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Short Communication

A Short Note on Fibroblast Growth Factor (FGF)

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DESCRIPTION

Fibroblast Growth Factors (FGF) are a group of cell signaling proteins generated by macrophages that are engaged in a range of functions, most notably as essential components for proper animal cell development. Any abnormalities in their function result in a variety of developmental problems. These growth factors are extracellular molecules that operate as systemic or locally circulating compounds that activate cell surface receptors. FGFs bind to heparin and heparin sulphate, which is one of their distinguishing characteristics. As a result, some are sequestered in tissues' extracellular matrix, which includes heparan sulphate proteoglycans, and are released locally when the tissue is injured or remodeled [1].

Growth factors are one of the most important components in tissue engineering because they give stem cells chemical signals that control their biological responses and tissue development. Despite the fact that the basic biological activities of growth factors and their endogenic roles in tissue formation and repair have been reasonably extensively researched, the application of growth factors in tissue engineering has lately attained attention. Because of their regulatory roles in cellular processes such as adhesion, proliferation, migration, and differentiation in the epithelium, bone, soft connective tissues, and nerves, growth factors might be used to target particular tissue responses. FGFs have been used to reform injured skin, Meta arterioles (blood vessels), muscle, adipose, tendon/ligament, bone formation process (cartilage), bone, tooth, and nerve tissues.

Functions

FGFs are multifunctional proteins with a huge range of operations; they are mostly mitogens, but they also have regulatory, morphological, and endocrine effects [2]. Due to their various activities on multiple cell types, they have been referred to as "pluripotent" growth factors and "promiscuous" growth factors. More than twenty distinct FGF ligands can activate four receptor subtypes in the case of FGF. Mesoderm induction, anterior-posterior patterning, limb development, neural induction, and neural development, and angiogenesis, keratinocyte organization, and wound healing processes are all activities of FGFs in developmental processes. FGF is required for proper vertebrate and invertebrate development, and any abnormalities in its function result in a variety of developmental disorders. While many FGFs are released by cells and operate on distant targets, others function locally inside a tissue or even within a cell [3]. Low Molecular Weight (LMW) and High Molecular Weight (HMW) isoforms of human FGF2 exist. HMW FGF2s are nuclear and act in an intracrine way, whereas LMW FGF2s are predominantly cytoplasmic and work in an autocrine manner. The encouragement of endothelial cell proliferation and the physical structuring of endothelial cells into tube-like structures is one of FGF1 and FGF2's most significant functions. As a result, they encourage angiogenesis, or the formation of new blood vessels from pre-existing ones. Angiogenic factors FGF1 and FGF2 are more powerful than Vascular Endothelial Growth Factor (VEGF) or Platelet-Derived Growth Factor (PDGF). FGFs are involved in neural stem cell proliferation, neurogenesis, axon growth, and differentiation throughout the development of the central nervous system. FGF2 has been used to produce artificial gyrification of the mouse brain by inhibiting neuronal differentiation and so allowing self-renewal of cortical progenitor cells, known as radial glial cells [4]. FGF8, a member of the FGF family, controls the growth and location of the functional regions of the cerebral cortex. FGFs are also necessary for the proper functioning of the adult brain. FGFs are thus important drivers of neuronal survival in both development and maturity. Adult neurogenesis within the hippocampus, for example, is heavily reliant on FGF2.

CONCLUSION

FGFs govern a wide range of biological processes, including cell proliferation, survival, migration, and differentiation, through signaling through FGF receptors (FGFRs). In the case of FGFs, RAS/MAP kinase is recognized to be the most important signal route. Biomaterial-based systems, such as FGF delivery carriers and stem cell scaffolds governed by FGF functions, have recently been created and proved to have several positive consequences in vivo. While FGFs' biological functions are extensively implicated in many types of cells in vitro via this signaling pathway, the

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maintenance of stability and half-life in vivo should be taken into account. Future therapeutic uses of FGFs in tissue regeneration, such as skin, muscle, tendon/ligament, bone, tooth, and nerve tissues, will be achieved when biomaterials and stem cells are used to enhance their biological activities.

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