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Role of Gut Microbiota in Modulating Immune Responses to Parasitic Infections

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Introduction

Economic evaluation of emerging therapies especially cell and gene therapies, advanced biologics, and precision medicines has become a pivotal discipline for modern healthcare systems because these innovations promise transformative clinical benefits but carry very large upfront costs, uncertain long-term durability of effect, and significant budget-impact implications that challenge traditional cost-effectiveness and reimbursement paradigms [1].

Description

The gut microbiota influences immune responses to parasitic infections through multiple mechanisms, including modulation of cytokine production, regulation of mucosal barrier integrity, and induction of immune tolerance. Commensal bacteria such as Lactobacillus and Bifidobacterium can promote Th1 and Th17 responses, which are critical for controlling intracellular parasites like Toxoplasma gondii. Conversely, helminth infections, including Schistosoma and Heligmosomoides polygyrus, often induce a Th2-dominated immune profile characterized by elevated interleukin (IL)-4, IL-5, and IL-13 production, which may suppress pro-inflammatory responses and promote chronic infection [2].

Interestingly, helminth-induced immune regulation can alter gut microbial composition, leading to increased abundance of anti-inflammatory taxa such as Clostridium cluster XIVa. These reciprocal interactions demonstrate how parasites manipulate the microbiota–immune axis to ensure survival and persistence within the host. Moreover, microbial metabolites such as Short-Chain Fatty Acids (SCFAs), including butyrate and propionate, have been shown to modulate immune signaling during parasitic infections. SCFAs enhance regulatory T-cell (Treg) differentiation and promote intestinal barrier integrity, thereby reducing excessive inflammation. Together, these microbial and host-derived regulatory pathways create a finely balanced environment that limits tissue damage while allowing controlled immune activation against helminths [3].

However, dysbiosis caused by antibiotic use or poor nutrition disrupts these protective mechanisms, exacerbating parasitic disease outcomes. For example, studies in malaria-endemic regions have revealed that gut microbiota diversity influences susceptibility to Plasmodium infection, where certain bacterial genera can enhance anti-parasitic immunity via Toll-Like Receptor (TLR) signaling. Furthermore, co-infections involving parasites and enteric bacteria can significantly alter disease progression, illustrating the delicate balance between commensalism and pathogenicity in the gut environment [4].

Recent advances in metagenomics and metabolomics have enabled the identification of specific microbial biomarkers linked to parasitic infections. These tools reveal that microbiota composition not only affects immune responses but also modulates drug metabolism and vaccine efficacy. Probiotic supplementation and microbiota transplantation are being explored as adjunct therapies to conventional antiparasitic drugs, aiming to restore immune equilibrium and enhance treatment outcomes. The integration of microbiome-based strategies into parasitic disease management may revolutionize current therapeutic approaches, particularly in immunocompromised populations and resource-limited settings [5].

Conclusion

The gut microbiota plays a pivotal role in shaping immune responses during parasitic infections, influencing both disease pathogenesis and recovery. Its bidirectional interaction with parasites underscores the complexity of host immunity, where microbial composition, metabolic products, and immune regulation collectively determine infection outcomes. As research progresses, microbiota-targeted interventions such as probiotics, prebiotics, and fecal microbiota transplantation may emerge as promising adjuncts to antiparasitic therapy.

Acknowledgement

None

Conflict of Interest

None

References

1. Efstratiou A, Ongerth JE, Karanis P (2017) Waterborne transmission of protozoan parasites: Review of worldwide outbreaks-an update 2011–2016. Water Res 114: 14-22

2. Krkosek W, Reed V, Gagnon GA (2016) Assessing protozoan risks for surface drinking water supplies in Nova Scotia, Canada. J Water Health 14: 155-166

3. Cheng HWA, Lucy FE, Graczyk TK, Broaders MA, Tamang L, et al. (2009) Fate of Cryptosporidium parvum and Cryptosporidium hominis oocysts and Giardia duodenalis cysts during secondary wastewater treatments. Parasitol Res 105: 689-696

4. Ma JY, Li MY, Qi ZZ, Fu M, Sun TF, et al. (2022) Waterborne protozoan outbreaks: An update on the global, regional, and national prevalence from 2017 to 2020 and sources of contamination. Sci Total Environ 806: 150562

5. Shepherd KM, Wyn-Jones A (1996) An evaluation of methods for the simultaneous detection of Cryptosporidium oocysts and Giardia cysts from water. Appl Environ Microbiol 62: 1317-1322