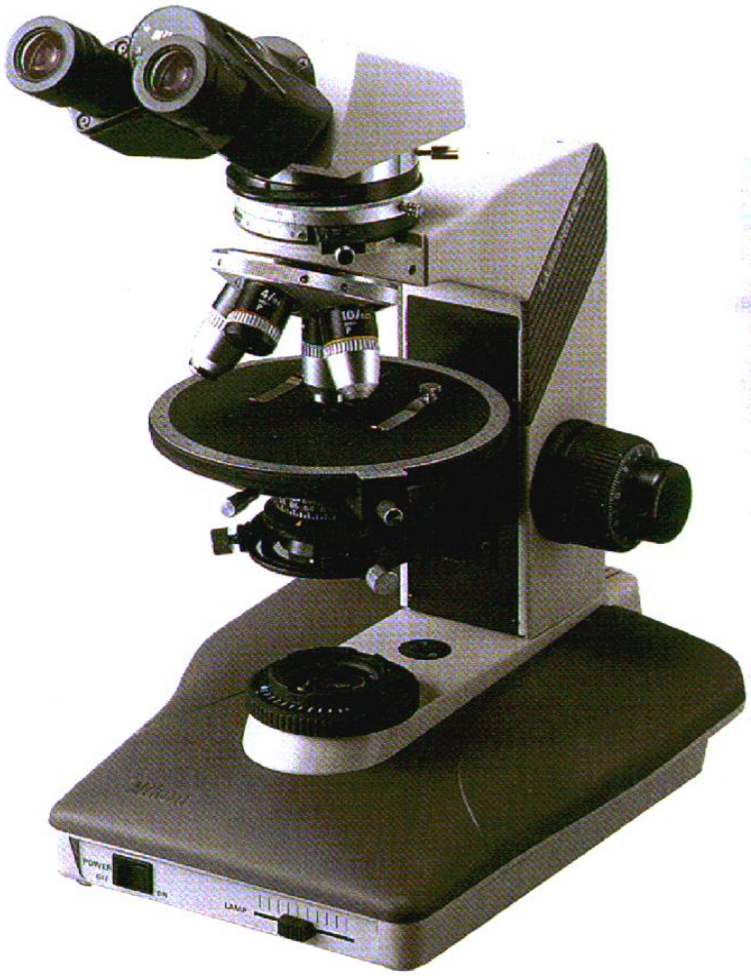


Histology seminars and practical classes

http://histologia.wum.edu.pl/

MEDICAL UNIVERSITY OF WARSAW

DEPARTMENT OF HISTOLOGY AND EMBRYOLOGY
FACULTY OF MEDICINE

PL

Education Research Team

Medicine - Histology with Embryology and Cytophysiology

Regulations & syllabus | Curriculum | Class topics

Schedule | Pass criteria

2. BASIC INFORMATION			
Year and semester of studies	**1 (1 and 2 semester)**	**Number of ECTS credits**	**12**
FORMS OF CLASSES / **Contacting hours with academic teacher**	**Number of hours**	**ECTS credits calculation**	
Lecture (L)	20	1	
Seminar (S)	30	1	
Classes (C)	70	6,5	

General regulations - Histology with Embryology and Cytophysiology for medical students 6ED 2025/2026

Organization of lectures, seminars and classes

1. Teaching of Histology, Embryology, and Cytophysiology is conducted in the form of practical classes, seminars, and lectures.
2. Attendance at lectures, practical classes, and seminars is mandatory. Being more than 15 minutes late will be treated as an absence.
3. Each class begins with a seminar, which is a compulsory part of the session.
4. Students must be substantively prepared for each class. The scope of material is provided in the Topics of classes and lectures.
5. During practical classes, students discuss the topic with the assistant and observe microscopic slides, diagrams, and electronograms. Tissue and organ images viewed under the microscope must be drawn and described (with a legend) in a notebook. Microscopes are placed on tables. After viewing the slides, students must turn off the microscope light and cover the microscope. Removing slides, electronograms, microscopes, or their parts from the classroom is prohibited.
6. Before intermediate examinations and final exam, each student group may borrow a set of demonstration slides. Sets can be exchanged multiple times. Before returning/exchanging a set, slides must be arranged according to the attached list. Students are financially responsible for lost or damaged slides.

Presence in the classes and seminars - Class Completion

1. To pass the semester, students must attend lectures, practical classes, and seminars, and complete all practical classes.
2. To pass a practical class, students must receive a positive grade for the material covered and complete accurate drawings and descriptions of slides.
3. Days scheduled for practical classes and midterms are mandatory.
4. Students are allowed to miss up to 2 lectures and 2 practical classes (with seminars) per semester. A third absence results in failing the semester and disqualification from the intermediate examination, regardless of the reason.
5. Missed or failed classes due to unpreparedness must be made up in a form determined by the Head of the Department at a designated time.

4. The program includes three theoretical intermediate examinations: (1) Cytophysiology and General Histology; (2) Microscopic Anatomy and (3) Embryology, and two practical intermediate examinations: (1) General Histology and (2) Microscopic Anatomy with Embryology.
5. Theoretical intermediate examinations (MCQ) for the entire course are conducted in-person using an electronic exam system.
6. Practical intermediate examinations are held in class groups. Failure to pass a practical intermediate examination disqualifies the student from the final exam.
7. A third and final (commission) intermediate examination is conducted in a form determined by the Head of the Department with the Dean's approval.
8. The midterm test consists of 50 single- or multiple-choice questions and lasts 50 minutes.
9. A minimum of 60% correct answers is required to pass.

Grading scale:
2.0 (failed): up to 59%
3.0 (satisfactory): 60–68%
3.5 (rather good): 69–76%
4.0 (good): 77–84%
4.5 (better than good): 85–92%
5.0 (very good): 93–100%

10. Any concerns or irregularities regarding the examination or question content must be reported only via the Examination Portal to the Examination Team during or immediately after the test, before leaving the computer room (per "WUM Written Exam Regulations," point 16). Students may review questions only via the Examination Portal immediately after the test, before leaving the room.
11. Objections to questions must be submitted exclusively through the electronic exam system.
12. In case of absence due to health reasons, a medical certificate must be submitted within three working days of the scheduled midterm, or a failing grade will be recorded.

11. Objections to questions must be submitted exclusively through the electronic exam system.
12. In case of absence due to health reasons, a medical certificate must be submitted within three working days of the scheduled midterm, or a failing grade will be recorded.

Final examination

1. The final exam covers the content from practical classes, seminars, and lectures.
2. To be eligible for the final exam, students must pass all midterms included in the program.
3. Exam dates are agreed upon with the Teaching Council and are not subject to change.
4. The exam consists of two independent parts: practical and theoretical.
5. Failure in either the practical or theoretical part results in a failing grade for the entire exam.
6. The Head of the Department may allow students who scored in the 96th percentile on midterms to take an early oral exam. Eligible students will be notified by the Department. The application for the early exam must be submitted in writing (form available on the Department's website).
7. Students approved for the early exam must complete the practical part before the oral exam date.
8. In case of absence due to health reasons, a medical certificate must be submitted within three working days of the scheduled exam, or a failing grade will be recorded.
9. The retake exam is held during the retake session. If the retake is failed, the Dean may grant a commission exam upon student request.

