

Doctoral School: **Biology Doctoral School**
Doctoral Program: Neuroscience and Human Biology

Subject code: **BIO/7/53**

Subject title: **Regulatory biology L**

Teacher and Neptun code: **Dr. Világi Ildikó (GYVVCB)**

Credits: 4

Class hours: 3 hours/week, lecture

Aim of the course

The lectures provide an insight about the homeostatic regulatory processes and the interactions of endocrine, hormonal and nervous system. Complex phenomena like rhythmic processes, stress and the organization of behaviour are also discussed.

Course contents

- Communication between cells I. Contact communication: cell adhesion molecules and gap junctions. Cell interactions in tissue, extravasation of blood cells, inflammation, electrical synapse.
- Communication between cells II. Intercellular communication via diffusible messengers: metabolic, paracrine, autocrine, endocrine and neurocrine communication.
- Homeostasis. The organism as a system. The notion and characteristics of a system, elements and interactions within the living organisms as a system. Cooperation of regulatory systems.
- Metabolic integration of the organism I. Phases of nutrition and metabolism: preabsorptive, absorptive and postabsorptive phases. Role of enteral hormones in nutrient processing, gastro-entero-pancreatic interactions.
- Metabolic integration of the organism II. Metabolically active parts of the body (liver, muscle, fat tissue, kidneys, blood, nervous tissue. Metabolic homeostasis. Regulation of food intake: hunger and satiety; peripheral and central factors.
- Regulation of volume, osmolarity and pH of body fluids I. Urine production and water intake. Regulation of urine concentration and dilution: interactions of ADH, aldosterone, ANP and angiotensin. Thirst and drinking. Relationship of cellular metabolism and osmosis. Osmotic regulation of food and nutrient processing.
- Regulation of volume, osmolarity and pH of body fluids II. Buffer systems of body fluids (chemistry, biology). Effects of respiration and kidney on the pH of body fluids. Ca⁺⁺ metabolism, bone build-up and degradation.
- Interactions of nervous, endocrine and immune system I. Integrative functions of hypothalamus and limbic structures. Neuro-endocrine and endocrine-neuro relationships.
- Interactions of nervous, endocrine and immune system II. Immuno-neuromodulation. Neuronal effects of immune cells and lymphokines. Interactions of the monocyte-macrophag system and the nervous system. Fever and acute phase reaction. Common contact communication of the immune and nervous system.
- Organization of behavior. Representation of outer and inner environment: motivation and emotion. Patterns of action and reaction.
- Rhythmic functions I. Circadian rhythms, structural and functional background of sleep-wake cycle regulation.
- Rhythmic functions II. Longer rhythms, adaptation to environmental factors.
- Stressors and in vivo stress responses. Physiology of stress response. Stress and brain neurotransmitter systems. Emotions. Stress and diseases. Civilization cardiovascular diseases. The meaning and disturbance of homeostasis. Types of stress: physiological and psychological (social). Phases of stress response: acute phase, general adaptation syndrome, exhaustion.
- Stressors and stress responses, cellular reactions. Stress proteins. Molecular mechanisms during cellular stress reactions.

Requirements

Written exam

Literature

Ppt slides available online, circa 350 slides