Universitat Autònoma de Barcelona

2018/2019

Animal Physiology: Systems

Code: 100806
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	OB	2	2

Contact

Name: Maria Amalia Molinero Egea
Email: Amalia.Molinero@uab.cat

Use of languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: Yes

Prerequisites

It is desirable that the student has acquired basic knowledge and competences on the structure and organization of animal organisms and their cellular systems.

It is important that the student has acquired the basic knowledge and skills of the Histology and the Biochemistry course

In order to be able to attend the sessions of laboratory practices, the student must justify having passed the biosafety and security tests that he will find in the Virtual Campus and be knowledgeable and accept the rules of operation of the laboratories of the Faculty of Biosciences.

Objectives and Contextualisation

The subject Physiology Animal I: systems is programmed during the second course of the Degree of Biology and develops the knowledge of the normal function of the following systems of the animal organism: blood and hematopoietic organs, cardiovascular system, respiratory system, digestive system, metabolism and Regulation of body temperature systems and excretory system and body fluids regulation.

The acquisition of the basic competences of the subject will allow the student to confront with a sufficient base the study of Animal Physiology II: neurophysiology and endocrinology as well as the understanding of the mechanisms that have been chosen evolutionarily in the different animal groups for Its effectiveness.

The general training objectives of the subject are:

Learn the basics of Physiology of thedifferent functional systems of the animal organism.
Acquire a complete and integrated vision of the interrelations of the different systems in the organism.
To integrate the knowledge of Physiology with those acquired in other basic subjects, which deal with the structure and the cellular and molecular aspects of the organism, in order to achieve a global vision of the functioning of the animal body.
To train the student to apply the physiological knowledge in the deduction of the consequences of the pathological alterations of the organism.

Acquire the practical skills needed to carry out functional study techniques

Content

PROGRAM

INTRODUCTION.

1.- Animal Physiology. Concept Internal madia and Homeostasis

EXCITABILITY AND EXCITABLE CELLS

1.-Intercellular communication mechanisms

2.- Excitable cells. Excitability concept

3.- Ionic channels. Ionic bases of resting membrane potential and action potential

MUSCULAR PHYSIOLOGY

1.- Muscular tissues: anatomical and functional characteristics

2.- Skeletal musculature. Motor unit, muscle tone, isotonic and isometric contraction

3.- Smooth musculature and heart musculature

AUTONOMIC NERVOUS SYSTEM

1.- General characteristics of the autonomic nervous system, comparing to the central nervous system

2.- SNA sympathetic and parasympathetic

LIQUID COMPARTMENTS, BLOOD AND HEMATOPOIESIS

1.- General functions and physicochemical characteristics of the blood

2.- Functional constituents: Physicochemical characteristics of plasma. Plasma proteins

3- Characteristics and functions of erythrocytes. Erythropoiesis. Hemoglobin

4.- Concentration and proportion of leukocytes. Leucocyte formula. Formation and functional characteristics of leukocytes. Inflammation

5.- Haemostasis: phases and elements

CIRCULATORY SYSTEM

1.- Organizational schemes of the circulatory systems. Concepts of hemodynamics. Evolution of the circulatory system.

2.- Characteristics of myocardial fiber. Electromechanical coupling. Calcium paper. Electrical events during the heart cycle. Rest and action potential. Excitability, conductivity and regulation of myocardial automatism. Record of the electrical activity of the heart. ECG

3.- Electrical and mechanical events during the heart cycle. Auricles and ventricles, auriculoventricular and semilunars valves. Systole and diastole. Normal limits of the auricular, ventricular and arterial pressures in pulmonary and systemic circulations

4.-Mechanisms of regulation of the cardiac function: Intrínsecs: homologous and heterometric self-regulation.

Extrinsic: autonomic nervous system. Coronary circulation

5.- Arterial and venous system: differences between the arterial and venous system: pressure and resistance.

6.- Capillary exchange and lymphatic system. Hemodynamic functions of the lymphatic system.

7.- Blood pressure. Distribution of the relation pressure / resistance. Blood pressure curve. Measurement of blood pressure. Arterial elasticity curve. Variation with age. Determinant parameters of blood pressure. Rhythmic fluctuations in blood pressure.

8.- Control of the cardiovascular system. General classification of control mechanisms. Local control mechanisms. Endocrine control mechanisms. Nervous control mechanisms

9.- Relationship between blood pressure and local flow control. Global control of blood pressure. Functional differences between short and long term control. Classification of regulatory mechanisms.

RESPIRATORY SYSTEM

1.- Concept of breathing. Respiratory pigments. Comparative aspects of breathing. Aerial and aquatic breathing

2.- Functional organization of the respiratory system. Respiratory and non-respiratory functions

3.- The mammalian lungs. Definition of ventilation mechanics. Variations of pressure and volume in the ventilation. Respiratory work Volumes and lung capabilities. Alveolar ventilation and respiratory areas.

