

Ministry of health Republic of Belarus
Establishment of education “Gomel state medical university”

Department of histology, cytology and embryology

MANUAL
for 1-st year students of faculty of foreign students on gynecology

Topic: 1:
INTRODUCTION. OBJECTS AND METHODS OF HISTOLOGY

Duration 4 hours

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THE MOTIVATIONAL CHARACTERISTIC OF THE THEME

The basic kind of work on laboratory researches on histology is independent from the study of histological preparations, the analysis structural and features of preparations on which it is possible to judge a functional condition of studied cells, tissues and organs. Thin structurally functional conditions define by means of electronic microscopy. Successful mastering by microscopic histological technics and research creates conditions for deeper and successful studying a material.

THE PURPOSE :

Mastering by methods of light and electronic microscopy.

PROBLEMS:

The student should know:

- 1) The basic techniques of preparation of the fixed and painted preparations of cells, tissues and organs for light microscopy and work on microtome.
- 2) The some cyto-and histchemical methods of research.
- 3) Methods of lifetime studying of cells and tissues.
- 4) The device and a principle of work of a light microscope.
- 5) Special methods of research of histological preparations: comparative, vaso-contrast, luminescent and ultraviolet microscopy.
- 6) Principles of work of an electronic microscope and feature of microobjects.

The student should be able:

- 1) Working with histological preparations in a light microscope.
- 2) To paint a preparation hematoxillin and eosin.

REQUIREMENTS TO THE INITIAL LEVEL OF KNOWLEDGE:

For full mastering a theme it is necessary for student to repeat from: – medical and biological physics; to medical biology and genetics a structure of the optical devices used in biological researches.

CONTROL QUESTIONS FROM RELATED SUBJECTS:

- 1) The basic optical devices used for microscopy.
- 2) The course of beams in a light and electronic microscope
- 3) Resolution and increase in a microscope.

CONTROL QUESTIONS ON THE THEME

- 1) Objects and methods of research in modern histology.
- 2) The Structure of a light and electronic microscope.
- 3) Technics of microscopy.
- 4) The basic stages of histological preparations.
- 5) Methods of painting of histological preparations.

THE PRACTICAL PART:

- 1) To study device of a light microscope and a rule of work with it (exercise №1 in album)
- 2) To calculate resolution of the microscope (exercise №2 in album)

- 3) To study units of length used in microscopy (exercise №3 in album)
- 4) To familiarize with basic stages of histological preparations and to enter the purpose of each stage in (exercise №4 in album)
- 5) To study a technique of colouring of paraffin cuts hematoxillin and eosin (exercise 5 in album) and independently to paint histological cuts
- 6) Using result of painting to fill table in (exercise №6 in album)
- 7) To familiarize with the basic histological methods and to enter them (exercise №7 in album)
- 8) Microscopy histological preparations and their sketch in an album (exercise № 8, 9, 10 in album)

SLIDES

1. Spinal ganglion.
2. Smear of blood

QUESTIONS FOR SELF-CHECKING KNOWLEDGE

- 1) Write down in a copy-book the requirements to histological preparations
- 2) Fill the table 1, having noted the basic kinds of microscopy, their version, briefly formulate the purposes of use of each version

Table 1 — Kinds of microscopy

Kinds of microscopy	Versions	The Purposes of use

INTRODUCTION. OBJECTS AND METHODS OF HISTOLOGY

Histology is a science about development, structure and functions of tissues. According to different levels of structural organization of the life, it contains some subdivisions,

1. Cytology, which studies development, structure and functions of cells.
2. General histology, which studies development, structure, functions and reactive changes of tissues.
3. Histology of various organs or microscopic anatomy.
4. Embryology is a science of embryonic development.

The sizes of the histological objects are very small. Units of measurement used in histology are:

Micrometer or micron (μ) = 10^{-6} m

Nanometere (nm) = 10^{-9} m.

Main histological method is microscopy:

Light microscopy

It uses a light source with a system of condenser lenses to send the light through the object to be examined. The image of this object is then magnified by two sets of lenses, the objective and the eyepiece [1].

There are two main indexes characterizing any microscope: the total magnification and resolution power. Total magnification is magnifications of the two lens systems. The

resolving power - how close two points can be and still be seen as separate. For the light microscope it is about 0.25 nm. This limit to resolution is determined mostly by the wavelength of the light.

Standard light microscopy uses the visible light.

Wavelength is 0.4 mcm. Resolving power 0.2 mcm. Total magnification is 2500 times.

Ultraviolet microscopy uses the ultraviolet light. Wavelength is 0.2 mcm. Resolving power 0.1 mcm. The acquired image is recorded on photograph because it is invisible for naked eye.

Fluorescent microscopy is based on fluorescent effect. Some molecules in tissues under short wave radiation become excited and start to shine. There are special stains that may cause fluorescence in tissues (e.g. acridine orange).

Interference microscopy. The light is divided into two beams. One beam goes through the object, other passes it by. Then they meet together and make interference picture.

Polarization microscopy. The light is separated to two perpendicular beams. If they pass through structures with strict orientated molecules, they late one to another due to different refraction. It helps to detect character of molecules localization in cells.

Phase contrast microscopy. The light is separated to several phases. When they come through object they change their position regarding to others [2, 3].

Electron microscopy

It uses an electron beam instead of light. The beam is focused by electromagnetic fields instead of the lens.

Conventional (or transmission) electron microscopy (TEM/EM) studies images are formed by electrons passing through the ultrathin section of the tissue. Its resolving power is 1 nm and magnification achieves more than 100 000 times.

Scanning electron microscopy. The images are produced by electrons reflected off the surface of the sample. It allows to see 3-dimensional image of the object.

There many others histological methods:

Histochemistry

It is based on ability of some stains selectively bound amino acids, carbohydrates, fats and other components of cells and tissues.

Immunohistochemistry.

Historadiography

Cytospectrophometry

Cell culture

Cell engineering

Methods of quantitative histology (morphometry) and many others [2].

REFERENCES

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