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Review Article

Microbial Pathogenesis' Damage-Response Framework

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ABSTRACT

Numerous infectious illnesses produced by bacteria that seldom cause disease in normal, healthy immunocompetent hosts emerged in the late twentieth century. The development of these illnesses demonstrates that a conventional notion of pathogenicity and virulence fail to account for the reality that microbial pathogenesis is influenced by both the bacterium and the host. To overcome this barrier to studying host–microbe interactions, we offer the 'damage-response' framework, a novel theoretical paradigm for understanding microbial pathogenesis.

Keywords: Microbial Pathogenesis; Bacterium; Host.

INTRODUCTION

Three tenets underpin the 'damage-response' concept of microbial pathogenesis [1]. First, microbial pathogenesis is the result of a host-microbe interaction and cannot be attributed to either the microorganism or the host alone. Second, the degree of injury to the host determines the pathological result of the host–microorganism interaction. Third, microbial factors and/or the host's reaction might cause harm to the host. These tenets serve as a scaffold — or framework — for developing and testing formal theories. (In this article, glossary words are defined in the context of the damage-response framework) [2].

Some relationships are quite complicated, demonstrating the difficulties in distinguishing between a host and a microbe. Ingestion of some microorganisms by amoebae (the host), for example, can be advantageous to the amoebae since the microorganisms provide food, but harmful to the eaten microbe.

A pathogen is defined as a microbe capable of inflicting damage to a host in the damage-response framework [3]. This definition eliminates the words commensal, saprophyte, non-pathogen, opportunist, and main pathogen, which have been used to characterise microorganisms that cause and do not cause illness. This is a less ambiguous definition of a pathogen than previously employed, because the pathogen is defined by the consequence or potential outcomes of harm, and it eliminates the need for modification or qualification to include microorganisms that cause illness exclusively in certain hosts.

Phylogenetic groupings (for example, bacteria, viruses, parasites, and fungi), the perceived ability to cause disease (for example, primary pathogens, saprophytes, opportunistic pathogens, or commensals), or, for bacteria, growth or other identifying characteristics are currently used to classify microbes (For instance, whether the organism is an anaerobe, aerobe, or facultative microbe, or its Gram-stain appearance) [4].

The immunological response of the host to a microbe or microbial antigens can cause host-mediated harm. A multitude of processes in the host response can cause harm to the organs and tissues of the host. The inflammatory reaction that occurs in part from normal people's immune responses to these bacteria is responsible for the clinical characteristics of microbial infection.

Microorganisms that may cause disease and hosts are the only components of the damage-response architecture. Similarly, following first contact, the consequences of a host–microorganism interaction are reduced to infection, commensalism, colonisation, persistence (latency), and illness.

CONCLUSION

The damage-response framework should provide a method that pulls together the many aspects of microbial pathogenesis that are now separated from one another, such as viral and bacterial pathogenesis, under one roof. Such an approach would encourage collaboration at all microbiology-immunology interfaces, ultimately advancing our understanding of infectious diseases.

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