Phosphatidyl Inositol 4-Kinases

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Contributor: Ravinder Kumar , Piyush Kumar

In recent decades, phosphoinositides (or PIs) have emerged as essential signaling molecules. Despite their low cellular abundance, PIs are found to be involved in various cellular processes, including cell migration, vesicular trafficking, cell cycle regulation, metabolism, cytoskeletal remodeling, autophagy, aging, apoptosis, and cell signaling. Recent studies have shown that aberrant activity of either lipid kinases or phosphatases leads to various medical implications like cancer, diabetes, and microbial infections, suggesting an essential role for these lipid molecules and enzymes in their metabolism. This entry focused on one of the critical enzymes involved in phosphoinositide metabolism: phosphatidyl inositol 4-kinase (PI4-Kinase).

phosphoinositoids kinases phosphatases lipid phospholipids

PI4-Kinase (or phosphatidylinositol 4-kinase) is a vital lipid kinase in cells. It phosphorylates at the fourth hydroxyl position of the inositol ring of PtdIns (phosphatidylinositol), thereby generating PtdIns 4P (phosphatidylinositol 4 phosphate) or PtdIns 4,5 bis phosphate (phosphatidylinositol 4,5 bis phosphate) or PtdIns 3,4,5 triphosphate (phosphatidylinositol 3,4,5 tri phosphate), depending upon substrates [1]. These three products act as important cell-signaling molecules by profoundly affecting cell physiology. Based on biochemical studies and sequence analysis, this enzyme is classified into two families: type-II PtdIns 4-kinases and type-III PtdIns 4-kinases. Both families have two isoforms, known as alpha and beta. PtdIns 4-kinases are found at the plasma membrane (as membrane-bound) in the cytoplasm, Golgi complex, endosomes, endoplasmic reticulum, cellular vesicles, and nucleolus.

References

1. Sasaki, T.; Takasuga, S.; Sasaki, J.; Kofuji, S.; Eguchi, S.; Yamazaki, M.; Suzuki, A. Mammalian phosphoinositide kinases and phosphatases. Prog. Lipid Res. 2009, 48, 307–343.