

HORMONES

A **hormone** (from Greek "impetus") is a chemical released by a cell, a gland, or an organ in one part of the body that affects cells in other parts of the organism. Only a small amount of hormone is required to alter cell metabolism. In essence, it is a chemical messenger that transports a signal from one cell to another. All multicellular organisms produce hormones; plant hormones are also called phytohormones. Hormones in animals are often transported in the blood. Cells respond to a hormone when they express a specific receptor for that hormone. The hormone binds to the receptor protein, resulting in the activation of a signal transduction mechanism that ultimately leads to cell type-specific responses.

STEROID HORMONES

Steroid hormones are crucial substances for the proper function of the body. They mediate a wide variety of vital physiological functions ranging from anti-inflammatory agents to regulating events during pregnancy. They are synthesized and secreted into the bloodstream by endocrine glands such as the adrenal cortex and the gonads (ovary and testis).

Five classes of steroid hormones:

- 1. ANDROGENS
- 2. ESTROGENS
- 3. PROGESTINS
- 4. MINERALOCORTICOIDS
- 5. GLUCOCORTICOIDS

Both androgens and estrogens affect sexual development and function. They regulate sexual differentiation, the secondary sex characteristics, and sexual behaviour patterns. A second class of ovarian steroids, C-21 compounds called progestins. Progestins help mediate the menstrual cycle and pregnancy. The mineralocorticoids largely function to regulate the excretion of salt and water by kidney. The glucocorticoids affect carbohydrate, protein, and lipid metabolism in manner nearly opposite to that of insulin, and influence a wide variety of other vital functions including inflammatory reactions and the capacity to cope with stress.

FUNCTION / ROLE:

While all steroids contain the four-ring structure of the sterol nucleus and are remarkably similar in structure, they have enormous differences in their physiological effects. In vertebrates, steroid hormones function as genetic regulators, controlling the rate of synthesis of a particular protein. Steroid hormones are crucial for many enzymatic reactions, the glucocorticoids trigger a variety of cellular responses including the synthesis of second messengers such as cAMP in the short term and the modulation of protein synthesis in the long term. On the molecular level, the enzymatic reaction rates are controlled by phosphorylation and dephosphorylation by increasing the reaction cascades. The administration of estrogens (female sex hormone) such as B- estradiol causes chicken oviducts to increase their ovalbumin mRNA level from ~ 10 to ~ 50,000 molecules per cell. Similarly in insects, the steroid hormone ecdysone mediates several aspects of larval development.

Steroid hormones, which are non-polar molecules, simply pass through the plasma membranes of their target cell to the cytosol where they bind to their respective receptors. The steroid hormone penetrates the cell membrane and moves through the cytoplasm to the nucleus; it then couples with the receptor protein, forming a hormone receptor complex.

The steroid receptor complexes, in turn enter the nucleus where they bind to specific chromosomal enhancers so they can induce or repress, the transcription of their associated gene. The action of eukaryotic steroid receptors therefore appear to resemble that of transcriptional regulators such as E. coli complex.

For instance, different cell types may have the same receptor for a given steroid hormone and yet synthesize different proteins in response to the hormone. Only some genes are made available for activation by that steroid.

The following steroid hormones (glucocorticoids, mineralocorticoids, estrogens, androgens, progestines, and vitamin D) will be defined according to their origin and their major effects.

Glucocorticoids

Glucocorticoids originate in the adrenal cortex and affect mainly metabolism in diverse ways; decrease inflammation and increase resistance to stress.

Mineralocorticoids

Mineralocorticoids originate in adrenal cortex and maintain salt and water balance.

Estrogens

Estrogens originate in the adrenal cortex and gonads and primarily affect maturation and function of secondary sex organs (female sexual determination).

Androgens

Androgens originate in the adrenal cortex and gonads and primarily affect maturation and function of secondary sex organs (male sexual determination).

Progestins

Progestins originate from both ovaries and placenta, and mediate menstrual cycle and maintain pregnancy.

Androgens and estrogens play a major role in the development of both sexes secondary characteristics. Androgens, or testosterone and androsterone give the male its sex characteristics during puberty and for promoting tissue and muscle growth. Estrogens, or estrone and estradiol are forms of testosterone synthesized in the ovaries, which control female secondary characteristics and regulation of the menstrual cycle. Another sex hormone is needed for preparing the uterus for implantation of the ovum, this hormone is progesterone.

Hormones are needed throughout the body for various functions, however, just as important as these function is the regulation and control of these steroids.
