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Opinion

Metabolic and immune system interface: immunometabolism, micro biota, and diseases

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OPINION

Elucidation and investigation of metabolic and immune system interfaces offered a new direction for the discovery of therapeutics that can be applied in treating metabolic diseases and disorders. Pro-inflammatory cytokines hindered normal metabolism and initiated periodontal disease, including rheumatoid arthritis, pancreatitis, and inflammatory bowel disease.(1) Overall, its dysfunction initiates chronic metabolic disorders that recruit several diseases and disorders such as obesity, cardiovascular disease, and type 2 diabetes. Infections, toxicity, medications, hormones, diet. Metabolic disorders induce genetic factors too that inhibit normal functioning of the gastrointestinal tract, enzymatic functions and disturb normal physiological processes. Incorrect synthesis and deficiencies of enzymes are the main causes that are responsible for initiating metabolic disorders. (2) Both metabolic disorders and inflammation initiate numerous diseases, namely, Alzheimer's disease, Parkinson's disease, diabetes mellitus, cardiovascular diseases, fatty liver disease, gout, hypertension, cancer, infertility, chronic kidney disease, macular degeneration, increased blood clotting, autoimmune disorders, heart arrhythmias, cardiomyopathy, arthritis, chronic depression, schizophrenia, fibromyalgia, heart valve failure, cataracts, bipolar disorder, chronic concussion effects, neuropathy, alopecia, and poor tissue repair. (3) Updated mechanisms of metabolic disorders expose the role of intestinal microbiota, barrier dysfunction in metabolic inflammation, and the phenomenon of immune-metabolic interactions, including nutritional needs, and the intestinal microbiome. (4) Further, the current understanding of immune-metabolism interactions illustrates new avenues of research that can identify the routes of immune harnessing and can be potential targets for treating metabolic disorders and diseases. (5) Besides, numerous other factors influence metabolism and regulate immune responses. Some specific cytokines such as [interleukin-1 (IL-1), IL-6, hormones (leptin and insulin), immune-related proteins (zinc-alpha2-glycoprotein, attracting and/or mahogany), neuropeptides (corticotropin-releasing hormone and alpha-melanocyte-stimulating hormone), transcription factors (peroxisome-proliferator-activated receptors), and glucose metabolism, tumor necrosis factor-alpha (TNF-alpha) and interferon-gamma (IFN-gamma)] were identified. (6) These findings were used for further elucidation for humanizing the understanding of novel therapeutic interventions in several immune-mediated diseases. (7) The outputs of such interpretation will explore the network of interactions, immune surveillance, energy regulation, and style of organ functioning. These opinions will open new avenues soon that will innovate fresh strategies for identifying new therapeutic targets for treating immune-mediated diseases. (8) The interaction in homeostasis and disease is one of the phenomenon, which comes into existence during the interface of the immune system and microbiota (Fig. 1). (9) Adverse environmental conditions disturb the microbiota-immunity interface and these settings initiate pathogenesis of immune-mediated diseases and disorders. (10) The illumination of the environmental impact of these interfaces is crucial for innovating microbiome-targeted therapeutic. The role of the immune system is not only anti-infectious but also involves with the pathways of metabolic homeostasis.(11) These outcomes are relevant in the development of future strategies that will be implemented for treating autoimmune diseases.

At the time of infection, the process of the beginning of the immune response needs more energy. This energy consumed using the process of cell proliferation. (12) Therefore, allied cells adopt a significant metabolic route to fulfill their needs. The interpretation of the immunometabolic mechanisms that governed the features of the cellular events and pathogenies of the disease is not yet discovered. (13) The examination of the underlined features and transformation routes will be crucial for further analysis and can disclose new avenues for searching the therapeutic targets for treating the aforesaid diseases. (14) The cellular events, which are associated with the immune system ensued, are controlled through various cellular and molecular pathways. These events further involved more complex mechanisms for retaining immune homeostasis. (15) The author also emphasized the need to correlate computational modeling to explore the hidden and vital features of immunometabolism. (16)

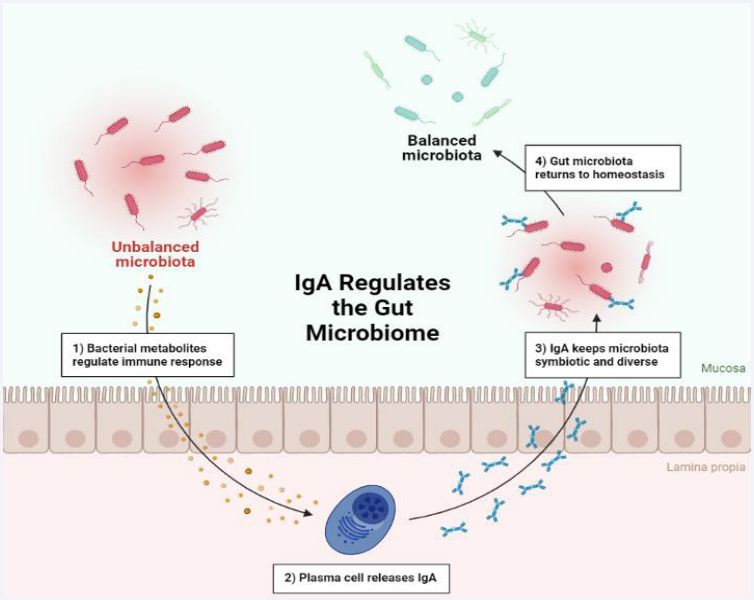

Figure 1 An illustration of interactions in homeostasis and disease is one the phenomenon which comes into existence during the interface of immune system and micro biota.

These new tools can reveal the persistent nonlinear dynamics and complex networking that have been discussed earlier. These modern applications can frame the routes and connectivity among cytokines, and cellular networks. (17) One more aspects such as metabolic transformations that are involved in many events should be explored to get a perfect detail about the metabolic and immune system interface. These explanations will develop a new approach and defiantly examine specific features of the pathways of immunometabolism components, and metabolites. These outcomes will develop new strategies in the innovation of new therapeutic as required. (18) The author explores the possibilities for better clarification of the physiology of the gut microbiota that influences metabolic inflammation and dysregulation. Furthermore, the author pointed out that the metabolic and immune system interface is a key aspect and should be illustrated with an emphasis on the central homeostatic mechanism.

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AVAILABILITY OF DATA AND MATERIALS

Wherever necessary, relevant citations are included in the reference section.

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