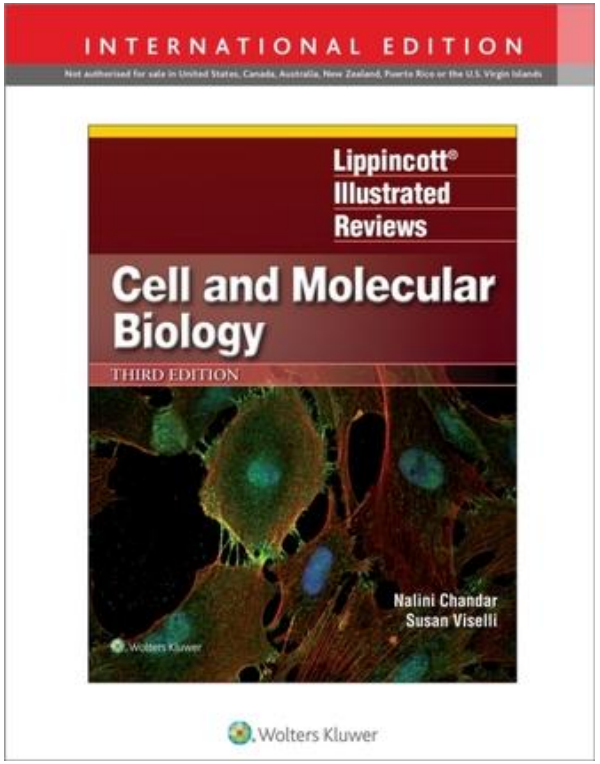
Department Policy on Cheating

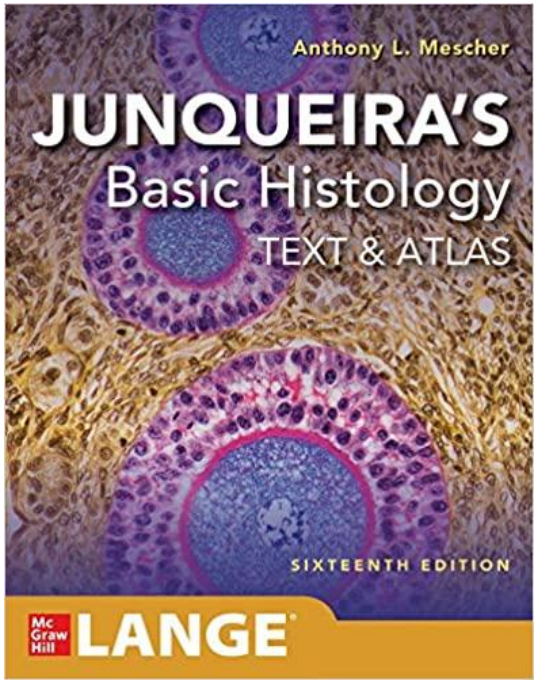
Cheating during exams violates ethical standards and the WUM Study Regulations. Active and passive participants will be removed from the exam and receive a failing grade. Disciplinary action will also be taken.

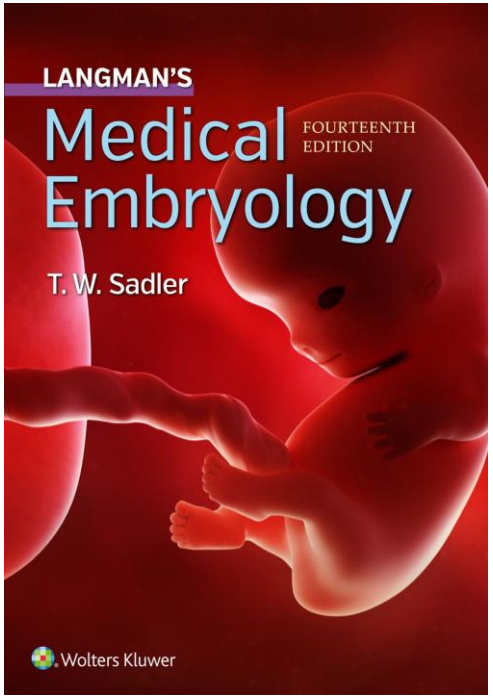
Active cheating includes copying answers from others or using unauthorized notes or electronic devices during the exam. Bringing such devices to exams is prohibited. Passive cheating includes allowing others to copy your answers. Students must take care to prevent others from copying their work.

The Head of the Department requires strict adherence to these rules by both students and examiners.

