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Golgi apparatus dynamics and function in proteoglycan synthesis

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Proteoglycans (PGs) are proteins modified by glycosaminoglycans (GAGs) in the Golgi apparatus. Different types of GAGs are polymerized from different disaccharide units by different glycosyltransferases in the Golgi apparatus. The polymerized GAG chains are sulfated to a variable extent by Golgi sulfotransferases which together determine the overall sulfation pattern and the biological activity of the PGs upon arrival at the cell surface, where some PGs remain membrane attached, while others are secreted. We have taken particular interest in how the supply of the availability of the nucleotide sulfate donor (PAPS) differently influences the sulfation pattern of heparan sulfate (HS) and chondroitin sulfate (CS) PGs in the apical and basolateral secretory routes of epithelial cells. By increasing or reducing the expression of the PAPS transporter in the Golgi membrane, we could show that CSPGs secreted apically and baso-laterally have been modified differently, where apically secreted CSPGs are under sulfated. Reduced PAPS transporter expression reduced the sulfation of CSPGs, while some HSPGs in the basolateral route in fact were prioritized and more intensely sulfated than in control cells. The total output of sulfated GAG chains from a given cell type depends on several factors that influence the size and dynamics of the Golgi apparatus. How the overexpression of Golgi associated proteins regulate proteoglycan synthesis will be discussed.

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