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The intra-Golgi Dynamics of Glyco-enzymes Determine Glycosylation Patterns and Related Biological Functions

Riccardo Rizzo
CNR-NANOTEC Lecce

Glycans are sugar polymers endowed with major biological functions. Their biosynthesis relies on orderly sequences of sugar additions catalysed by glycoenzymes during transport through the Golgi *cisternae*. How the position of glycoenzymes and hence their reaction sequence in the Golgi stack is determined to achieve the correct glycan output is unclear. Here, we address this question by studying the enzyme-recycling adaptor and oncogene GOLPH3 in the framework of the cisternal maturation, by which glycoenzymes recycle through progressing *cisternae* to maintain a suitable enzyme distribution across the Golgi stack. Our findings, unravel the mechanisms by which Golgi enzyme recycling specifies 1) the localization of specific glycoenzymes in the appropriate *cisternae*; 2) their degradation rate and hence their abundance; and 3) their organization into functional modules that impact specific glycosylation pathways and associated biological functions. Moreover, they have broad medical implications as they outline a novel oncogenic mechanism of action for GOLPH3 based on glycosphingolipid biosynthesis.

Keywords: Golgi, Glycosylation, GOLPH3, glycosphingolipids, cancer.

Short BIO*: Riccardo-Rizzo received his Master Degree in Industrial Biotechnology in 2008 from the University of Salento, Lecce (Italy). In April 2014 he got his PhD in Life and Biomolecular Sciences at the Telethon Institute of Genetics and Medicine (The Open University program, UK), Naples (Italy). From April 2014-July 2020, he was a postdoctoral researcher at IBP-CNR and then at the IBBC-CNR in Naples, Italy. In July 2020 he became permanent Researcher at Institute of Nanotechnology of CNR (CNR NANOTEC, Lecce). His scientific interests concern the morpho-functional organization and regulation of the biosynthetic pathway and its involvement in diseases.*