

DISCIPLINE ANNOTATION:

BIOLOGY OF INDIVIDUAL DEVELOPMENT

Biology of individual development is a discipline covering general regularities and mechanisms of ontogenetic transformations of bodies of different taxonomic groups of animals, particularities of their course under different environmental factors, in normal and pathological conditions; particularities of microscopic and submicroscopic organization of animal bodies of different taxonomic groups at different stages of embryogenesis; as well as outlining the range of methods, methodological approaches and analysis algorithms that can be used in setting up experiments in related sciences and within interdisciplinary projects and which require in-depth knowledge of the biology of individual development. The discipline is the basis for studying most courses in fundamental natural science training and professional training.

The goal of the course: to provide students with a holistic system of knowledge about the development of animal bodies and their mechanisms; ideas about conditions of reproduction of organisms, ontogeny and phylogeny, life cycles, stages and processes of individual development, causes of anomalies, biological age; methods of obtaining and studying embryonic material; causes of anomalies; embryonic biotests for assessing environmental pollution.

Program learning outcomes:

to know: basic terms, concepts and characteristics of developmental biology methods; developmental processes in their real sequence and interconnection; basic concepts and laws of biology and ecology in relation to living systems of increasing complexity; the causes of anomalies, methods of obtaining and studying embryonic material, embryonic biotests for assessing environmental pollution;

to be able to: competently perceive practical problems related to the biology of individual development, including human health; work independently with educational literature.

Content of the academic discipline:

SECTION I. INTRODUCTION TO ONTOGENESIS. The knowledge of

modern achievements in the study of the prenatal period of ontogeny at the molecular and cellular levels allows understanding the mechanisms of differentiation, intercellular interactions, and genetic control of the early stages of human development. The study of regularities and mechanisms of embryogenesis, especially critical periods, is not only of theoretical importance for understanding normal development but also creates the basis for preventive measures to prevent congenital pathology.

SECTION II. HISTO- AND ORGANOGENESIS.

Definition; periods; types of embryonic development, fertilization; zygote; division; gastrulation; histo- and organogenesis; differentiation, levels: molecular genetic; cellular; tissue. Experimental study of embryonic development: totipotency; embryonic induction; differentiation; experimental mutations; chromosome puffs; cloning; genetic engineering. Critical periods, progenesis (meiosis stage); fertilization; implantation; laying of axial organs; placentation; organogenesis; childbirth. Teratogenic environmental factors: physical; chemical; biological. Congenital malformations, classification: hereditary, exogenous; multifactorial; gametopathies; embryopathies; fetopathies; primary; secondary; phylogenetically determined; non-phylogenetic.

SECTION III. POSTNATAL ONTOGENESIS. Periodization, definition; age periods of life; chronological age; biological age. Direct and indirect development. Defined and indefinite growth; Hormonal regulation. Features of human development in relation to its biosocial essence: genetic control; hormonal regulation; influence of social factors; influence of environmental factors; critical periods; biofield; biorhythms; phenotypic polymorphism. The period of old age as a stage of ontogeny: aging processes; theories of aging; life expectancy; clinical death; biological death; gerontology; geriatrics. Regeneration: physiological; reparative; pathological; typical; atypical; epimorphosis; morphalaxis; endomorphosis (regenerative hypertrophy). Transplantation: autotransplantation; allotransplantation; xenotransplantation.