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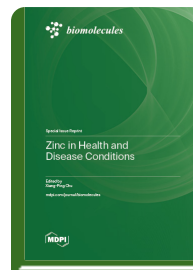
Special Issue Reprint

Zinc in Health and Disease Conditions

www.mdpi.com/books/reprint/11326

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ISBN 978-3-7258-4143-1 (Hardback)
ISBN 978-3-7258-4144-8 (PDF)



Zinc, the second most prevalent trace element in the human body, is crucial for numerous physiological processes. It acts as a signaling molecule, modulating cellular pathways, gene expression, and enzyme activity. Zinc plays a vital role in immune function, wound healing, DNA synthesis, and antioxidant defense. In the brain, it regulates neuronal excitation and inhibition by modulating receptors like the glutamate receptor, which is essential for cognitive and motor function. However, zinc's role is complex, as both deficiency and excess can lead to pathological conditions. In neurological disorders, for example, zinc dysregulation contributes to seizures by disrupting the balance between excitatory and inhibitory neurotransmission. Excessive intracellular zinc can lead to neurotoxicity, mitochondrial dysfunction, and cell death, while low zinc levels impair immune responses and promote inflammation. In cancer, metabolic diseases, and neurodegenerative conditions, altered zinc homeostasis can exacerbate disease progression. Thus, zinc's physiological functions are intricately tied to health and disease. Its dual nature—as both protective and potentially harmful—makes it a critical target for research looking to develop therapeutic strategies aimed at restoring the zinc balance in various pathological conditions. Understanding the fine regulation of zinc is key to harnessing its potential for disease prevention and treatment.



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