Chapter 3

Flavonoids and Immune System Modulation

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Abstract

The immune system is an intricate and highly coordinated defense network that protects the body against environmental toxins, microbial pathogens, and malignant cell transformation. It consists of two interdependent components: the innate immune system, which provides rapid and nonspecific protection, and the adaptive immune system, which generates specific, long-lasting immune responses. Maintaining equilibrium between these systems is essential for overall health, as disruptions can lead to chronic inflammation, autoimmune disorders, or impaired host defense. In recent years, considerable scientific interest has focused on the influence of dietary bioactive compounds on immune regulation. Among these, flavonoids—abundant polyphenolic molecules present in tea, cocoa, fruits, vegetables, and various medicinal plants—have emerged as promising immunomodulatory agents. Traditionally recognized for their antioxidant properties, flavonoids are now understood to exert broader biological effects by actively modulating immunological signaling pathways. Evidence indicates that they regulate key processes such as antigen presentation, cytokine production, and T-cell maturation and activation. This chapter provides an in-depth overview of the immunomodulatory actions of flavonoids, detailing their roles in both innate and adaptive immunity. It further explores their capacity to modulate cytokine networks and influence T-cell-mediated immune responses. Finally, potential therapeutic implications,

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