biology and life sciences forum

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Abstract

Pioneering organelle structural biology: Golgi apparatus dysfunction and cascades of fatal pathways in disease †

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Abstract: This presentation explores the emerging field of organelle structural biology and its relevance to disease research. Specifically, it delves into the dysfunctions of the Golgi apparatus (GA) in neurodegenerative diseases and cancer and the importance of understanding these dysfunctions for therapeutic targets, gene therapy, and drug design. The GA plays a crucial role in the structural biology of cells, regulating the transport and modification of proteins and lipids. Dysfunction of the GA has been implicated in a range of neurodegenerative diseases, including Parkinson's Disease and neurodevelopmental disorders. It can result in the mislocation and accumulation of proteins and impaired glycosylation of proteins. Inhibition of vesicular trafficking by α-synuclein may affect dopamine-producing neurons and neuromodulators, while fragmentation and defects within the GA can lead to apoptotic pathways during pathological mechanisms. In addition, the GA has also been shown to play a role in cancer, with primary defects and fragmentation potentially contributing to fatal pathways. The presentation also discusses the importance of organelle structural biology, highlighting the various technologies and imaging techniques used to visualize GA dysfunction, such as cryogenic electron tomography, soft-X-ray tomography, and multiplex correlative light and electron microscopy. The presentation concludes by outlining future directions in organelle structural biology, including the need for further research into high-resolution nanoimaging techniques and computational reconstruction of the GA. Overall, this presentation provides insights into the importance of understanding organelle structural biology in disease research and highlights the potential for advancements in therapeutic targets and drug design.

Keywords: organelle structural biology; Golgi; cancer; nanoimages; tomograms; therapeutics; cryo-EM; cryo-ET; SXT; CLEM; SBEM; OCT

Citation: Lastname, F.; Lastname, F.; Lastname, F. Title. Biol. Life Sci. Forum 2022, 2, x. https://doi.org/10.3390/xxxxx

Academic Editor: Firstname Lastname

Published: date