THE HUMAN ENDOCRINE SYSTEM

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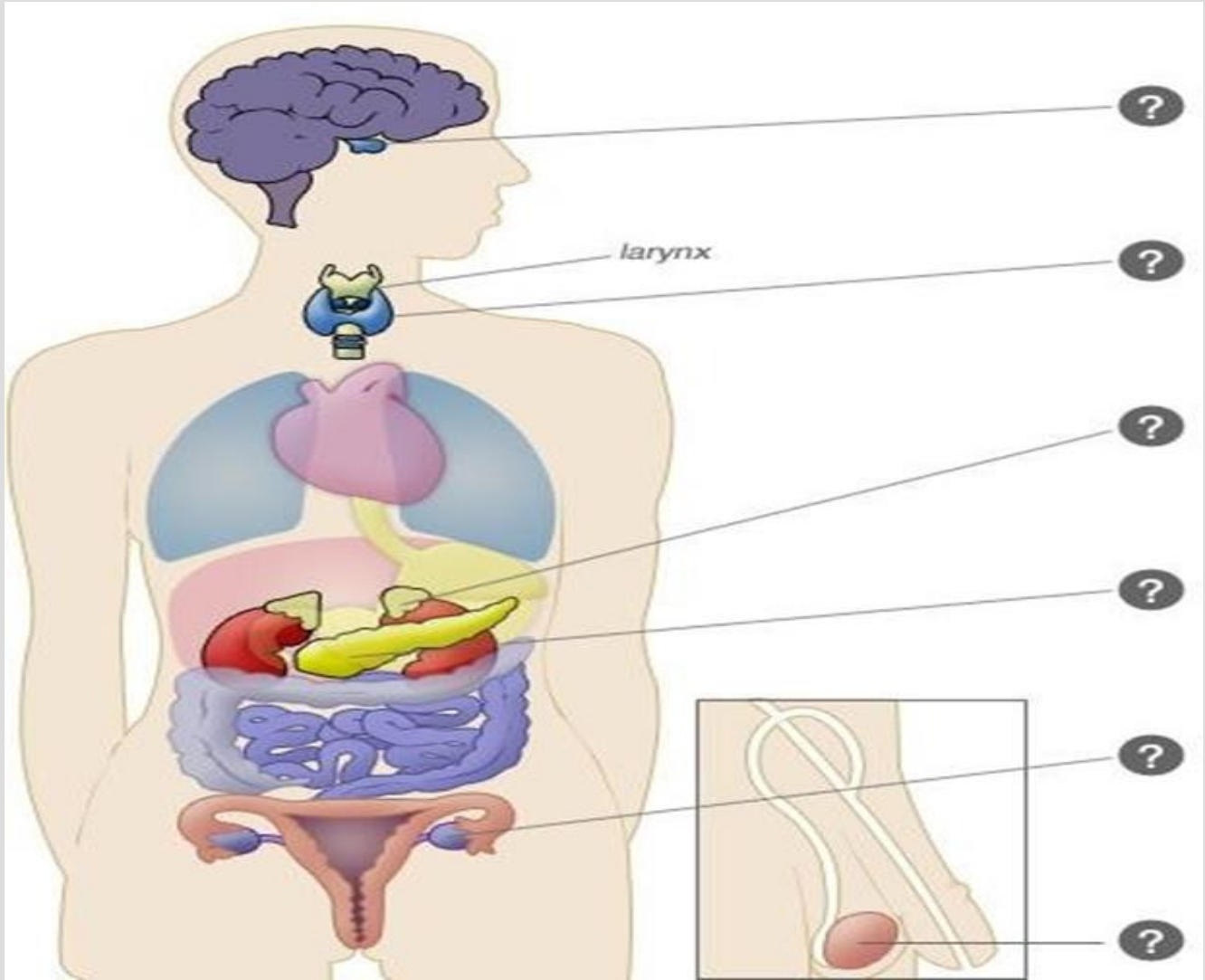
- In humans, special chemicals called hormones play a major role in the maintenance of homeostasis because they help regulate and coordinate the functions of all organ systems.

