

Programma di Fisiologia Umana
CORSO DI LAUREA MAGISTRALE IN ODONTOIATRIA E
PROTESI DENTARIA
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Cell Physiology

The intra and extracellular compartments

Cell membrane: channels transporters and receptor

Mechanism of signal transduction

The nuclear receptors and control of gene transcription

The electrochemical gradient: cell excitability

Membrane potential: excitatory and inhibitory post synaptic potentials, the action potential

Electrical impulse transmission

The synapse, neurotransmitters

The muscle

Different muscle cell types: skeletal, cardiac and smooth muscle fibers

Membrane potential and contraction properties of the different muscle fibers

From synaptic junction to the cell contraction

The respiratory system

Respiratory system structures: the respiratory tract, the blood circulation, and the neuronal innervations.

Inspiratory and expiratory muscles

Central control of breathing: the chemosensors

Respiratory volumes and frequency

Compliance elastance, surfactant

Gas pressures and exchanges, hemoglobin and gas transport

The urinary system

Kidney structure

The functional unit, nephron, cortical and medullary nephrons

Filtration, reabsorption, secretion and excretion

Renal blood flow, glomerular filtration velocity, renal clearance.

Tubule-glomerular feedback

Molecule involved in the reabsorption, pH control

Volemia and osmolarity, baroreceptors and chemoreceptors

Salt-water balance: hormonal controls and tissues targets.

Central controls of body homeostasis

Hypothalamus as the main regulatory center of body homeostasis.

Relationship between endocrine system, autonomic nervous system and limbic system

Hypothalamus and circumventricular organs

Epiphysis, melatonin and circadian rhythms

The Autonomic Nervous System

Anatomy of the ANS: Sympathetic, Parasympathetic and Enteric

Neurotransmitters and the target organs

Gastroenteric System and the cell metabolism

Structure and function of the gastroenteric organs

Exocrine and endocrine cells

Digestion and absorption

The nutrients: glucids, lipids, proteins and vitamins

Tissue nutrient storages

In particular: the salivary glands: composition, blood circulation and neuronal innervations.

Salivary composition

The digestion and absorption on the oral cavity.

The Endocrine System

Hypothalamus-pituitary-target organs axes

Calcium Phosphate and Fluor homeostasis: hormonal control

The bone tissue: growth factors and hormones the control bone turnover

Metabolism: glycemic control and lipostate. Hormonal control of metabolism. Hypothalamic control of feeding behavior and energy expenditure

Pancreas Langherans islet cells and adipose tissue cells as origin of hormones

Hypothalamus-Pituitary-Liver axis: GH IGFs

Hypothalamus-Pituitary-Tyroid: TSH T4/3 target tissues and mechanism of action, metabolic termogenesis. The thermoregulation.

Hypothalamus-Pituitary-Surreal gland: POMC glucocorticoids, targets receptor and mechanism of actions

The stress: ANS and endocrine activation

The male and female reproductive endocrine system

Pregnancy and lactation hormones

Cardiovascular system:

Bioelectrical activities of the common and of the specific myocardial cells.

Mechanical activities of the heart: structure of the heart muscle.

Phases of the cardiac cycle: pressure and volume changes in both the atria and the ventricle.

Pressure-Volume diagram, cardiac work and efficiency.

Heart sounds: headquarters origin and characteristics.

Main anatomic areas to focus on while evaluating heart sounds

Arterial and venous wristles.

Cardiac dynamics: systolic volume, rate and cardiac output, venous return

Heart rate control. Intrinsic and extrinsic regulation of cardiac activity, regulation of systolic, tele-systolic and tele-disatolic volumes

Bainbridge reflex or atrial reflex,

The Frank–Starling law of the heat

Heart's electrical system and activity: electrical properties of cardiac cells.

Fundamental properties and regulation of heart: excitability, automatism, conductivity, contractility. correlation between electrical activity and mechanical events.

The electrocardiogram (EKG).

The hemodynamic system: laminar and turbulent flow, blood viscosity.

Structural and functional characteristics of blood vessels.

Elasticity of arteries; pulse wave (genesis and propagation).

Blood pressure profile of the systemic circulation.

