**Lecture 23 – Endocrine System**

In this lecture, you will learn how endocrine system functions, characteristics of different hormones, specific organs that produce hormones and the function of those hormones.

* Endocrine systems coordinate body activities (digestion, metabolism).
  + transmits (hormones) to receptive cells throughout the body via (blood)
  + affects one or more regions throughout the body
  + relatively slow acting, but long-lasting effects
* There are many different kinds of signaling systems. Know what endocrine signaling is and how it is different from other signaling systems (Fig. 45.1).
  + Endocrine signaling: cell releases chemical signals into blood stream
  + Paracrine signaling: cell releases signals to affect adjacent cells
  + Autocrine signaling: cell releases signals to affect itself
  + Synaptic signaling: one neuron to another neuron
  + Neuroendocrine signaling: nerve cell releases neuro-chemicals into blood stream

\* Endocrine and neuroendocrine signaling reach target cells through bloodstream.

* Hormones are the signal molecules for the endocrine system.
  + Secreted by (Endocrine cells).
  + Endocrine cells are found in organs or form endocrine glands.
  + Bind only to target cells with specific receptors.
  + Regulate reproduction, development, energy metabolism, growth, behavior, etc.
* Hormones vary in characteristics and the solubility determines the location of receptors in target cells.

Water-soluble

Fat-soluble

Types: Polypetides, Amine Types: Steroid, Amine

Insulin 🡪 (Epineprine)

Receptor: Plasma membrane Receptor: Cell nucleus

Target response: Target response:

Change in cytoplasmic function Bind to intracellular signal receptor,

or glue transcription activity glue transcription

* One hormone can have different effects in different targets.
  + Epinephrine example
    - In liver cell: glycogen breaks down & glucose released from cell
    - In skeletal muscle blood vessel: dilates vessels
    - In intestinal blood vessel: vessel constricts
* There are many endocrine glands and organs containing endocrine cells. You need to be able to identify the following organs and the hormones (and functions) of these organs.
  + - * Figure 45.21 \*\*\*\*
  + Hypothalamus:
    - Hormone:
    - Action:
  + Pineal gland:
    - Hormone:
    - Action:
  + Thyroid gland:
    - Hormone:
    - Action:
  + Parathyroid glands:
    - Hormone:
    - Action:
  + Pancreas:
    - Hormone:
    - Action:
  + Adrenal glands:
    - Hormone:
    - Action:
* Posterior pituitary gland produces antidiuretic hormone (ADH) regulates blood osmolarity. Produces oxygen (uterus contraction)
  + Normally, blood osmolarity is 300mOsm/L. If it increases, osmoreceptor in hypothalamus triggers the release of ADH from posterior pituitary gland.
  + ADH (Antidivertic hormones) water permeability in the nephron, which leads to more water reabsorption.
* Anterior pituitary gland is a master gland that produces many hormones. Specifically it produces many (tropic) hormones, which regulate the function of endocrine cells or glands.
* Growth hormone is one of the hormones produced by (aepithitay glad) gland. A benign tumor of the pituitary gland can cause continuous and excessive growth hormone production, which results in a condition known as the (acromegaly).
* Thyroid gland produces hormones to stimulate and maintain (metabolic process).
  + Too little thyroid function (weight gain, lethargy, intolerance to cold)
  + Too much thyroid function (high body temperature, sweating, weight loss, irritability, high blood pressure)
* Parathyroid glands (PTH) produce hormones to regulate blood (calcium) level.
  + If blood calcium level falls below the normal range, PTH stimulates calcium uptake in ( ) of the excretory system and (kidney) in the digestive system, and also stimulates calcium release from (kidney & bone).
* Pancreas produces hormones that regulate blood (glucose) level.
  + Insulin: (lowers) blood glucose level (produced from beta cells)
  + Glucagon: (increases) blood glucose level (produced from alpha cells)
  + Both are water-soluble, polypeptide hormones.
  + You need to know the homeostasis of blood glucose level. Learn Fig. 45.13.
* Diabetes is the deficiency of (insulin) or decreased response to (insulin) in target tissues.
  + Type 1 diabetes: insulin-dependent diabetes, autoimmune disorder (immune system destroys beta cells of pancreas)
  + Type 2 diabetes: non-insulin-dependent diabetes, target cells fail to take up glucose from blood, resulting in general insulin-deficiency
* Adrenal glands produce hormones in response to (stress). \*\*on top of kidney \*\*
  + For short-term stress, adrenal glands produce epinephrine and norepinephrine.
    - Fight-or-flight response:

- Increased blood (glucose): Why?

Tissues refine(?) more energy (chem. Fuel)

- Increase blood (pressure): Why?

Chemical fuel & oxygen 🡪 necessary to be pump faster

- Increased (metabolic rate) rate: Why?

Increased alertness

- Change in blood flow patterns (increased alertness, decreased digestive, excretory, and reproductive system activities): Why?

* + For long-term stress, adrenal glands produce mineralocorticoids and glucocorticoids.