

## Significance of Neurotransmitters in Cell Signaling

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### DESCRIPTION

Peptides, which range in size from a few to over a hundred amino acids, are the most diverse signaling molecules found in animals. Peptide hormones, neuropeptides, and a wide range of polypeptide growth factors are the signaling molecules in this category. Insulin, glucagon, and the hormones generated by the pituitary gland are all examples of peptide hormones (growth hormone, follicle-stimulating hormone, prolactin, and others).

Like small-molecule neurotransmitters, some neurons release neuropeptides. For example, Enkephalins and endorphins, work not just as neurotransmitters at synapses but also as neurohormones which act on distant cells. Because of their activity as natural analgesics that reduce pain responses in the central nervous system, enkephalins and endorphins have been extensively investigated. They are naturally occurring chemicals that bind to the same receptors on the surface of brain cells as morphine [1].

Polypeptide growth factors are signaling molecules that affect the growth and differentiation of animal cells. Rita Levi-Montalcini discovered the first of these factors (Nerve Growth Factor, or NGF) in the 1950s. NGF is a member of the neurotrophin family of polypeptides, which govern the development and survival of neurons. Stanley Cohen identified an unrelated substance (named Epidermal Growth Factor, or EGF) that increases cell proliferation while doing tests on NGF. Epidermal Growth Factor (EGF), a 53-amino-acid polypeptide, has served as the prototype for a wide range of growth factors that regulate animal cell proliferation during embryonic development and in adults [2].

The activity of Platelet-Derived Growth Factor (PDGF) in wound healing is a notable example of growth factor action. PDGF is a protein that is held in blood platelets and released when blood clots at a wound site. It then stimulates the multiplication of fibroblasts in the area of the clot, assisting in the regeneration of injured tissue. Cytokines are a wide group of polypeptide growth factors that affect the formation and differentiation of blood cells as well as the actions of lymphocytes during an immune response [3]. Other polypeptide growth factors (membrane-anchored

growth factors) gets attached to the plasma membrane rather than being released into extracellular fluids, by acting as signaling molecules only during direct cell-cell interactions.

The peptide hormones, neuropeptides, and growth factors cannot permeate the plasma membrane of their target cells, they must attach to cell surface receptors. Abnormalities in growth factor signaling are the basis for a number of disorders, including many types of cancer, therefore the polypeptide growth factors play a vital role in controlling cell proliferation. For example, abnormal expression of an EGF receptor is a significant contributor to the development of many human breast and ovarian malignancies [4].

### CONCLUSION

Neurotransmitters are chemical messengers that transport messages between neurons or from neurons to other cells (such as muscle cells). Acetylcholine, dopamine, epinephrine (adrenaline), serotonin, histamine, glutamate, glycine, and amino butyric acid are some of the hydrophilic molecules. An action potential at the neurons terminal signals causes the release of neurotransmitters. The neurotransmitters then diffuse across the synaptic cleft and bind to receptors on the cell surface of the target cell. Some neurotransmitters also includes hormones. Epinephrine, for example, is a neurotransmitter that also serves as a hormone generated by the adrenal gland to trigger the breakdown of glycogen in muscle cells.

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