Preface Special Issue: Microbiome–Immune System Interactions

Body homeostasis, immune response to microbial infections or vaccination, control of cancer onset or autoimmune or inflammatory diseases, as well as autism or other behavioral disorders, among other examples, are now recognized to be associated with the complex constitution of the body’s microbiome. Recent findings demonstrate that the microbial composition, i.e., pathogenic, symbionts, and commensal viruses, bacteria, or yeast mainly in the gut, is strongly associated with susceptibility/resistance to several classes of diseases or its therapeutic response.

This Special Issue focuses on the processes that link the human microbiome to three classes of diseases: immunodeficiency, autoimmunity, and cancer. Review articles cover aspects of the recent progress in selective immunoglobulin A (IgA) deficiency, Sjögren’s syndrome, and breast cancer. The three contributions from researchers from the United States and Poland are outlined below.

Galant-Swafford’s article “Selective immunoglobulin A deficiency and the microbiome” discusses how the most common primary immunodeficiency, i.e., the defect in the differentiation of IgA-bearing B lymphocytes into IgA-secreting plasma cells (SIgAD), affects the first line of defense against bacterial and viral pathogens. The IgA antibody plays a critical role in immune homeostasis in the gut and determines the gut microbiota composition, and SIgAD patients feature gut dysbiosis. Moreover, the IgA deficiency provokes a range of clinical phenotypes from allergic disease, recurrent bacterial respiratory tract infections, gastrointestinal disorders, and even aggressive autoimmunity in symptomatic patients. The author discusses the microbiome in patients with SIgAD and provides new insights into therapeutics and patient monitoring.

Maslinska and colleagues’ article “The role of the microbiome in Sjögren’s syndrome” discusses that dysbiosis in the microorganisms found in the gut, eyes, and mouth often results in excess of commensals, which may push activation of autoimmune or autoinflammatory response. Sjögren’s syndrome is an autoimmune disease in which the epithelium’s protective barrier changes. The authors discuss the molecular mimicry mechanism between microbial and self-antigens leading to the initiation of autoantibody response.

Swafford’s and colleagues’ article “Challenges in investigating immune–microbiome interactions in breast cancer” discusses the effect of the human microbiome on the direct and distal impact on oncogenesis, tumor growth, and the immune responses to combat or to promote tolerance in breast cancer. Authors show evidence that the microbiome influences immune response along the skin, gut, and oral cavity or directly the tumor microenvironment where microorganisms can promote growth or clearance of tumor cells. The authors discuss the participation of microbial metabolites in shaping the success or failure of immunotherapy.

This Special Issue offers a critical reading of the present microbiome research given the current knowledge of immunodeficiency, autoimmunity, and cancer.

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