Chapter-9

Flavonoids in respiratory and Cardiovascular Health

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Abstract:

Flavonoids, a diverse group of polyphenolic compounds found abundantly in fruits, vegetables, and medicinal plants, have gained significant attention for their therapeutic potential in managing chronic diseases, particularly those affecting the respiratory and cardiovascular systems. Their potent antioxidant, anti-inflammatory, immunomodulatory, and vasodilatory properties make them attractive candidates for disease prevention and adjunctive therapy. In the context of respiratory health, flavonoids such as quercetin, kaempferol, and luteolin exhibit protective effects against asthma, chronic obstructive pulmonary disease (COPD), and pulmonary fibrosis by modulating inflammatory cytokines, inhibiting reactive oxygen species (ROS), and regulating immune cell activation. In cardiovascular health, flavonoids contribute to endothelial function improvement, reduction in blood pressure, inhibition of platelet aggregation, and lipid profile regulation. Epidemiological studies suggest a strong inverse correlation between flavonoid intake and incidence of cardiovascular events. Mechanistically, they influence signaling pathways including NF-κB, MAPK, and Nrf2, and modulate nitric oxide (NO) bioavailability, which is crucial for vascular homeostasis. This chapter aims to provide a comprehensive overview of the current evidence regarding the biological activities of flavonoids, with a focus on their roles in respiratory and cardiovascular systems. It will also discuss bioavailability, structure–activity relationships, and limitations in clinical translation, while highlighting recent advances in formulation and delivery systems to enhance therapeutic outcomes.

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