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Mutual regulation between the microbiome and immunity in symbiosis

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Abstract

The mammalian gastrointestinal tract accommodates trillions of bacteria, many of which provide beneficial effects to the host. The intestinal immune system needs to adapt to the constantly fluctuating microbial environment at mucosal surfaces in order to maintain homeostasis. Changes in the microbiome can result in the dysregulation of the host immune system and increased susceptibility to inflammatory diseases. However, the mechanism by which the microbiome regulates and is regulated by the host immune system remains unclear.

The microbiome induces the generation of intestinal T cells that express RORγt, thereby maintaining immune homeostasis at mucosal surfaces. In addition, Microbe-associated molecular patterns (MAMPs) regulate intestinal immune responses through Toll-like receptor signalling pathways. Immune context-dependent recognition of bacterial flagellin leads to anti- or pro-inflammatory responses, selectively promoting symbiosis or pathogenesis. Conversely, T cell-dependent IgA responses controls the colonization of symbiotic bacteria, which play important roles in protection against allergic responses in the intestine. Collectively, these findings suggest that mutual regulation between the microbiome and host immunity is essential in establishing symbiotic relationship and immune homeostasis in the intestine.