Physical laws involved in the relationship between flow, resistance and pressure.

Venous blood return.

Regulation of blood pressure and its determination.

Neural mechanisms of blood pressure control. Baroreceptor and chemoreceptor reflex control of blood Pressure.

Anatomical and functional aspects of microcirculation; continuous, fenestrated, and discontinuous capillaries.

Transcapillary exchange: diffusion and filtration. control movements: vasomotility, local self-regulation of the circle.

The cardiovascular centers. Role of the renin-angiotensin-aldosterone, ADH, ANP and erythropoietin in blood pressure control.

Cardiovascular system response to hemorrhage

Blood clotting system

Coagulation intrinsic and extrinsic pathway

Nervous system

Neuronal communication: electrical and chemical synapses synapse.

Neurotransmitters of the class I (glutamate, D-aspartate, GABA and glycine) and their receptors.

Considerations on their involvement in the memory process.

Neurotransmitters of class II: (acetylcholine, catecholamines serotonin, histamine) and their receptors.

General considerations on their mechanism of action mainly focused to the control of catecholaminergic and serotonergic functions.

Neurotransmitters of class III: (neuropeptides, neuromodulators neuro-hormones).

Synthesis, structure, properties, functions of enkephalin, endorphins, VIP, CCK, tachykinin and substance P.

Property and signal pathways of neurotransmitters class III receptors and their involvement in neuronal pain pathways, meso-cortico-limbic pathway or the reward pathway and in drug addiction, dependence, and tolerance.

Physiology of the endocannabinoid system.

Physiology of purinergic and nitroergic systems.

Sensory system.

General principles of the structural and functional organization of sensory systems.

Sensory receptors: and classification of receptors by stimulus.

Mechanisms of conversion of a sensory signal to an electrical signal.

The concept of receptive field and the code of labeling line.

Function and mechanisms of relay nuclei in processing sensory informations.

Somatic sense: touch, proprioception, thermic sense and nociception.

Structure and distribution of tactile receptors.

Pain pathways. The physiological basis of pain modulation (gate control theory of pain; central mechanisms of pain modulation. Referred pain or reflective pain.

Vision: physiology of the retina and central processing of visual information.

Shape analysis, color, visual image motion.

Anatomy of the visual pathways. Structure, organization and physiology of primary visual cortex. Secondary visual areas and pathways.

Hearing, auditory perception, or audition: structural and functional properties of outer and middle ear.

Cochlear physiology.

Central processing of auditory information.

Auditory pathways and cortical areas. Analysis of sound frequency, intensity and localization.

The chemical senses: taste and olfaction. Vestibular System: structure and function and its role in sense of balance and spatial orientation.

Motor system

General principles of the functional organization of the motor system.

Spinal reflexes: organization of the reflex arc .

Proprioceptive reflexes (stretch reflex or stretching and inverse stretch reflex), flexor reflex.

Locomotor function. Role of spinal circuits in generating rhythmic locomotor patterns.

Vestibular apparatus and control of posture and muscle tone.

Types of Eye Movements and Their Functions (vestibular-ocular reflex, nystagmus, saccades).

Functions of the cerebellum and basal nuclei.

Motor learning. Role of cerebral cortex in voluntary movements.

Organization and function of primary motor cortex and premotor cortex.

Direct and indirect descending motor medial and lateral pathways

Stomatognathic System

Phylogeny

Development and growth of skull and vertebrae

Anatomy and Physiology of TMJ: Condyle, glenoid cavity, articular tubercle, articular meniscus

Ligaments: collateral, capsular, temporomandibular, sphenomandibular and stylomandibular

Muscles: masseter, temporal, internal and external pterygoid

Relationship between posture and skull: Sagittal, vertical, mandibular, sella-nasion, frankfurt planes;

Vertical and horizontal dimensions, skull-cervical angle, ipo/hyperdivergents;

Biomechanics of head and neck, occlusion and posture

Biomechanics of TMJ: rotation and translation, horizontal, frontal and sagittal rotation axis

Intracapsular and extracapsular disorders

TMJ clinical exam

Salivation physiology

Etiology of the TMJ alterations