

# CYTOKINES AND GROWTH FACTORS ( INCLUDES TNF, INTERLEUKINS ETC)



Cytokines are a large and diverse family of polypeptide regulators, signaling proteins and glycoproteins, which- like hormones and neurotransmitters- are critical to the development and functioning of both innate and adaptive immune response, as well as to other body systems. While hormones are secreted from specific organs to the blood and neurotransmitters are related to neural activity, cytokines are more of a diverse category or class of compounds in terms of origin and function.

These signaling molecules, historically known as immunomodulating agents (e.g. interferons, interleukins) like neurotransmitters, hormones and growth factors, function as mediators, directly and indirectly, in cellular communication by triggering specific cellular reactions or responses in target tissues and organs throughout many areas of the body, or to distinct, specific cells. Neurotransmitters act in a similar fashion when released at an axon terminal of a neuron that eventually locks on to a specific receptor site or target impacting another neuron, muscle or gland cell. Growth factors like cytokines are secreted by a variety of cells and bind to or lock on to specific high-affinity cell-surface target receptors, thereby eliciting similar or more specific biochemical changes through a cascade of events. Whereas the effects of cytokines include autocrine, endocrine and paracrine activity relative to target organ or cell-receptor site, growth factors not only elicit a cascade of events by participating in the regulation of cell growth and differentiation, but also by promoting replication and similar complex processes.

The cytokine family includes a variety of colony and growth-stimulating factors, interferons, interleukins, chemokines and other molecules that exhibit pleiotropic effects and considerable redundancy. They may act on the cellular level such as in cell differentiation, through tissue development, homeostasis, and in certain developmental processes, during embryogenesis. Due to the fact that they are characterized by such general effects and hence are often difficult to objectively characterize, such aforementioned distinctions, allowing for exceptions, are for the most part null and void. Nevertheless, this much is known about them. These distinct effects are multi-fold and depend upon, inter alia:

- The specific cytokine per se.
- The abundance or concentration of the cytokine relative to its location or target receptor.
- The complementary high-affinity receptor site or sites (presence and abundance).
- The quality of downstream signals triggered by the interaction of receptor binding activity.

For example, a variety of cytokines and growth factors influence the invasive properties of extravillous trophoblast and surrounding cells. Of these, Epidermal Growth Factor (EGF), Insulin-like Growth Factor II (IGF-II), Transforming Growth Factor  $\beta$  (TGF- $\beta$ ) and Granulocyte-Macrophage Colony Stimulating Factor (GM-CSF) and others have been extensively studied in human implantation. Over fifty different proteins that function as growth factors have been isolated and identified with many more possibilities on the horizon. While some growth factors affect a broad range of cell types (e.g. EGF, PDGF) others are much more specific. Nerve Growth Factor (NGF), for instance, promotes the growth of certain classes of neurons, while erythropoietin stimulates red blood cell precursors triggering cell division. Most mammalian cells in culture need a combination of different growth factors and/or cytokines to impact the various controls that inhibit cell division or to elicit other more receptor-specific and distinct effects.

Biological Industries' Cytokines and Growth Factors are manufactured under strict and vigorous Quality Assurance Protocols and comply with verifiable product specifications. They are of the highest quality, exhibit high levels of bioactivity performance and are competitively priced.

Cytokines	Growth Factors
Adiponectin (10 products)	Colony Stimulating Factor (14 products)
Angiopoietin (4 products)	CTGF (3 products)
Apolipoprotein (8 products)	Epidermal Growth Factor (6 products)
B-cell Activating Factor (3 products)	Erythropoietin (2 products)
Beta Defensin (4 products)	Fibroblast Growth Factor (21 products)
Bone Morphogenetic Protein (8 products)	Galectin (2 products)
B type Natriuretic Peptide (3 products)	Growth Hormone (21 products)
Endoglin (3 products)	Hepatocyte Growth Factor (3 products)
Fli-3 Ligand (3 products)	Insulin-Like Growth Factor (10 products)
Hedgehog Protein (2 products)	Insulin (3 products)
Interleukin (92 products)	Keratinocyte Growth Factor (2 products)
Interferon (19 products)	Leptin (25 products)
	Macrophage Migration Inhibitory Factor (4 products)
Resistin (9 products)	
Thrombopoietin (3 products)	Myostatin (3 products)
Trefol Factor (5 products)	Noggin (2 products)
Tumor Necrosis Factor (11 products)	PDGF (9 products)
Visfatin (3 products)	Placental Lactogen (3 products)
Other (13 products)	Prolactin (14 products)
	Stem Cell Factor (4 products)
	Transforming Growth Factor (4 products)
	VEGF (18 products)
	Other (18 products)