4.- Regulation of pulmonary blood flow. Relation ventilation-perfusion. The respiratory membrane. Exchanging gas to alveoli and tissues.

5.- Regulation of respiration in mammals. The respiratory centers. Respiratory rhythm

DIGESTIVE SYSTEM

1.- General functions of the digestive system. Evolution of the digestive system. Components and functions of the digestive system. Smooth gastrointestinal muscle, characteristics and particularities. Electric base rhythm and action potential. Peristaltism

Enteric nervous system. Gastrointestinal extrinsic innervation. Gastrointestinal reflexes. Hormones and gastrointestinal peptides

2.- Mastication and swallowing. Salivary secretion

3.- Functional structure of the stomach. Gastric motility. Control of the emptying of the gastric content for gastric and duodenal signals. Gastric secretions Acid secretion: Composition and regulation of acid secretion. Other gastric secretions: digestive enzymes, mucus and intrinsic factor. The gastric mucosa barrier

4.- Functional structure of the small intestine. Secretions in the small intestine, pancreatic secretion and biliary secretion, regulation of secretions. Digestion and absorption of nutrients. The ilio-cecal valve.

5.- Heavy intestine, functional structure. Movements in the large intestine. Secretions and control of secretions. Secretion and intestinal absorption of water and electrolytes. Defecation

6.- Introduction to the regulation of short and long term intake

METABOLISM AND BODY TEMPERATURE REGULATION

1.- Characteristics of energy systems: Energy balance. Metabolic rate: Basal metabolic rate. Factors that regulate the metabolic rate.

2.- Integration of the metabolic functions of the organism. Liver as a metabolic organ in the cycles of intake / stomach.

3.- Body temperature and thermal balance. Pioquilothermia and homeothermia. Mechanisms of regulation of body temperature. Adaptations of animals to extreme temperatures. Hyperthermia and fever. Hypothermia and freezing

EXCRETOR SYSTEM

1.- Volume and composition of body fluids. Body water Water balance

2.- Excretory organs. Excretion of nitrogenous products. Basic functions of the kidney in vertebrates. Functional structure of the kidney. Nephron as a functional unit.

3.- Processes that intervene in the formation of urine. Glomerular filtration, secretion and tubular reabsorption.

4.- Glomerular haemodynamics. Concept and calculation of plasma purification. Determination of the glomerular filtration rate. Determination of renal plasmatic flow

5.- Tubular reabsorption and secretion. Regulation of tubular reabsorption

6.- Mechanisms of concentration of the urine. The proximal tubule and the Henle Nansa. Function of the distal tubule and tubule collectors. Contracorrent deconcentration mechanism. Changes in volume and osmolarity of the tubular fluid throughout the nephron. Micción

7.- Regulation of the volume and osmolality of body fluids. Animal adaptations to situations of water stress

8.- Regulation of the acid-base balance. Concentration of hydrogenation in body fluids. The shock absorber systems. Renal regulation of the hydrogen concentration. Physiological compensation of acidic-basic alterations.

LABORATORY PRACTICAL CLASSES PROGRAM

ELECTROCARDIOGRAPHIC REGISTRY

1) Electrocardiogram

- Registration procedure. Placement of electrodes. Bipolar, monopolar and precordial derivations

- Evaluation of normal electrocardiogram register. Variations due to body position, local cold and apnea

CARDIORESPIRATORIES ADAPTATIONS TO THE EXERCISE

Heart rate and heart rhythm

- Measurement of the arterial pressure by the digital and analog method

- Effects of exercise, static and dynamic

- Evaluation of normal values and their physiological variations.

FUNCTIONAL RESPIRATORY TESTS

-Volums and lung capabilities

-Determination and analysis of the forced expiratory stream

EXPERIMENTAL DESIGN IN PHYSIOLOGY

1) ANSWER TO HYDRIC DEPRIVATION IN THE RATOLI

- Physiological criteria to observe before designing an experiment with live animals.

- Study of the possible response to water deprivation in the mouse.

- Establishment of hypotheses of the experimental methods to address it

- Discussion of the approaches and establishment of the experimental groups

2) DISCUSSION OF THE EXPERIMENTAL CONDITIONS

FUNCTIONAL ANATOMY OF THE RATE (NECROPSY)

1) IDENTIFICATION OF THE ORGANS AND SYSTEMS

- Disection and identification of organs

2) DETERMINATION OF THE ABSOLUTED AND RELATED ORGAN WEIGHT

- Identification of the main organs that are part of physiological systems

- Manipulation techniques used in studies with rodents

- Obtaining absolute and relative weight of the organs

PROGRAM OF SEMINARS

Problems and / or clinical cases related to the different subjects of the course will be solved, once the corresponding part is finished in the theoretical classes