Growth Factor

Growth factors (GFs) are essential substances found in humans that enhance the cellular growth, proliferation, and cellular differentiation.

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Related terms:

Vascular Endothelial Growth Factor, Cytokine, Protein, Neoplasm, Transforming Growth Factor Beta, Malignant Neoplasm, Mouse

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Growth Factors

Wilma Friedman, Wilma Friedman, in Basic Neurochemistry (Eighth Edition), 2012

Introduction: What is a Growth Factor?

Growth factors are proteins that regulate many aspects of cellular function, including survival, proliferation, migration and dif ferentiation. In non-neuronal cells growth factors stimulate proliferation, but mature neurons are postmitotic and cannot re-enter the cell cycle. Consequently, when considered in the context of the nervous system, growth factors are frequently referred to as neurotrophic factors. These factors are critical for proper development of the nervous system from the earliest embryonic stages. Growth factors determine the fate of cells as they dif ferentiate from being progenitors along either neuronal or glial lineages. In addition, during embryonic development, growth factors are crucial for regulating neuronal survival, determining cell fate and establishing proper connectivity. Many growth factors have now been identif ed that function in the brain, even factors that were originally identif ed in other systems, and there is an ever-expanding landscape of growth factor interactions with cellular populations in the nervous system, both during development and in the adult. The nervous system is composed of an extremely heterogeneous population of cells. In addition to the broad categories of neurons, astrocytes and oligodendrocytes, there are multiple types of neurons with a diversity of structure, function, localization, phenotype and projections, each with specif c needs for trophic support. Understanding the complexity of these relationships is a major challenge (see Chaps. 1, 6, 28).

In this chapter the neurotrophin (NGF) family of factors, which were the f rst growth factors to be identif ed for actions in the nervous system, will be emphasized. Several other families of growth factors that have important functions in the peripheral and central nervous systems, including the GDNF family, the neuregulins, and the neurotrophic cytokines will be discussed. Finally, other factors that were initially discovered in non-neuronal systems and subsequently shown to have important roles in nervous system function will be touched upon. An important conclusion is that numerous growth factors, whether they were initially discovered in the nervous system or for ef fects on other cellular populations, have ef fects on neuronal and glial survival, development and

function.

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Neil Bakshi MD, ... Asheesh Bedi MD, in Biologics in Orthopaedic Surgery, 2019

Conclusion

The use of growth factors and PRP in orthopedic surgery is a rapidly expanding area of research with a wide array of possible clinical applications. PRP and other autologous blood products primarily function through the release of growth factors from the alpha granules of activated platelets. These growth factors are important for cellular processes such as mitogenesis, chemotaxis, differentiation, and metabolism, all of which are important to healing and regeneration after musculoskeletal injury. Further high-quality evidence is required for PRP and biologics to identify areas of efficacy, specific indications, and formulations for which a treatment effect exists in orthopedic surgery.

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Martin Kolb, ... Jack Gauldie, in Asthma and COPD (Second Edition), 2009

Summary

Of the many cytokines and growth factors that are found within the tissue or surrounding fluids in COPD and asthma, only a few can be shown to have direct impact on the process of tissue remodeling. *In vitro* and *in vivo* studies outlined above indicate that factors such as TGF-β, which induces chronic repair without accompanying tissue injury, and IL-1β, which induces tissue injury and chronic repair, likely through induction of TGF-β, may be considered the most critical targets for intervention. The fact that these growth factors act mainly at a local site in association with matrix helps explain the progressive and tissue-restricted nature of remodeling. Development of potent inhibitors of these growth factors or of genes activated downstream of them could prove beneficial in modifying the altered tissue in asthma and COPD allowing conjoint therapy with anti-inflammatory drugs, preferably delivered to the local remodeled site, to halt the destructive process and return the lung to normal function.

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Thomas F. Deuel, Yunchao Chang, in Principles of Tissue Engineering (Fourth Edition), 2014

Other Roles of Growth Factors and Cytokines

A growing appreciation for roles of growth factors in many normal and abnormal processes is emerging from numerous other investigations of a diverse nature. For example, TGF-α and TGF-β are expressed with high specificity in developing mouse embryo [150,151], PDGF may mediate normal gliogenesis [87]; maternally encoded FGF, TGF-β, and PDGF have been implicated as important in the developing Xenopus embryo [152–154]; and bFGF is a potential neurotrophin during development [155]. PDGF also has been identified within plaques and is a potent vasoconstrictor and thus has been implicated in the genesis of atherosclerosis [156,157]. Furthermore, PDGF is secreted from endothelial cells and arterial smooth muscle cells [37,158–162] and activated monocytes/macrophages [160]. Elevated levels of PDGF receptors are found in synovial cells in patients with rheumatoid arthritis [162]. In each instance, however, when the *in vitro* studies are considered in the context of roles of the growth factors in inflammation and tissue repair, it seems likely that common roles of growth factors are associated with normal development and the abnormal remodeling is associated with disease states, indicating the importance of attention to mechanisms that regulate cell type and temporal levels of expression of the growth factors and their cognate receptors.

Principles of Tissue Engineering

F. Akter, in Tissue Engineering Made Easy, 2016

2.5 Growth Factors

Growth factors are soluble signaling molecules that control cellular responses through specific binding of transmembrane receptors on target cells. Growth factors applied to a cell–scaffold construct can help promote tissue regeneration in comparison to non-use of growth factors (Ikada, 2006). Growth factors that have been used