

The Roles of Lysosomal Exocytosis in Regulated Myelination

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ABSTRACT

The myelin sheath wraps axons is an intricate process required for rapid conduction of nerve impulses, which is formed by two kinds of glial cells, oligodendrocytes in the central nervous system and Schwann cells in the peripheral nervous system. Myelin biogenesis is a complex and finely regulated process and accumulating evidence suggests that myelin protein synthesis, storage and transportation are key elements of myelination, however the mechanisms of regulating myelin protein trafficking are still not very clear. Recently, the evidences of lysosomal exocytosis in oligodendrocytes and Schwann cells are involved in regulated myelination have emerged. In this paper, we briefly summarize how the major myelin-resident protein, as proteolipid protein in the central nervous system and PO in the peripheral nervous system, transport from lysosome to cell surface to form myelin sheath and focus on the possible mechanisms involved in these processes. Advances in our understanding of glia, as well as new tools engineering, will further improve the knowing of myelin biogenesis.

Introduction

Myelin is a specialized membrane structure generated by oligodendrocytes and Schwann cells, which offers electrical insulation around the axon and involves in mutual communication with neurons and the outside environment¹. Myelin biogenesis is a complex and finely regulated process and accumulating evidence suggests that myelin protein synthesis, storage and transportation are key elements of myelination¹. However, the mechanisms of regulating myelin protein trafficking still remain poorly understood.

Lysosomes are acidic organelles and generally considered to be responsible for the degradation of endocytic and autophagic substrates. Interestingly, some cells used their lysosomes as secretory compartment. Compared to conventional lysosomes, this kind of lysosomes serve dual functions – for degradation of proteins and for storage of newly synthesized secretory proteins, were named as secretory lysosomes². Lysosomal exocytosis is defined as a process that a lysosome responds to extracellular stimuli, docks at the interior of the cell surface and fuses with the plasma membrane to their contents^{2,3}. In nervous system Ca²⁺-dependent lysosomal exocytosis is already proved as a new pathway for gliotransmitter secreted from astrocytes⁴⁻⁶ meanwhile the lysosome exocytic process was also found in microglia^{7,8}, oligodendrocyte⁹ and Schwann cells^{10,11}.

Recently, the roles of lysosomal exocytosis in myelin formation

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