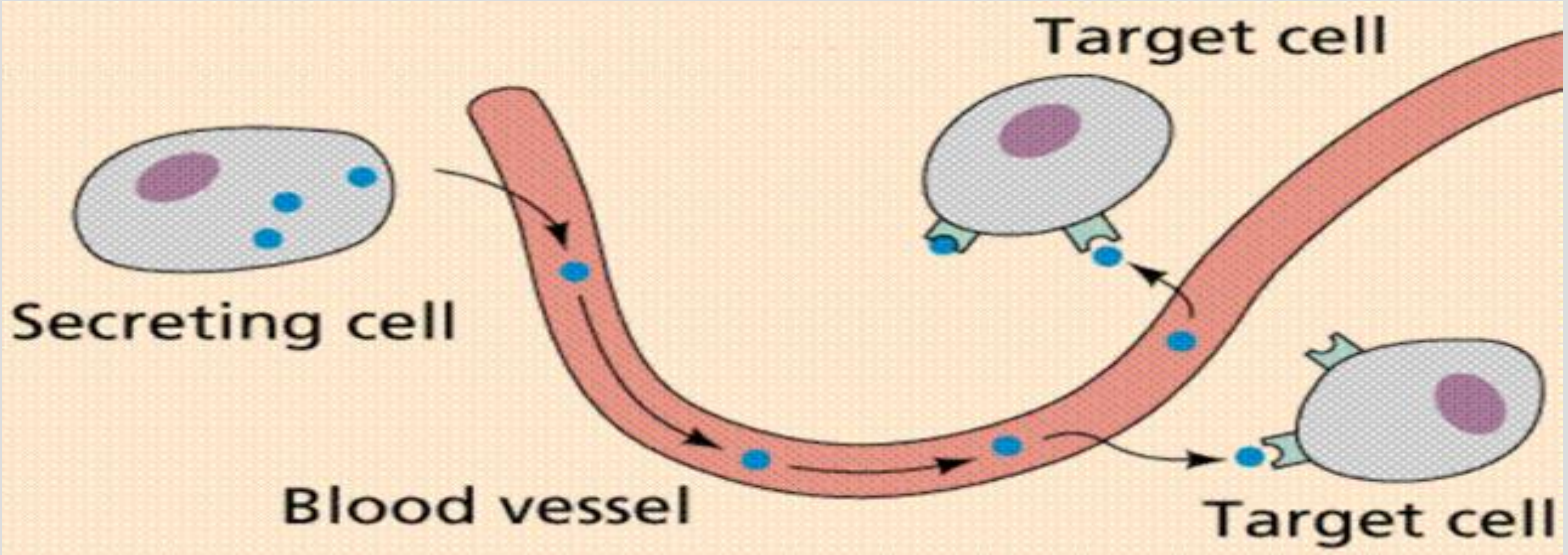
- **Hormone** – a compound released by one type of cell that has an effect on other cells of the body
  - ➔ Are manufactured by special cells in organs called **glands** and are released into the
    - bloodstream

- **Endocrine system** – the organ system that regulates internal environmental conditions by secreting hormones into the bloodstream

MAJOR GLANDS OF THE HUMAN ENDOCRINE SYSTEM



- ➔ Although hormones secreted into the bloodstream reach all cells of the body, they only affect certain target cells
- ➔ Cells of the body have different hormone receptors on the surface of their cell membrane that attach only certain hormone molecules



PITUITARY GLAND (AKA "MASTER GLAND")

- Size of a pea
- Located near the base of the brain
- Secretes more types of hormones than any other endocrine gland
- Divided into two lobes: 1. Anterior lobe 2. Posterior lobe

- ➔ Neurons in the **hypothalamus** secrete **hormone-releasing factors** that control the secretion of various hormones in the anterior lobe of the pituitary gland
- ➔ The anterior pituitary then secretes hormones that control the hormone secretions of other glands in the body (master gland… yet it is still controlled by the hypothalamus!)

HORMONES PRODUCED AND SECRETED BY THE ANTERIOR PITUITARY

Hormone	Target	Primary Function
Thyroid-stimulating Hormone (TSH)	Thyroid gland	Regulates cell metabolism
Adrenocorticotropic Hormone (ACTH)	Adrenal Gland	Stress responses
Growth Hormone (GH)	Most Cells	Promotes growth
Follicle-stimulating Hormone (FSH)	Ovaries & Testes	Females: follicle development in ovaries Males: development of sperm cells in testes
Luteinizing Hormone (LH)	Ovaries & Testes	Females: stimulates ovulation and formation of the corpus luteum Males: production of testosterone
Prolactin (PRL)	Mammary Glands	Stimulates and maintains milk production in lactating females

HORMONES PRODUCED AND SECRETED BY THE POSTERIOR PITUITARY

Hormone	Target	Primary Function
Oxytocin	Uterus & Mammary Glands	Initiates strong contractions Triggers milk release in lactating females
Antidiuretic Hormone (ADH)	Kidneys	Increases water reabsorption in the kidneys

THE FIGHT OR FLIGHT RESPONSE (NERVOUS HORMONAL INTERACTION)

- When in danger or feel stressed the sympathetic nerves of the body…
  - Increase heart rate
  - Redirect blood flow away from the skin to the muscles (contract blood vessels in the skin and dilate those in the muscles)
  - Dilate the pupils (improves peripheral vision)

- ➔ All are nervous actions that prepare your body to deal with the potential danger
- ➔ Fight or Flight Response = fight the cause of danger or run away from it
- Sympathetic nerves also stimulate the adrenal glands to secrete the hormone **adrenaline**.

