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Perspective

Protein kinase and its Importance

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DESCRIPTION

Protein Kinases (PTKs) are enzymes that regulate the biological activity of proteins by phosphorylation of specific amino acids with ATP as the source of phosphate, thereby inducing a conformational change from an inactive to an active form of the protein. The protein kinase enzyme family has been one of the most significant drug targets in the 21st century due to the dysregulation of protein kinase function in several diseases, including cancer. Protein kinases assume a crucial role in the intracellular transduction on account of their capability to phosphorylate plenty of proteins. Eukaryotic protein kinases are enzymes that catalyze phosphoryl transfer from MgATP to Ser/Thr and Tyr side chains in proteins. Their importance is in part evidenced by their frequency in eukaryotic genomes, typically representing 2-3% of the genes, including in human where 518 protein kinases have been annotated.

Protein kinases are enzymes located in the cytoplasm that phosphorylate proteins. The main protein kinases consist of PKA, PKG, and PKC32 as well as tyrosyl protein kinases (part of tyrosine kinase receptors). They are distinguished from each other by the different intracellular second messengers involved in their regulation and by the selective substrates they use. They all have a binding site for Mg^{2+}ATP (phosphate donor) and for substrate protein as well as various regulatory sites.The catalytic domain of a protein kinase is divided into two parts: N-terminal and C-terminal. A peptidic strand connects the two, forming an active site with a front pocket (catalytic residues) and a back pocket. A stored lysine residue and a residue "gatekeeper" control access to the back pocket. The catalytic domain is unavailable while activated since the propellers of the N- and C-terminal sub domains move inward. Non-catalytic domains of the kinases allow substrate attachment and signalling protein recruitment.

Protein kinases are intracellular enzymes that regulate cell growth and proliferation as well as immune response triggering and control. Protein kinases are phosphotransferases that binds phosphate to the side chains of serine, threonine, or tyrosine residues in cells to phosphorylate them. Kinases are needed in the first phase of intracellular immune cell signalling. Protein kinases play a major role in cellular activation processes. An important aspect of activation is the need to provide stringent controls which will allow for appropriate enhancement and diminution of function. Protein kinase activities are regulated by interaction with other proteins. Some of these may be protein kinases themselves as occurs during multilayer protein kinase cascades. Other protein–protein interactions contribute to controlling kinase activity in a second messenger or receptor–ligand interaction dependent manner (e.g. Ca^{2+}/calmodulin kinases). Protein phosphorylation is implicated in a variety of physiological processes, including glucose absorption, signalling, epigenetic modifications, and cell cycle progression. Diabetes, cardiovascular disease, Alzheimer's disease, and cancer, to name a few illnesses, have all been linked to phosphorylation deficiencies.

CONCLUSION

Protein kinase is a type of kinase enzyme that adds phosphate groups to other proteins chemically (i.e. phosphorylation). Many biochemical signalling pathways within cells (i.e. signal transduction) and effectors in cellular functions, such as cell proliferation and necrosis, are influenced by this enzyme. There are currently a range of protein kinase inhibitors in the market that inhibit protein kinase activity. They can be used to regulate the cellular responses that protein kinase activity causes. As a result, there is scope for the design and production of new medicines that inhibit protein kinase overexpression for the prevention and treatment of associated disorders.

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