RECOMENDED HANDBOOKS







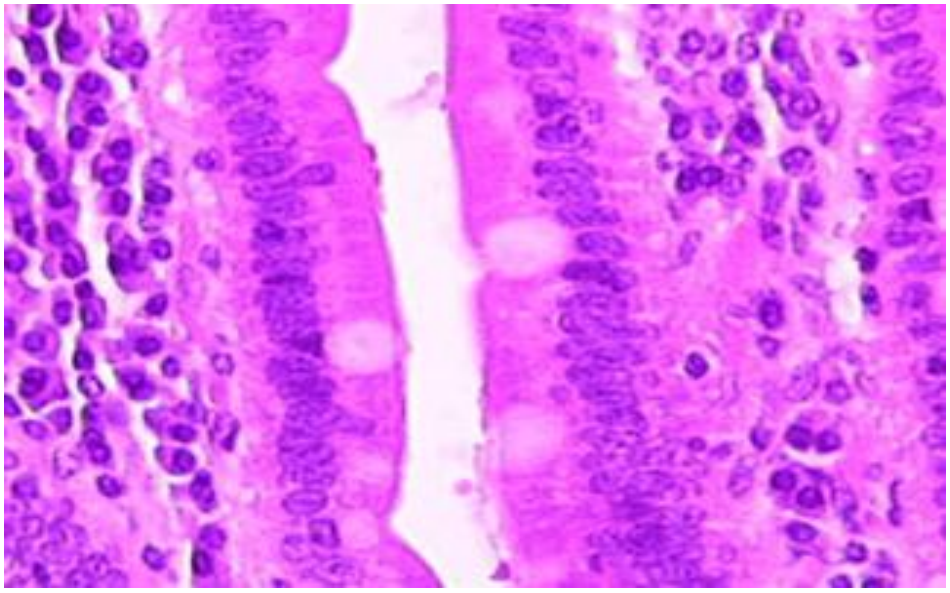
Histology

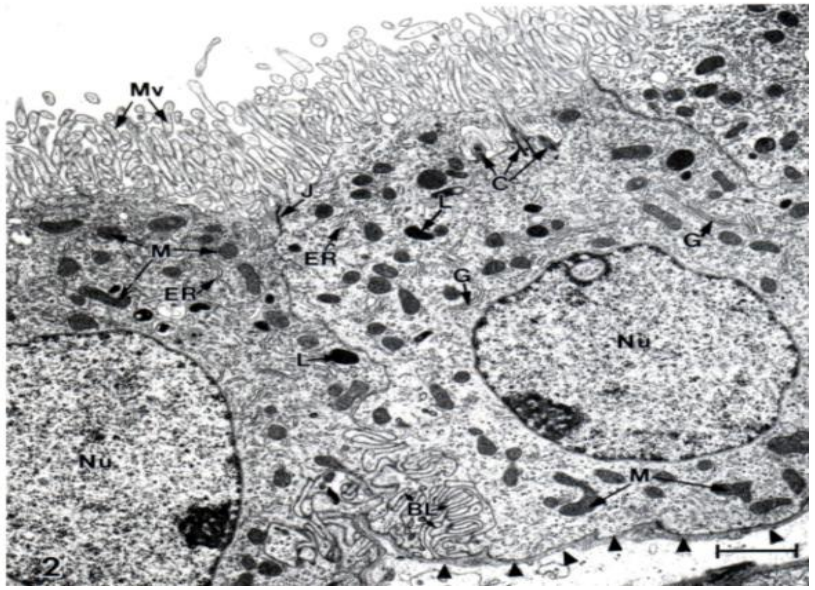
- the study of microscopic anatomy of cells, tissues and organs

- **performed by examining cells and tissues under a microscope**.

The fine structure can be distinguished at the level of light microscopy

Ultrastructure - the detailed structure of the cell cytoplasm, organelles and membranes is studied at the level of electron microscopy





The light source

Condenser lens

Condenser diaphragm

Objective lenses – usually magnify 4, 10, 40 times and oil magnification (100x)

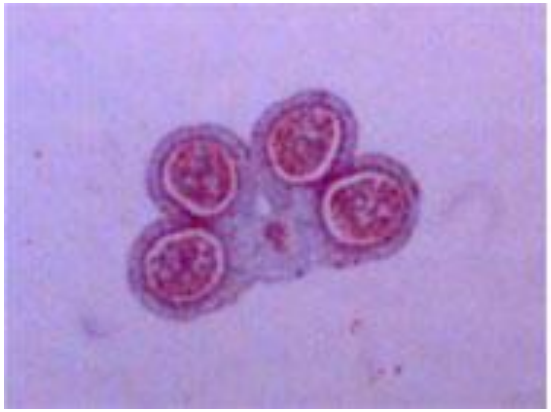
Ocular lenses - usually magnify 10 times

Magnification

$$M = M_{ob} \times M_{oc}$$

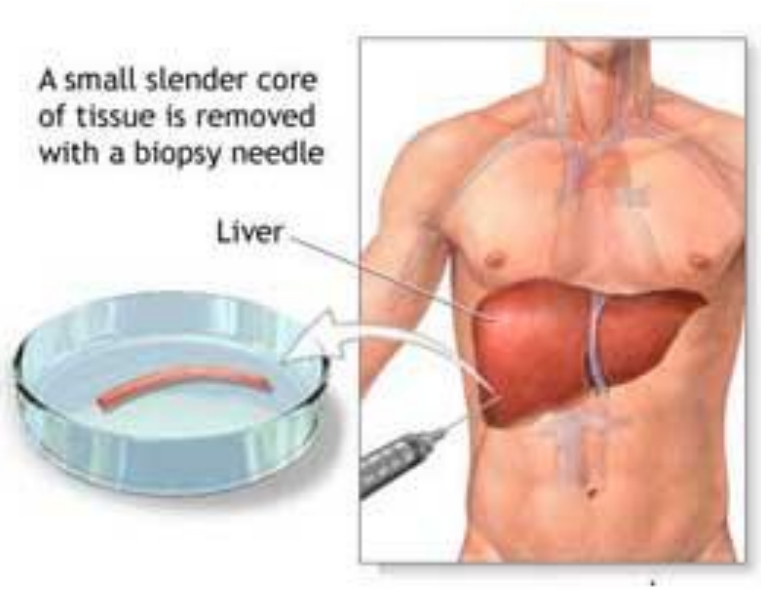
Knobs serve for focusing

Resolution - **the ability of the lens to show that two distinct objects are separated**



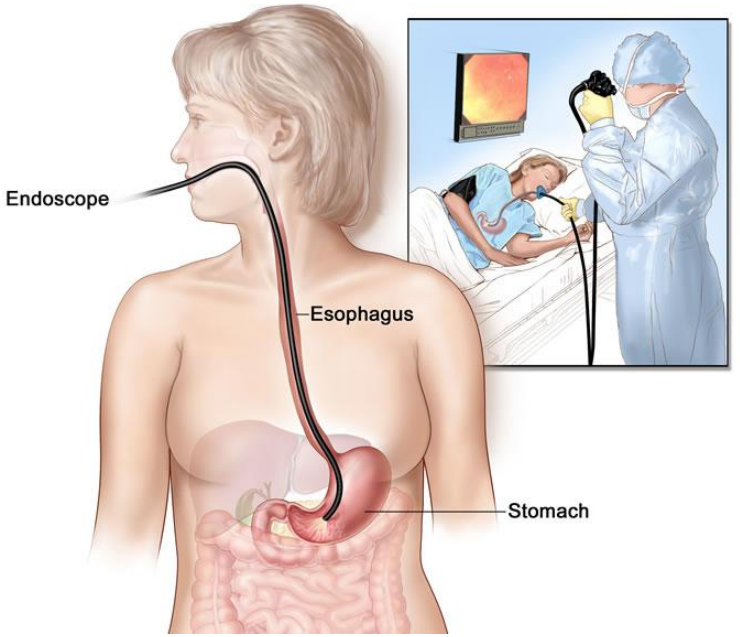
Examination of tissues starts with **surgery**, **biopsy**, or **autopsy**.

A biopsy is the medical removal of tissue from a living subject to determine the presence or extent of a disease:



-needle biopsy - tissue obtained by puncture of a tissue with the the needle, cells are removed without preserving the histological architecture of the tissue

-endoscopic biopsy - removal of tissue by appropriate instruments through an endoscope, a sample of tissue is removed with preservation of the histological architecture of the tissue's cells



STEPS IN PREPARING SECTIONS FOR LIGHT MICROSCOPY

1. FIXATION

- stabilizes the tissues to prevent decay
- preserves in a state as nearly as possible like the living condition
- prevent autolysis

Fixative - neutral buffered formalin

2. DEHYDRATION

- removes water

A grade series of alcohol baths (from 50% to 100%)

3. CLEARING

- the tissue becomes transparent

Xylene

4. EMBEDDING

- to allow sectioning the tissue.

