Parasites and microbiota: A complex relationship

Hala S Elwakil

Medical Parasitology Department, Faculty of Medicine, Ain Shams University, Cairo, Egypt

The human gut is populated by a huge number of microbiota that is acquired first at birth and soon stabilizes in the early years of life. Microflora and gut helminths have co-evolved over many millions of years until recently when the geographical prevalence of parasitic diseases in human has become restricted to the developing world. Immune homeostasis relies on a balance in the composition of intestinal microflora; long lived parasites have also been shown to regulate immune function, and their absence in western lifestyles is suggested to be a factor for the increasing frequency of allergy and autoimmunity. The diversity of the microbiota is thought to reflect the health of the intestine and contributes to healthy metabolic and immune functioning.

Keywords: gut helminthes, immune homeostasis, intestinal microflora, microbiota.

Received: 12 November, 2018, Accepted: 24 November, 2018

Corresponding Author: Hala S Elwakil, Tel.: 01001241275, E-mail: halawakil39@gmail.com

Print ISSN: 1687-7942, Online ISSN: 2090-2646, Vol. 11, No. 3, December, 2018.

...
elevates regulatory T cell frequencies and results in greater helminth establishment. As regards the effects of the microbiota on host immune response to protozoal infections, when *T. gondii* reaches the gut of an individual with a functional microbiota, an immune response is initiated at the level of the intestinal mucosa by activation of toll-like receptors (TLR11/12) in dendritic cells. This recognition activates the transcription factor interferon (INF) regulatory factor 8, leading to the production of interleukin 12 (IL-12) which promotes a cellular-based immunity with production of INF-γ and differentiation of Th1 T lymphocytes. TLR-knockout mice (TLR11−/−) are not completely impaired to respond to *T. gondii* as long as gut commensal bacteria are present because the production of diminished amounts of IL-12 is compensated by indirect stimulation provided by the gut microbial commensals via TLR2, TLR4, and TLR9. Therefore, TLR11−/− mice survive the acute phase of infection. When TLR11−/− mice are treated with antibiotics to eliminate gut commensal bacteria, this remaining protective IL-12 response is lost. In addition, it was found that gut microbiota elicits a protective immune response against malaria transmission. In a mouse study, Yelmiz et al., reported that anti-α-gal antibodies, induced by the presence of *Escherichia coli* O86:B7 in the gut, are cytotoxic to α-gal-expressing *Plasmodium* sporozoites, and thus protect mice from mosquito-transmitted *Plasmodium* infection. In the same context, an association was observed between anti-α gal IgM levels and protection from *P. falciparum* infection in Malian children and adults living in an area of intense malaria transmission.

**The contributions of microbiota to helminth-induced modulation of autoimmune diseases:** Multiple recent investigations have highlighted the promise of helminth-based therapies for the treatment of inflammatory bowel disease (IBD) and coeliac disease. Several studies reported amelioration of clinical symptoms of Crohn’s disease and ulcerative colitis in patients subjected to oral administration of *T. suis* ova. Some of the immunoregulatory capacity of worms may be directly or indirectly related to alterations in intestinal microbial communities. Experimental infections with *H. polygyrus bakeri* in a mouse model of IBD revealed a significant expansion of the bacterial family *Lactobacillaceae* in the ileum of infected mice, which correlated with improved disease outcome. Moreover, it was found that microbiota may have a role in the therapeutic potential of helminths in the treatment of allergic diseases. Zaiss et al. reported that chronic infection with the murine helminth *H. polygyrus bakeri* reduced airway inflammation in a house dust mite induced model of allergy by alteration of the intestinal habitat, allowing increased short chain fatty acid production. Also, the transfer of the *H. polygyrus*-modified microbiota alone was sufficient to mediate protection against allergic asthma in uninfected recipient mice.

**REFERENCES**


