beneficial effect on the host. Pathogenic microbes can cause harm by producing toxins or by directly invading host tissues. For example, *Streptococcus pyogenes* can cause strep throat, while *Staphylococcus aureus* can cause skin infections.

On the other hand, some microbes can have a beneficial effect on the host. These microbes are referred to as commensal or mutualistic microbes. Commensal microbes have no harmful effect on the host, while mutualistic microbes provide a benefit to the host. For example, some gut bacteria help to break down food and extract nutrients, while others produce short chain fatty acids that can be used as an energy source. The micro biome plays a crucial role in host microbe interaction. The composition of the micro biome can be influenced by various factors, including diet, genetics, and environmental exposure. Changes in the micro biome can have a significant impact on the host's health. For example, alterations in the gut micro biome have been linked to various diseases, including inflammatory bowel disease, diabetes, and obesity (Wen L et al., 2018) (Mao A, 2020).

DISCUSSSION

Impact of host immune system after microbial interaction

The immune system plays a crucial role in host microbe interaction by providing a defense against harmful pathogens while tolerating commensal and mutualistic microbes. The immune system recognizes microbial molecules, called Pathogen Associated Molecular Patterns (PAMPs), through Pattern Recognition Receptors (PRRs) and initiates an immune response. The immune response can include the activation of immune cells, the production of antibodies, and the recruitment of other immune cells to the site of infection (Wen L et al., 2014).

However, the immune response to commensal and mutualistic microbes is different from that of pathogenic microbes. The immune system has evolved to tolerate these microbes and even provide a benefit to the host. For example, some mutualistic microbes can modulate the immune response to prevent harmful inflammation (Zhang D, 2018).

In conclusion, host microbe interaction is a complex and dynamic process that is essential to the health and survival of both the host and the microbes. The micro biome plays a crucial role in this interaction, and changes in the

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micro biome can have a significant impact on the host's health. Understanding host microbe interaction is vital for developing strategies to prevent and treat microbial infections and for promoting overall health and wellbeing (Wen L et al., 2017).

Mechanism

Host microbe interactions are a fundamental aspect of all living organisms. Microbes, which are defined as small organisms such as bacteria, viruses, fungi, and protozoa, have evolved to interact with their hosts in a variety of ways. These interactions can be beneficial, neutral, or detrimental, depending on the specific host microbe relationship. One of the most important aspects of host microbe interaction is the recognition of microbes by host immune systems. This recognition can be mediated by Pattern Recognition Receptors (PRRs) on host cells, which recognize Pathogen Associated Molecular Patterns (PAMPs) on microbes. These PRRs include Toll like receptors, NOD like receptors, and RIG I like receptors, which are all involved in recognizing different types of microbes. Once a microbe is recognized, the host immune system responds in a variety of ways, including the release of cytokines and chemokine's, activation of immune cells, and induction of the complement cascade. These responses are designed to limit the spread and growth of microbes in the host. However, some microbes have evolved mechanisms to evade host immune responses. For example, some bacteria can produce capsules that prevent recognition by PRRs, while others can inhibit the complement cascade. Similarly, some viruses can down regulate the expression of MHC class I molecules, which are important for presenting viral antigens to T cells. In addition to immune recognition, host microbe interactions can also involve the exchange of nutrients and metabolites. For example, some microbes in the gut are able to break down complex carbohydrates that the host can not digest, producing short chain fatty acids that can be used as a source of energy by the host. Similarly, some bacteria are able to synthesize vitamins that are essential for host health. Overall, host microbe interactions are complex and multifaceted. They involve the recognition of microbes by host immune systems, the evasion of host immune responses by some microbes, and the exchange of nutrients and metabolites between hosts and microbes. Understanding these interactions is important for developing new therapies for infectious diseases and for maintaining overall host health (Wen L, 2020).

Importance of host parasite interaction in vaccine development

Host microbe interactions play a critical role in the development of vaccines. Vaccines work by triggering the immune system to recognize and eliminate pathogens. However, the immune response is influenced by the host's genetic makeup, previous exposure to the pathogen, and the host's micro biome, among other factors. Understanding these interactions is crucial for designing effective vaccines that can protect against infectious diseases. The human micro biome is made up of trillions of microorganisms, including bacteria, viruses, fungi, and parasites. These microorganisms colonize different parts of the body, such as the skin, gut, and respiratory tract, and play a critical role in maintaining the host's health. The micro biome can influence the immune response by modulating the production of cytokines, antibodies, and other immune molecules (Xiao Q, 2012).

The micro biome can also affect the efficacy of vaccines. For example, studies have shown that the composition of the gut micro biome can affect the immune response to oral vaccines such as rotavirus and polio. In one study, infants who received oral rotavirus vaccine had a better immune response if their gut micro biome was dominated by Bifido bacterium or Lactobacillus bacteria. In contrast, infants with a gut micro biome dominated by Prevotella or Ruminococcus bacteria had a weaker immune response to the vaccine (Mao A, 2018).

Another example of the micro biome's influence on vaccines is the use of live attenuated vaccines. These vaccines contain weakened forms of the pathogen that can replicate in the host but do not cause disease. Live attenuated vaccines work by stimulating a strong and long lasting immune response. However, the effectiveness of live attenuated vaccines can be influenced by the host's micro biome. In one study, mice with a disrupted gut micro biome had a weaker immune response to live attenuated influenza vaccine than mice with a normal micro biome (Xie J, 2018).

Understanding host microbe interactions is also important for the development of adjuvants, which are substances added to vaccines to enhance the immune response. Adjuvants work by activating the innate immune system, which can then trigger a stronger adaptive immune response. However, the effectiveness of adjuvants can be influenced by the host's micro biome. In one study, mice with a disrupted gut micro biome had a weaker immune response to a vaccine adjuvant with aluminum hydroxide than mice with a normal micro biome. In conclusion, host microbe interactions play a critical role in the development of vaccines. Understanding these interactions can help researchers design more effective vaccines that can protect against infectious diseases. Further research is needed to elucidate the mechanisms underlying these interactions and to identify specific micro biome factors that can influence the immune response to vaccines. Ultimately, this knowledge could lead to the development of personalized vaccines tailored to an individual's micro biome composition, providing a new level of protection against infectious diseases (Wang W, 2021).

CONCLUSION

Unique selection pressures are applied to both the parasite and the host as a result of the antagonistic nature of the host parasite interaction. These results in parasites that are highly specialized to infect particular hosts. There are, however, a few exceptions, such as *Trypanorhynch cestodes*, which are capable of infecting multiple intermediate host species. According to Hudson, this interaction between the parasite and the host causes an evolutionary tension that enables the parasite and host to achieve a delicate equilibrium. The Red Queen Hypothesis refers to this state of evolutionary equilibrium; namely, that in order to keep up with one another's adaptations, both the parasite and the host need to constantly change. The host, on the other hand, would have to spend a lot of money developing a defensive strategy against each and every possible parasitic species. Therefore, allowing a moderate level of defense at the expense of a slight infection is less expensive.

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None

CONFLICT OF INTEREST

None

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