Medium: paraffin

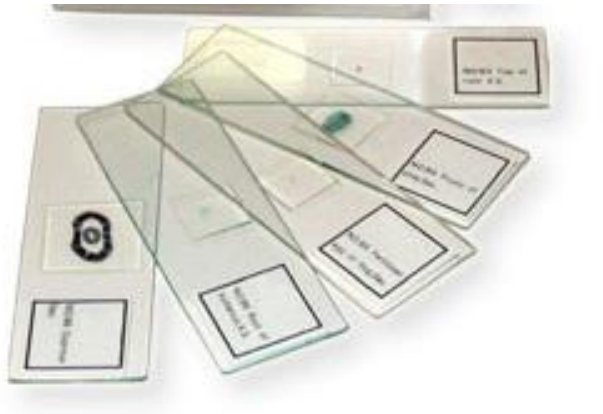
5. SECTIONING

- to obtain the thin slices of the tissue

Microtome - drive a knife across the surface of the paraffin cube and produce a series of sections of very precise thickness

A thickness between **5 – 10 µm** is optimal for viewing with a light microscope

6. MOUNTING
The sections are mounted on individual microscope glass slides.



7. REMOVAL OF PARAFFIN – xylene

8. REHYDRATION
Because the tissue will be stained by water soluble dyes
a grade series of alcohol baths (from 100% alcohol to water)

9. STAINING
Various types of stains

10. DEHYDRATION
- coverslip must be affixed by the use of medium which does not mix with water.
a grade series of alcohol baths (from 50% to 100%) and xylene

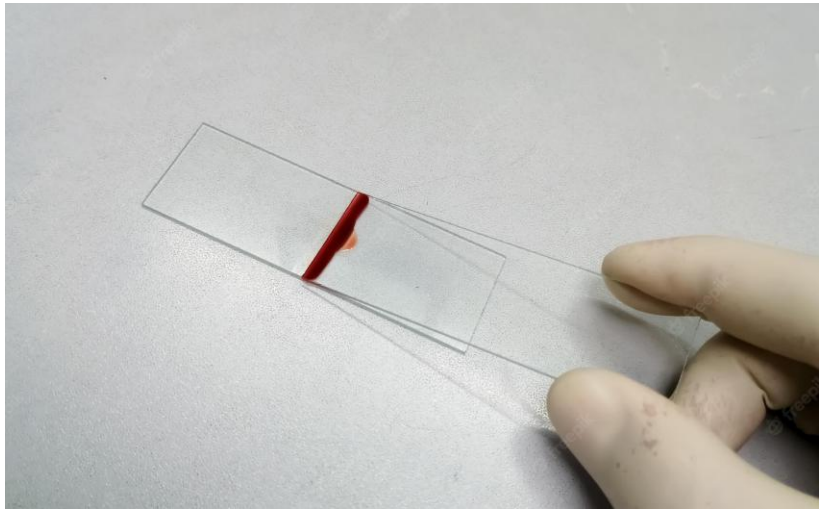
11. PREPARING PERMANENTLY MOUNTED SECTIONS UNDER THE COVERSLIP

The ideal mounting medium should not distort the stain color and preserve the slide

Canada balsam - the resin of the balsam fir tree

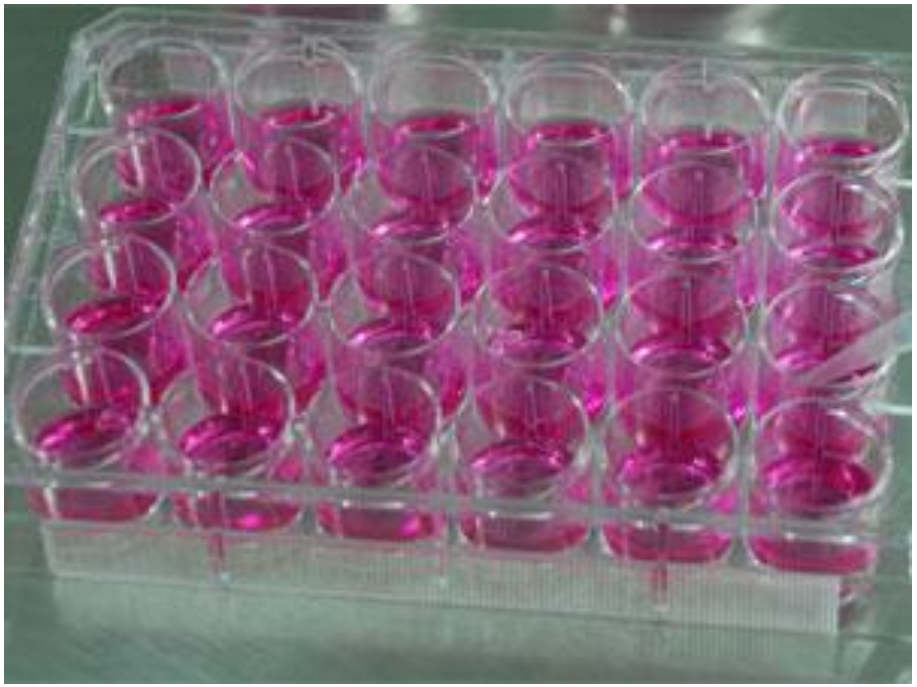
PREPARATION OF THE SLIDE SMEARS

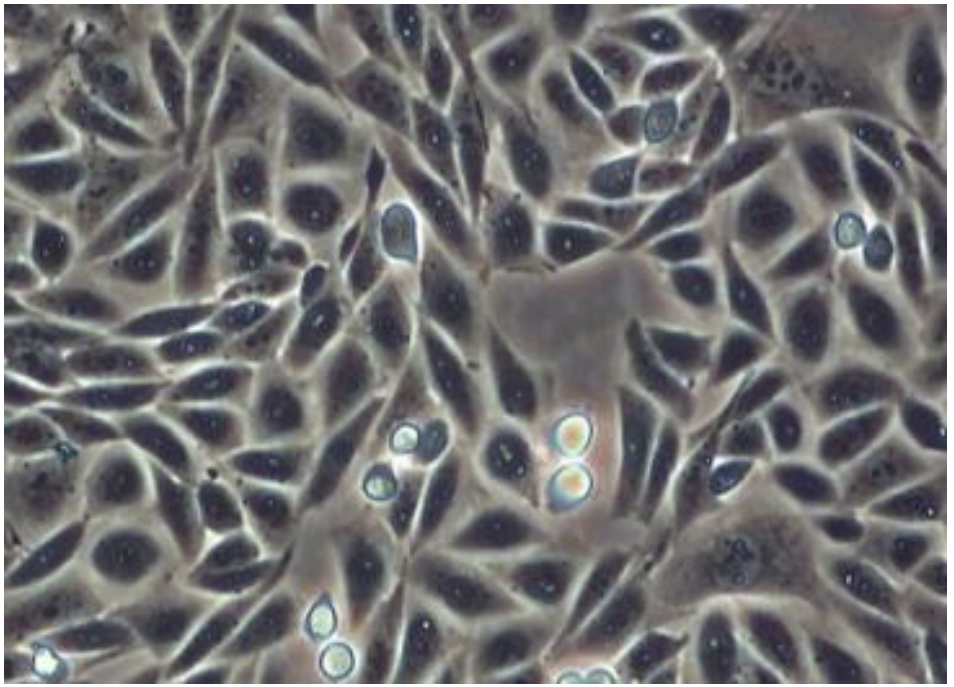
The drop of separated cells suspended in proper medium has to be placed on the microscopic slide, smeared and fixed



