UNIVERSITÀ DI PISA

PHYSIOLOGY AND GENERAL PATHOLOGY

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Anno accademico	2019/20
CdS	NURSING (LICENSING TO NURSING PRACTICE)
Codice	005FE
CFU	6

Moduli	Settore/i	Tipo	Ore	Docente/i
FISIOLOGIA	BIO/09	LEZIONI	24	DIEGO MANZONI
PATOLOGIA GENERALE	MED/04	LEZIONI	24	ALESSANDRO CORTI

Learning outcomes

Knowledge
The student who successfully completes the course will be able to demonstrate a solid basic knowledge for the understanding of the main physiological mechanisms and functions of various organs and systems of human body. He or she will acquire basic knowledge for understanding the causes and the mechanisms underlying pathological processes and the immune response. The adequate preparation of the student on these aspects is a precondition for a correct clinical approach.

Assessment criteria of knowledge
In the written exam the student must demonstrate his/her knowledge of the course material and the appropriate terminology (questions of Pathology and Physiology).

Skills
An adequate preparation in Physiology and Pathology is the prerequisite for a correct approach to subsequent clinical disciplines.

Teaching methods

Delivery: face to face
Attendance: Mandatory
Learning activities:

- attending lectures
- participation in discussions

Teaching methods:

- Lectures

Syllabus

The course will provide knowledge to understand the main mechanisms regulating cellular functions and excitability; to understand the functions of the different organs of the human body, their dynamic integration in the apparatus and the general homeostatic mechanisms. The course will also provides notions on the four aspects of a disease process that form the core of Pathology: the cause (etiology), the mechanisms of its development (pathogenesis), the structural alterations induced in the cells and organs of the body (morphologic changes), and the functional consequences of the morphologic changes (clinical significance).
General Pathology
Health status and causes of disease. Etiology and pathogenesis.
Cellular responses to stress and toxic insults: adaptation, injury, and death. Atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia.
Reversible cell injury: hydropic swelling and ultrastructural changes. Intracellular storage. Irreversible cell injury: necrosis (coagulative, liquefactive, caseous) and apoptosis. The ischemic cell injury.
The immune system. Cellular and humoral components of the immune response. Physical, chemical, cellular and microbiological barriers. Antigens, haptens and types of antibodies. Primary and secondary immune response. The human major histocompatibility complex (MHC) and the MHC-restricted response.
Immunopathology. Types of hypersensitivities and their properties. Immune reactions to transplanted organs and tissues. Immunodeficiency

diseases. Autoimmunity.
Acute and Chronic Inflammation. Acute inflammation: vascular permeability and cells involved. Specific mediators of inflammation: sources and effects. Types of exudates (serous, fibrinous, purulent). Systemic manifestations of inflammation.
Chronic inflammation: granulomatous and nongranulomatous inflammation.
Tissue renewal, repair, regeneration and fibrosis. Wound healing: healing by primary and secondary intention; complications of wound healing.
Neoplasia. The biochemistry and the cell cycle kinetics of cancer cells. Benign and malignant tumors. Classification of neoplasms. The grading and staging of cancers. Invasion and metastasis. The causes of cancer: chemical, physical and viral carcinogenesis. Epidemiology of cancer. Proto-oncogenes and anti-oncogenes.
Developmental and genetic diseases. Monogenic autosomal and eterochromosomal diseases. Chromosomal abnormalities (Down's syndrome, Klinefelter's syndrome, Turner's syndrome). Examples of storage diseases and inborn errors of amino acid metabolism (phenylketonuria, albinism).
Environmental and pathology. Physical agents (physical injuries; radiations; burns and frostbites; altitude-related illnesses) and environmental chemicals. Free radicals.
Phisiology
Membrane potential and action potential: ionic mechanisms. Synaptic transmission: excitation and inhibition. Neurotransmitter release. The motor endplate. Neuronal integration. Electro-mechanic coupling in the skeletal muscle. Mechanical aspects of muscle contraction.
Pulmonary and systemic circulation. Electrophysiology of the heart: ventricular myocites and pacemaker cells. The conduction system. Electro-mechanic coupling. The Starling's law. The cardiac cycle. Cardiac valves and sounds. The electrocardiogram. The vascular system: compliance and capacity. Blood pressure, flow and vascular resistance. The arterial tree. Blood pressure measurements. The pressure pulse. Local and nervous control of microcirculation. The capillary exchanges. The circulation in specific regions. Nervous control of the blood pressure. The baroreflex. Long-term control of the blood pressure: renal mechanisms.
Conduction and exchange in the respiratory system. Respiratory measures. The dead space and the alveolar ventilation. Mechanical aspects of ventilation: the respiratory muscles. Lung-thorax relationship: the intra pleural space. The pneumothorax. Pulmonary compliance and the alveolar surfactant. The work of breathing. Cough and sneeze. The gas laws. The gas solubility. Alveolar ventilation, alveolar Po2 and Pco2. The alveolar diffusion. O2 and Co2 transport in the blood stream. The hypoxia. Neural control of breathing. Chemoreceptive regulation of breathing.
Renal functions. The glomerular filtration rate. The clearance. Tubular physiology: absorption, secretion and excretion, active and passive mechanisms. The glucose reabsorption. The counter current multiplier system of the kidney ant the corticomedullary osmotic gradient. Regulation of osmolality: the ADH. The NA+ and K+ balance. The renin-angiotensine-aldosterone system. The kidney and the acid-balance control.
Motility and secretion in the digestive system. Nervous and humoral control. The salivary secretion. Swallowing. The stomach: motility and secretion. The vomit reflex. Phases of gastric secretion. Motility in the small intestine. The migrating myoelectric complex. Colon motility. Mass movements and defecation. The pancreatic secretion. Exocrine functions of the liver: action and composition of the bile. Control of gallbladder empting and pancreatic secretion. Digestion and reabsorption of proteins, carbohydrates and fats. Water, ions and vitamins reabsorption. Non-exocrine functions of the liver. Hepatic control of metabolism. Hormonal regulation of substrates utilization. Basal metabolic rate and respiratory quotient.
Autonomic control of vegetative functions. The endocrine system. Endocrine glands functions and secretions. Pituitary gland, thyroid, parathyroid glands, pancreas, adrenal glands, ovaries and testicles

Bibliography

Recommended reading for Physiology: Fisiologia Umana di D.U. Silverthorn, Pearson Education Italia, 2010 Fisiologia di German Stanfield, EdiSES, 2009 Fisiologia, acura di P.Scotto, paletto Editore, 2006 Principi di Anatomia e Fisiologia di G.J.Tortora, B.Derrickson, Casa Ed. Ambrosiana, 2011
Recommended reading for General Pathology G.M. Pontieri. "Elementi di Patologia Generale", Ed. Piccin, IV ed.; M. Parola. "Patologia Generale", EdiSES.

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