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Commentary

General Introduction of Scaffold Proteins and its Functions

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DESCRIPTION

The essential regulators of numerous important signalling pathways are scaffold proteins. Although the role of scaffolds is not clearly defined, they are known to interact and/or connect with numerous signalling pathway constituents, tying them together into complexes. They control signal transduction in such pathways and support the localization of pathway components (arranged in complexes) to particular cell regions, including the plasma membrane, the cytoplasm, the nucleus, the Golgi, the endosomes, and the mitochondria.

In order to control signal transduction, scaffold proteins coordinate positive and negative feedback signals. They also localise signalling components to specific regions of the cell and shield the proper signalling proteins from competing proteins.

The most fundamental function of a scaffold is thought to be this one. Complexes are created by scaffolds from the signalling elements of a cascade. By avoiding pointless interactions between signalling proteins, this assembly may be able to improve signalling selectivity. It may also improve signalling efficiency by improving the closeness and effective concentration of components in the scaffold complex. A scaffold that binds a protein kinase and its substrate, ensuring specific kinase phosphorylation, is an example of how scaffolds increase specificity.

Additionally, some signalling proteins need a number of contacts to be activated; scaffold tethering might be able to combine these connections into a single interaction that causes a number of alterations. Scaffolds may also have catalytic properties because their interactions with signalling proteins may cause allosteric changes in these signalling components. These alterations may be able to either increase or decrease the signalling proteins' ability to activate. The Ste5 scaffold in the mitogen-activated protein kinase pathway serves as an illustration. It has been postulated that Ste5 controls mating signalling by catalytically freeing the Fus3 MAPK, allowing its MAPKK Ste7 to activate it. Scaffolds focus the signaling reaction in a particular region of the cell, which may be crucial for the local synthesis of signaling intermediates. The scaffold, A-kinase anchor proteins (AKAPs), which direct cyclic AMP-dependent protein kinase to diverse places in the cell, is one specific illustration of this mechanism. This localization causes PKA to phosphorylate its substrates locally and permits local control of PKA.

From manufactured scaffolds and mathematical modeling, numerous hypotheses regarding how scaffolds coordinate positive and negative feedback have been developed. Scaffolds bind all three kinases in three-kinase signaling cascades, improving kinase selectivity and preventing signal amplification by limiting kinase phosphorylation to one downstream target.

The stability of the contact between the scaffold and the kinases, basal phosphatase activity in the cell, scaffold location, and the expression levels of the signaling molecules may all be factors in these abilities.

To keep the chromatin in a compact chromosome, the chromosomal scaffold plays a crucial function. The proteins condensin, topoisomerase II, and kinesin family member make up the chromosome scaffold (KIF4) Proteins that make up the chromosome scaffold are also referred to as scaffold proteins.

- Large multifunctional enzymes, often known as scaffold proteins, carry out a series or chain of reactions in a single route.
- An enzyme or structural protein, such as an iron sulphur cluster scaffold protein, that binds several molecules together to keep them in the right spatial configuration.
- The molecules act as a mechanical scaffold in the cytoskeleton and ECM.

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