PREPARATION OF CULTURED CELLS

1. Isolation the cells from the tissue by enzymatic digestion.
2.Culturing cells in proper medium on the plates with coverslips until cultured cells adhere to coverslips.
3. Fixation.
4. Staining
5. Dehydration
6. Preparing permanently mounted slides



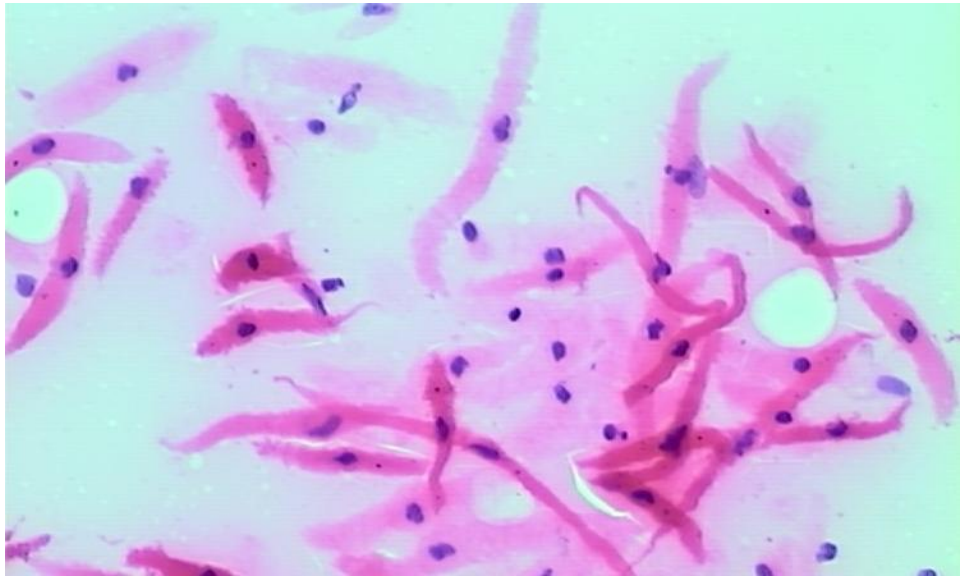


STAINING

HEMATOXYLIN - basic dye. Forms salts with tissue anions -the phosphate groups of nucleic acids and the sulfate groups of the glycosaminoglycans.

Hematoxylin stains basophilic structures dark blue color

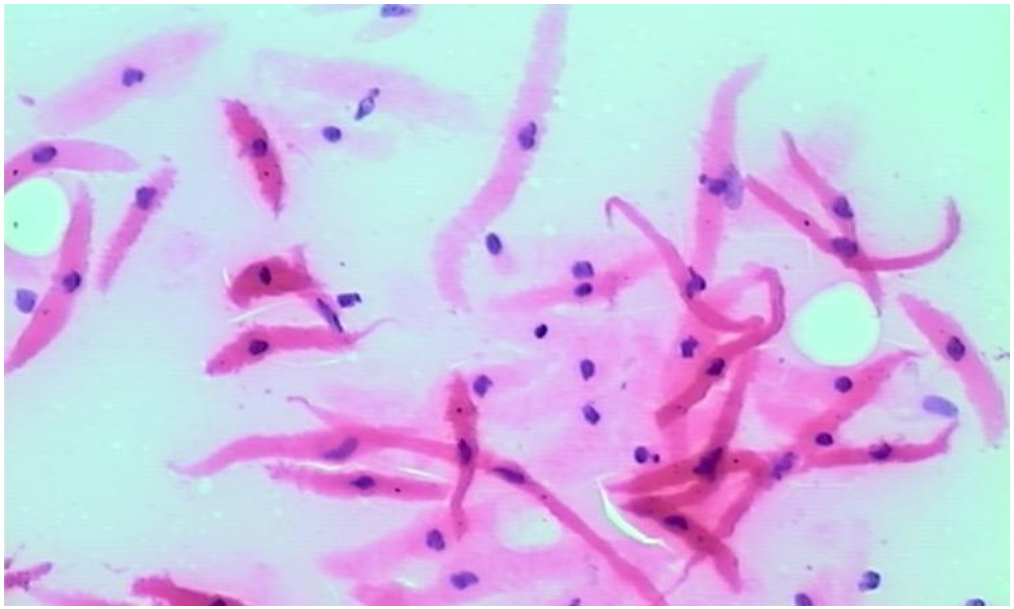
Basophilic is the term used to designate the components of a cell or tissue, which take up the basic dye. Nuclei are basophilic, because they contain the acids; DNA and RNA



EOSINE- acid dye. Forms salts with cationic groups in cells and tissues, particularly the amino groups of proteins

Eosin stains the acidophilic components of the tissue a pink color

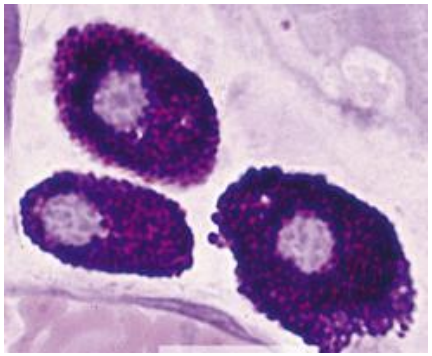
Acidophilic or oxyphilic is applied to parts, which show a greater affinity for acid dyes. The cytoplasm is usually acidophilic**.**



METACHROMASIA

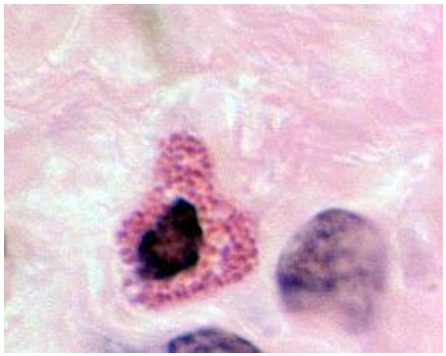
Characteristic change in the color of staining carried out in biological tissues, exhibited by e. g. toluidine blue when it binds to particular substances.

