Abstract

Myotubularins are a family of dual-specific phosphatases, divided into two groups, active and inactive enzymes. Active myotubularins recognize and dephosphorylate the phosphoinositides phosphatidylinositol-3-phosphate (PI3P) and phosphatidylinositol-3,5-bisphosphate ($PI(3,5)P_2$). Phosphoinositides are components of various types of cell membranes, including the plasma membrane and the endomembrane system. In total, there are 7 types of phosphoinositides which are interconvertible by phosphatases and kinases. These transformations are important for membrane identification because one type usually predominates in each membrane. PI3P and $PI(3,5)P_2$ are part of endosomes and lysosomes and both have a key role in cellular vesicle transport. Myotubularins influence the functionality of this transport. Mutations in genes for myotubularins can negatively affect their protein structure and activity. The severity of these mutations is supported by the fact that defects in several members of this family have been associated with serious genetic diseases such as X-linked centronuclear myopathy (XLMTM) and Charcot-Marie-Tooth syndrome. The first myotubularin member discovered was MTM1, whose mutations are associated with X-linked centronuclear myopathy. XLMTM is characterized by muscle weakness and hypotonia, often leading to respiratory problems. Secondary symptoms include neurological, endocrinological, immune, and cardiovascular problems. A thorough understanding of these secondary symptoms is essential for comprehensive treatment and improving the quality of life of affected individuals.

Keywords: PI3P, $PI(3,5P)_2$, MTM1, myotubularins, XLMTM