

# Extracellular and Intracellular Signalling Molecules Involved in Signalling Pathway

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## DESCRIPTION

Cells are able to sense and respond to substances present in their external environment. The ability of respond to external stimuli enhances a cell's chances of survival, especially in multicellular organisms. Chemicals that could pass into cells and bind directly to proteins inside the cell and modulate their activities.

In animals, secreted molecules can be classified into three types. They are: Endocrine signalling, Paracrine signalling and Autocrine signalling. In endocrine signalling, signalling molecules called hormones act on target cells distant from their site of synthesis by cells of endocrine organs. In paracrine signalling, the signalling molecules released by a cell only affect target cells in close proximate to it. In autocrine signalling, cells respond to substances that they themselves release.

## Signalling molecules involved in signalling pathways

Signalling molecules are the molecules that are responsible for transmitting information between cells in the body. Most of them have been conserved in evolution. Different types of cells respond differently to same signal molecules.

These are of two types. They are Extracellular Signal Molecules and Intracellular Signal molecules.

**Extracellular signal molecules:** Extracellular molecules are critical regulators of physiology and development in organisms. There are many different types of signals including peptides, small lipophilic molecules, small hydrophilic molecules and gases. Binding of extracellular signalling molecules to cell surface receptors trigger intercellular pathways that ultimately modulate cellular metabolism, function and development.

Extracellular Signal Molecules are Peptide hormones, Steroid hormones, Prostaglandins and Nitric oxide.

**Peptide hormones:** These are water soluble molecules and they all bind to cell surface receptors such as insulin, growth factors and glucagon etc.,

**Steroid hormones:** These are lipid soluble molecules and they interact with receptors in cytosol or nucleus.

**Prostaglandins:** Prostaglandins are lipid autacoids derived from arachidonic acid and they play a major role in the generation of inflammation responses, they act as autocrine and paracrine factors.

**Nitric oxide:** NO diffuses freely across cell membranes and it is quickly consumed where it is synthesized.

**Intracellular signal molecules:** Intracellular Signal molecules relays signals received at receptors, ultimately results in signalling cascade and it transduce and integrate signals before relaying a signal forward and intracellular signalling complexes enhance the speed, efficiency and specificity of the response. Many intracellular signalling molecules functions as Molecular switches.

Intracellular Signal Molecules are G Proteins (GTPase switch proteins) and Protein kinases.

**G Proteins (GTPase switch proteins):** GTPase switch protein signals results in the release of GDP and the binding of abundant GTP and after a short period of time they hydrolyse GTP and come back to their off state.

**Protein kinases:** Protein kinases add phosphate groups to themselves and other proteins are at either serine/threonine, or at tyrosine residues. Their activity can be regulated by second messengers, interaction with other proteins or by phosphorylation itself.

## CONCLUSION

The responses in the body are carried out by the cells and are passed through a chain of chemical messengers within the cells. This results in changes in the cell such as alteration in the gene activity or the entire process. Thus, an intercellular signal gets converted into an intracellular signal that stimulates a response.

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