Toluidine blue



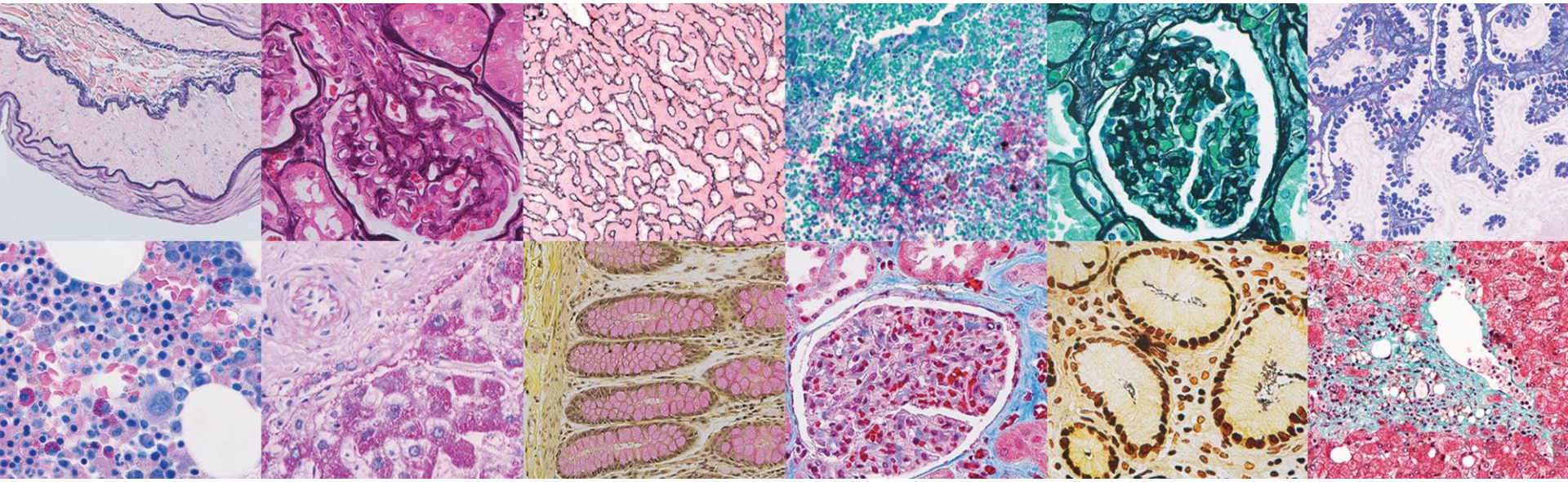
Mast cells

H&E



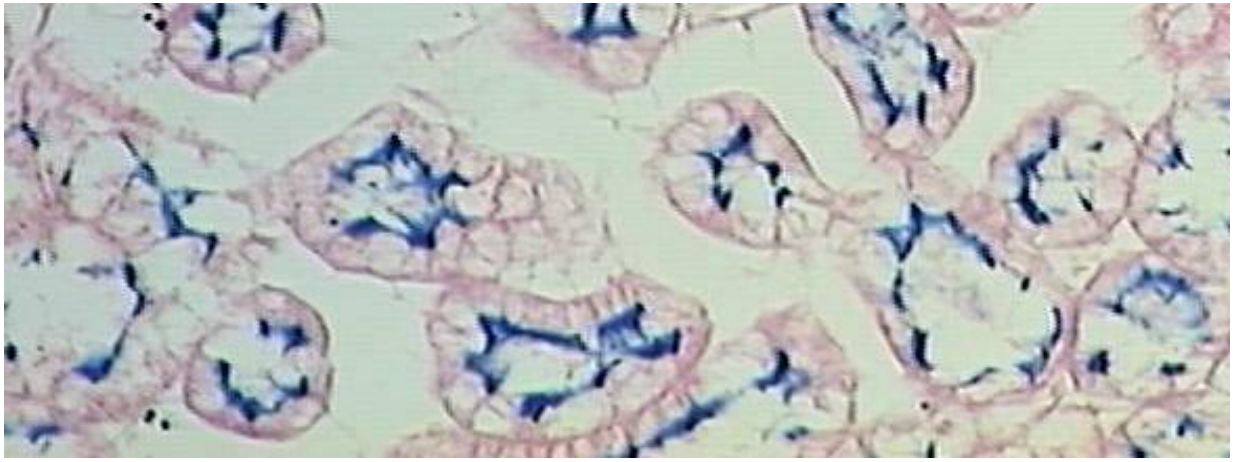
Other dyes:

- Giemsa
- Alcian blue
- Sirius red
- Oil red
- Orcein
- Rezorcin
- ……



DETECTION OF ENZYMES

	EXEMPLE: alkaline phosphatase in proximal tubules of kidney
ENZYME PRESENT IN TISSUE	
SUBSTRATUM	beta-naphthyl phosphate
PRODUCT	beta-naphthyl
INTERMEDIATE CHEMICAL	diazo dye
PRECIPITATE (colored, insoluble)	PRECIPITATE (colored , insoluble)



IMMUNOHISTOCHEMISTRY

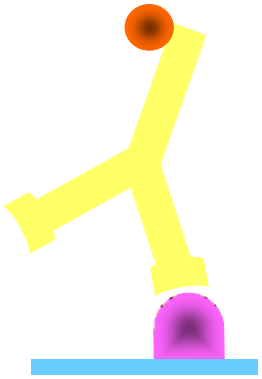
DIRECT METHOD

The antibody (primary Ab)is directed against the particular protein and is labeled.

Primary antibody

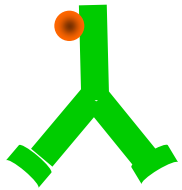
Antigen

Marker

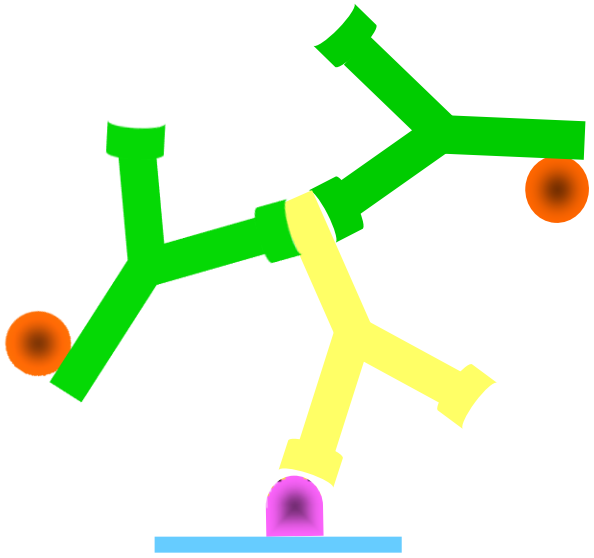


INDIRECT METHOD

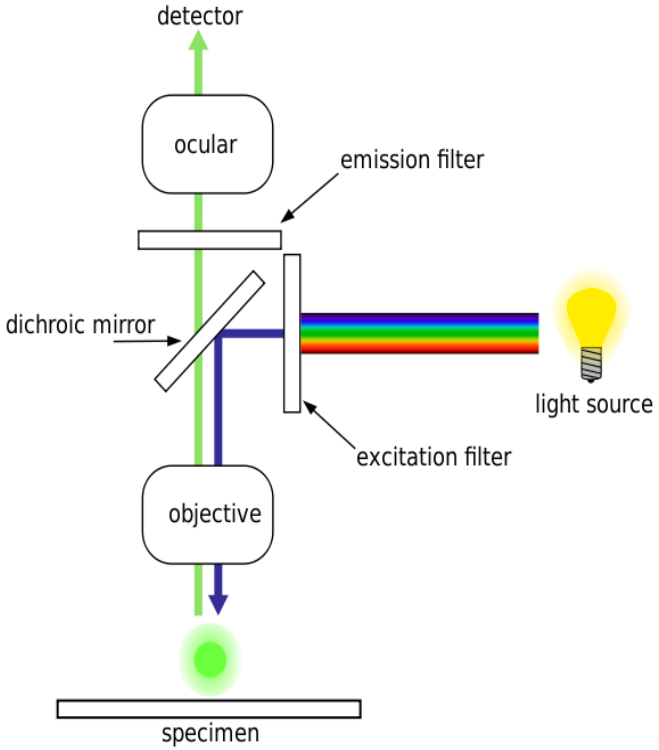
The labeled antibody (secondary Ab) is directed against Fc of primary antibody

