Ministry of Health of the Russian Federation

Federal State Autonomous Educational Institution of Higher Education

**I.M. SECHENOV FIRST MOSCOW STATE MEDICAL UNIVERSITY**

**(Sechenov University)**

ANNOTATION OF THE DISCIPLINE PROGRAM

**« Molecular and Biological Basiсs of Regenerative Medicine”»**

Area of training (speсiality) 31.05.01 General Medicine

Scope of the discipline \_\_\_\_\_\_\_\_\_\_2 \_\_\_\_\_\_\_\_ credit units

**Goals of the discipline:**

The purpose of mastering the discipline " is training specialists with scientific and practical knowledge in the field of molecular and biological basics of regenerative medicine, the formation of a scientifically based approach to the development of new materials and skills related to their use in regenerative medicine, mastering the basic principles of creating artificial tissues and organs and their translation into clinical practice.

**Objectives of the discipline:**

Students should know:

- general concepts and approaches in regenerative medicine;

- basic principles of cultivation and types of cell cultures;

- methods and parameters for characterizing cells;

- basics of three-dimensional bioprinting;

- advances in regenerative medicine and their application in clinical practice;

- organizational structure and regulatory framework for biomedical research.

Students should be able to:

- plan the experiment, including its goals and objectives;

- conduct an experiment using physicochemical, biological and medical methods;

- analyze data using statistical processing and describe the results obtained;

- identify the causes of errors and take measures to prevent them;

Students should possess:

- terminology adopted in regenerative medicine;

- skills of public presentation of scientific information based on research and / or literature data.

**Place of the discipline in the Curriculum:**

The discipline is within the Elective disciplines of the General Medicine Curriculum. The discipline is close is connected with studying of other disciplines such as Biochemistry, Anatomy, Anatomical Pathology, Histology, Physiology, Pathophysiology.

**Structure and contents of the discipline:**

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| № | Discipline section |
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| **1** | **The concept of regenerative medicine: the subject, purpose and objectives. The main trends and directions. Objects and methods. The current state of regenerative medicine** |
| **2** | **Cells** |
| 2.1 | Stem cells: types, classification, sources and features. Induced pluripotent cells. |
| 2.2 | Cultivation of eukaryotic cells: basic principles and conditions, features. Bioreactors. |
| 2.3 | Mechanisms of cell death and their regulation |
| **3** | **Biomaterials** |
| 3.1 | Types and classification. Sources. Requirements for biomaterials. |
| 3.2 | Scaffolding. Scaffold manufacturing methods. |
| **4** | **3D bioprinting** |
| **5** | **Morphological aspects of regenerative medicine** |
| 5.1 | Biocompatibility and biodegradation of scaffolds. |
| 5.2 | Inflammation, regeneration, and fibrosis |
| **6** | **Methods for the study of cell cultures and constructs based on them** |
| 6.1 | Visualization: immunohistochemical staining, fluorescent and confocal microscopy, electron microscopy, atomic force microscopy |
| 6.2 | Flow cytometry and cell sorting |
| 6.3 | Time-lapse microscopy and high-informative screening systems |
| 6.4 | Experiments on animals: the basics of planning. Simulation of pathological conditions for testing constructs. |
| **7** | **Biobanking** |
| **8** | **Legal regulation and ethics** |