Chapter 8
Immunology of Dietary Exposure

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ABSTRACT

To keep our body healthy and protected from infectious microbes, immunity is essential. The immune system (IS) predominantly comprised of innate and acquired immunity, and has evolved as a specific, complex, efficient, and regulated protective mechanism in human beings. The IS commands different macro and micronutrients to function properly. Dietary habits have an impact on immunity and inflammation. Investigations have shown that omega-3 fatty acids can mitigate inflammation whereas food items that may aggravate inflammation include processed meat, simple sugars, trans fats, and refined carbohydrates. The immunological function of gut antigens has been partially elucidated by germ-free models. But the large intestine, which has a high concentration of gut microbiota, does not contain much of the gut associated lymphoid tissue (GALT). The immune response, diet balance, and preserving the necessary levels of vitamins and minerals to fend off infections have been clearly discussed in this chapter. Further, an overview of food allergy and allergens are also included in this chapter.

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INTRODUCTION

The well-being, comfort, and reproductive performance of particular organisms are all impacted by nutrition, which is also essential for immunological defence and pathogen resistance (Pontzer et al., 2018). Nutrition also has significant ecological and evolutionary ramifications. Malnutrition, particularly insufficient protein intake, is a major contributor to morbidity and mortality from infectious diseases in humans, particularly in developing nations. Many studies approach foods as uniform commodities and change their amount without considering the nutrients that the food contains or recognizing the quantitative amount of nutrients that the animal requires (Smits et al., 2018). Some dietary supplements have one characteristic (typically the number of calories) or nutritional component (such the amount of protein or nitrogen in the diet) that they isolate and adjust through experimentation while maintaining the same levels of other dietary components. This distinguishes between changes in the ratio of nutrients in the diet and changes in the focal nutrient/attribute. Similarly, overeating and the metabolic diseases it is linked to can weaken immunity, interfere with commensal and symbiotic microbiota relationships, and make a person more vulnerable to infectious diseases (Costa et al., 2020). Although there is no denying the connection between immunity and diet, it is still difficult to fully grasp how intricate this relationship is. This intricacy is divided into three primary areas: There are numerous direct and indirect mechanisms that reflect the complex and different interactions between host immunity and diet, which also involve the host's microbiota. Food allergies may arise as a result of a multitude of causes, such as environmental influences, genetic predisposition, and the molecular makeup of allergens. Additionally linked to food allergies are neuroimmune interactions, demonstrating the great level of intricacy in this phenomenon (Saeed et al., 2016). We will discuss recent research on the gut circuits that food components stimulate to demonstrate how important they are to the IS's function in both health and sickness, far beyond their function as nutrients. We will also discuss the immunological impacts of various food ingredients such as vitamins and fats. There are many local pro-inflammatory mediators and most of the GALT cells are triggered. It is well recognized that regulatory components offer a careful yet reliable balance that preserves intestinal homeostasis (Arrazuria et al., 2018). The two main immunological responses that are often triggered by antigenic interaction in the gut are secretory IgA production and oral tolerance. Mucosal homeostasis is upset according to pathological circumstances, though, and this can lead to inflammatory reactions like food hypersensitivity. Food allergies can be caused by an array of circumstances, such as outside factors, family history, and the chemical structure of allergen. A further illustration of the high level of intricacy in food allergy is the involvement of neuroimmune interactions. In this chapter the current