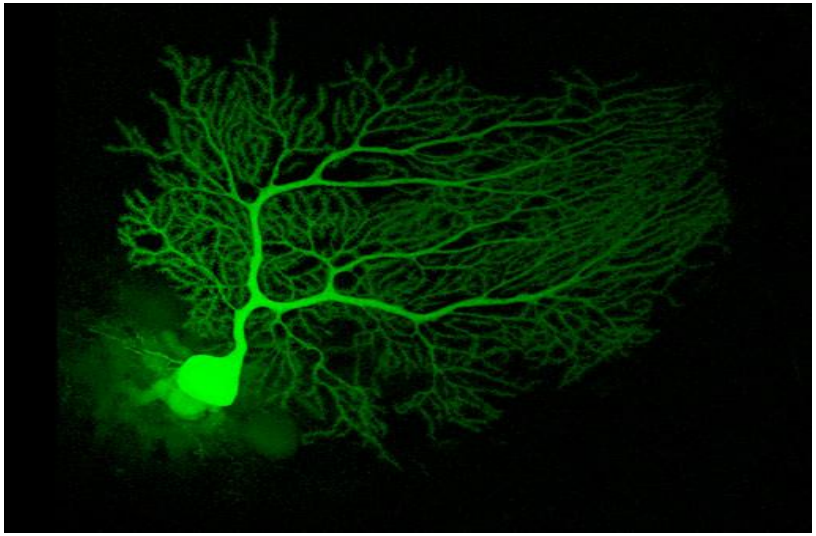


Secondary antibody

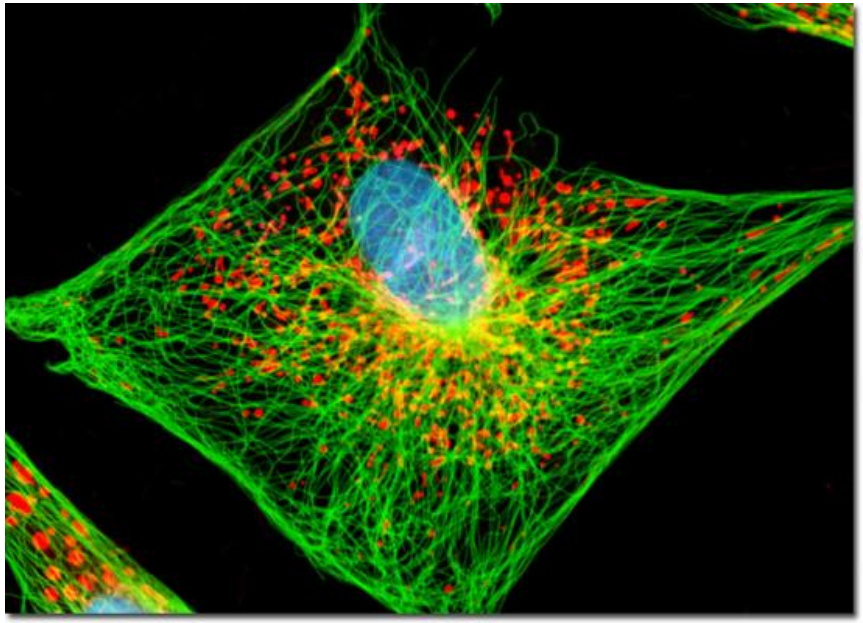


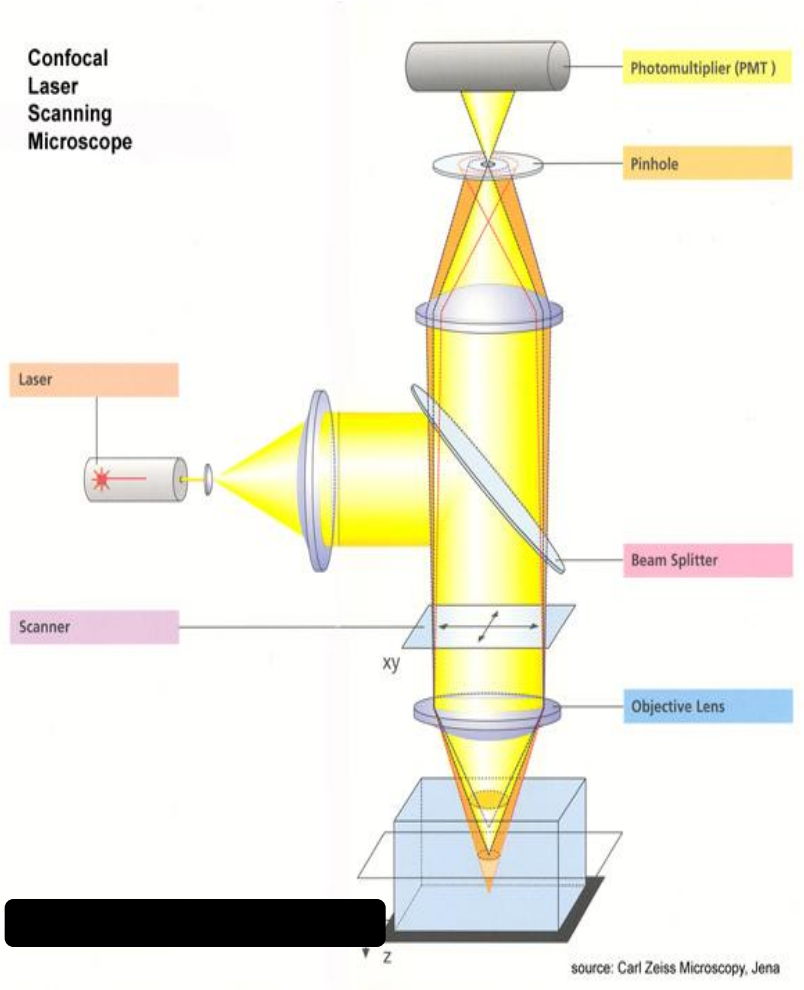
Fluorescent microscope



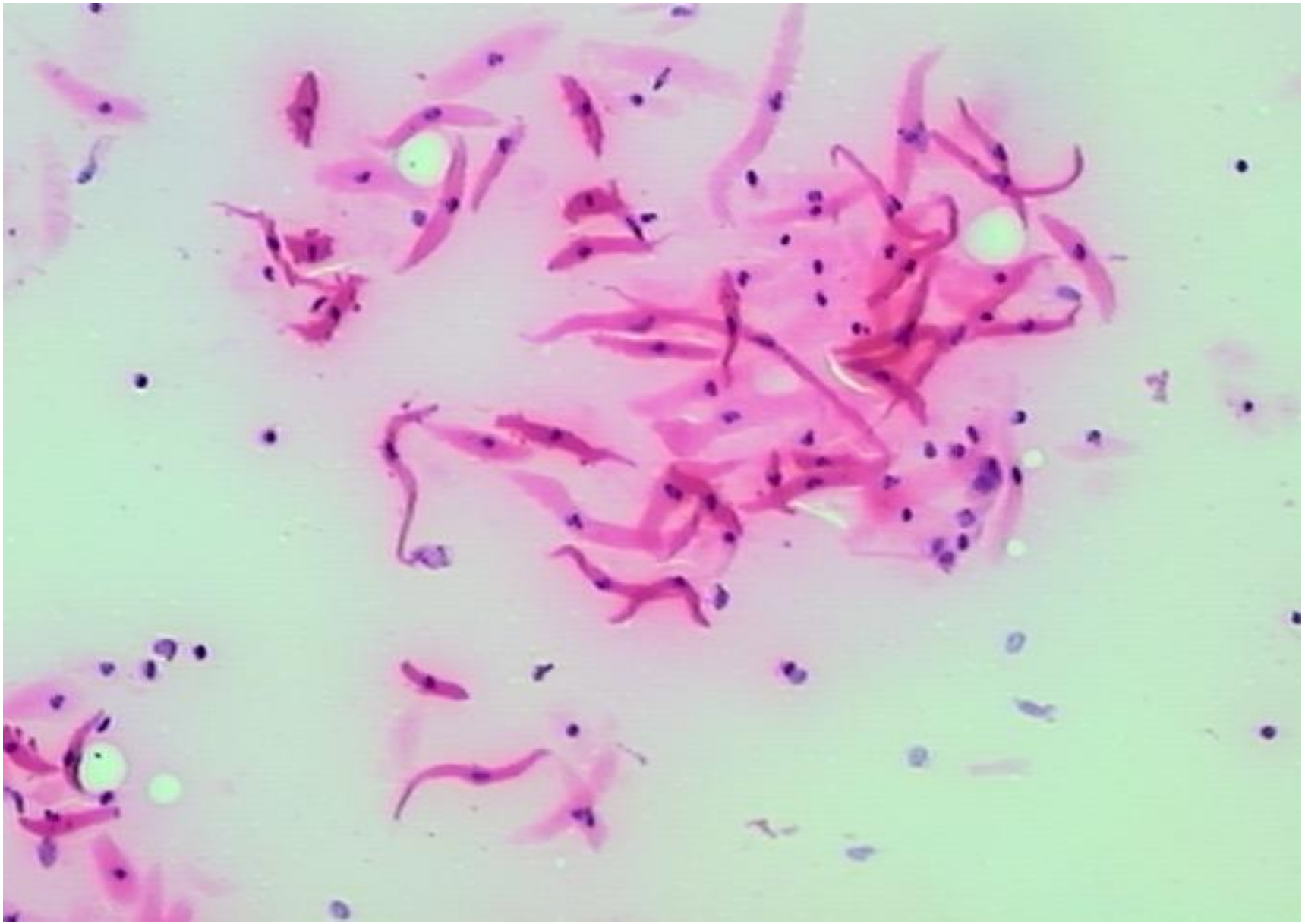