ADRENALINE

- ✓ Increases heart rate and blood pressure
- ✓ Causes perspiration
- ✓ Increases muscle tension
- ➔ These effects would be harmful to the body if continued for an extended period of time
  - ➔ The parasympathetic nerves prevent this from happening by returning the body to normal conditions when the dangerous or stressful situation has ended

PSYCHOACTIVE DRUGS AND HOMEOSTASIS

- **Psychoactive drugs** – legal and illegal drugs that affect the nervous system and disturb its ability to receive and process information about the internal and external environment
  - ➔ Changes in the nervous system may also affect the functions of the endocrine system
- **Stimulant** – a drug that speeds up the action of the central nervous system, causing an increase in heart and breathing rates (ex) Caffeine
- **Depressant** – a drug that slows down the action of the central nervous system, causing a decrease in heart and breathing rates (ex) alcohol
- ➔ Both stimulants and depressants cause the normal homeostatic level to change

PSYCHOACTIVE DRUGS AND HOMEOSTASIS

- **Neurotransmitter** – a chemical that transmits nerve-cell impulses from one nerve to another; is released from one nerve cell and attaches to receptor sites on another nerve cell
    - ➔ Psychoactive drugs interfere with the movement of neurotransmitter molecules or their attachment to receptors
- ➔ <u>Depressants</u>: delay the affect of neurotransmitters by slowing the reaction of connecting nerves (ex) tranquillizers, barbiturates and alcohol

- ➔ <u>Stimulants</u>: prevent the neurotransmitters from breaking down or recycling; they remain on their receptor sites longer than normal and result in the nerve firing more frequently
    - (ex) cocaine, nicotine and caffeine

ALCOHOL (DEPRESSANT)

- Most widely used and abused psychoactive drug
- Slows the heart and thus lowers oxygen delivery to the tissues of the body
- Affects nerve cells in the brain that control the hormone that regulates water reabsorption in the kidneys (kidneys' ability to reabsorb water is impaired and urine output increases)
- This loss of fluids affects blood pressure
- Alcohol is easily broken down and used for energy… this causes other nutrients (fats etc.) to be broken down and stored in the liver as they are not needed. The accumulation of fats in the liver causes cirrhosis (normal liver cells are replaced by fats)

NICOTINE (STIMULANT)

- Most widely used and additive stimulants
- When inhaled, it reaches the brain in 10 seconds
- Nicotine binds to receptor sites in the brain and gives a feeling of pleasure (same as cocaine)
- Increases heart and breathing rates, increases cell metabolism
- Nerve cells in the brain adjust to prolonged exposure of nicotine and produce fewer neurotransmitters. Neurons become less sensitive to drug and more is needed to maintain the
- same pleasurable feeling = **addiction**

MARIJUANA (STIMULANT)

- Mixture of dried leaves, stems etc. of the hemp plant
- Hashish or hash oil are stronger forms
- Contain THC and 400 other dangerous chemicals
- Effects on the user depends on the strength of the THC
- Some short term effects: memory and learning problems, distorted perceptions, loss of coordination, increased heart rate and anxiety

ECSTASY (STIMULANT)

- Aka “Adam or X-TC”
- Synthetic drug with hallucinogenic properties
- Stimulating effects similar to that of amphetamines (speed) and cocaine
- Psychological effects: confusion, depression, sleep problems, anxiety and paranoia
- Physical effects: muscle tension, teeth clenching, nausea, blurred vision, faintness, sweating and increases heart rate and blood pressure
- Destroys brain neurons that regulate mood, aggression, sexual activity, sleep and pain sensitivity

NARCOTICS (DEPRESSANT)

- Are psychoactive drugs that relive pain (painkillers) and make you sleepy
- Include opium (from the opium poppy plant)
- Examples: codeine (common prescription liquid or pill painkiller taken by mouth), morphine and heroin (injected into a muscle or in the bloodstream)
- Heroin is most widely abused narcotic
- Are highly addictive, short term effects: drowsiness, loss of pain, nausea and urinary problems

TREATING SUBSTANCE ADDICTION

- ➔ Counselling and medication are two common treatments
- ➔ Marijuana – no treatment
  - ➔ Alcoholism – prescription medicines Antabuse and Temposil (give unpleasant side effects when mixed with alcohol – nausea, headaches)
  - ➔ Nicotine – nicotine patch or gum (nicotine replacement therapies), steady controlled release of nicotine to reduce cravings
- ➔ Narcotics – counselling and morphine-like drug called methadone

IN GENERAL

- ✓No single treatment is appropriate for all individuals
- ✓Addicts may begin using the drug again during or after treatment
- ✓Recovery from a severe drug addiction is a long-term process requiring many forms of treatment