**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 ( ) to receptive cells throughout the body via ( )
  + 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:
  + Paracrine signaling:
  + Autocrine signaling:
  + Synaptic signaling:
  + Neuroendocrine signaling:

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

* Hormones are the signal molecules for the endocrine system.
  + Secreted by ( ).
  + 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: Types:

Receptor: Receptor:

Target response: Target response:

* One hormone can have different effects in different targets.
  + Epinephrine example
    - In liver cell:
    - In skeletal muscle blood vessel:
    - In intestinal blood vessel:
* 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.
  + 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.
  + Normally, blood osmolarity is 300mOsm/L. If it increases, osmoreceptor in hypothalamus triggers the release of ADH from posterior pituitary gland.
  + ADH ( ) 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 ( ) hormones, which regulate the function of endocrine cells or glands.
* Growth hormone is one of the hormones produced by ( ) gland. A benign tumor of the pituitary gland can cause continuous and excessive growth hormone production, which results in a condition known as the ( ).
* Thyroid gland produces hormones to stimulate and maintain ( ).
  + 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 ( ) level.
  + If blood calcium level falls below the normal range, PTH stimulates calcium uptake in ( ) of the excretory system and ( ) in the digestive system, and also stimulates calcium release from ( ).
* Pancreas produces hormones that regulate blood ( ) level.
  + Insulin: ( ) blood glucose level (produced from beta cells)
  + Glucagon: ( ) 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 ( ) or decreased response to ( ) 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 ( ).
  + For short-term stress, adrenal glands produce epinephrine and norepinephrine.
    - Fight-or-flight response:

- Increased blood ( ): Why?

- Increase blood ( ): Why?

- Increased ( ) rate: Why?

- 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.