Confocal laser scannig microscope





19. Isolated smooth muscle cells x10



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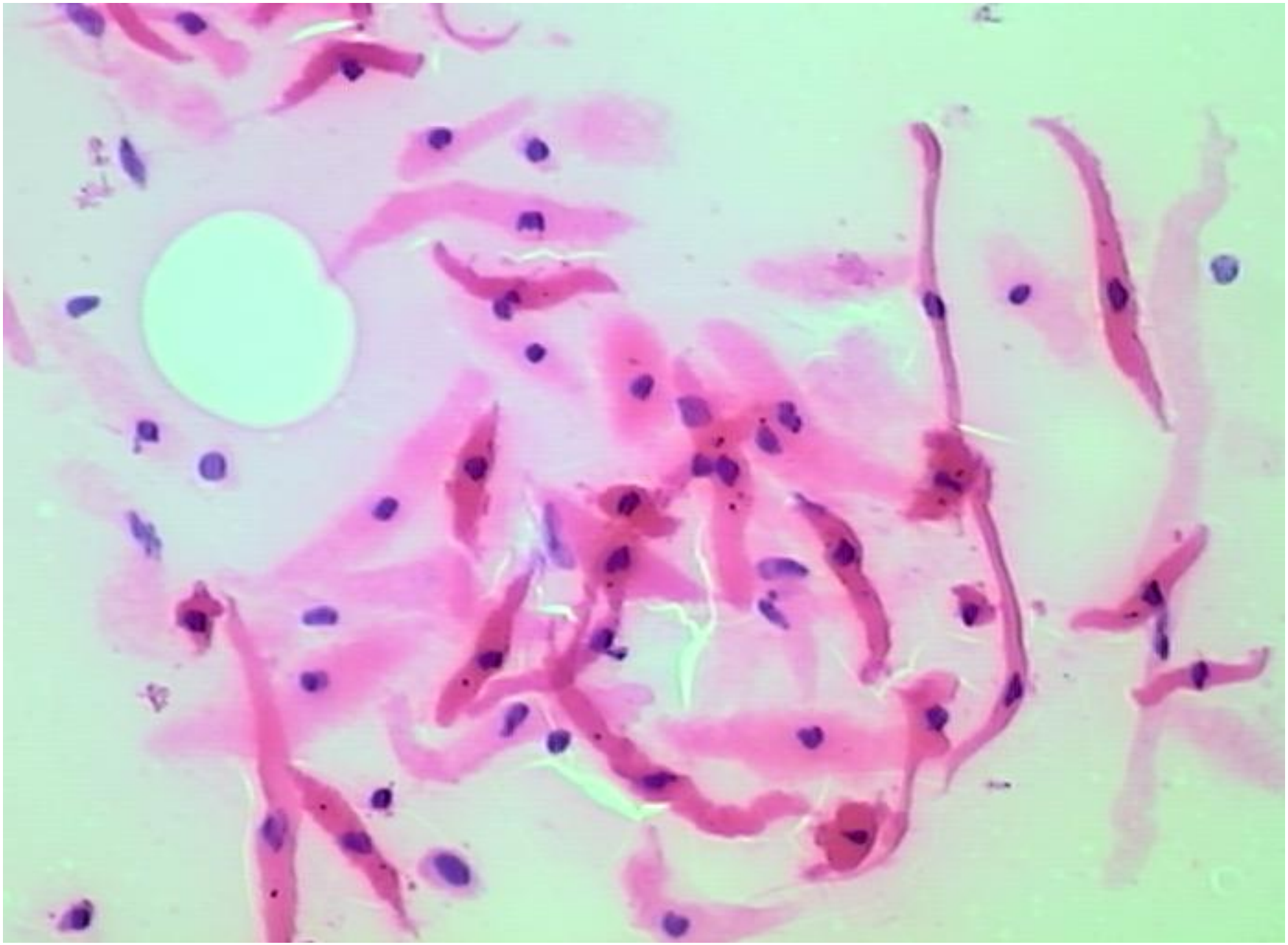

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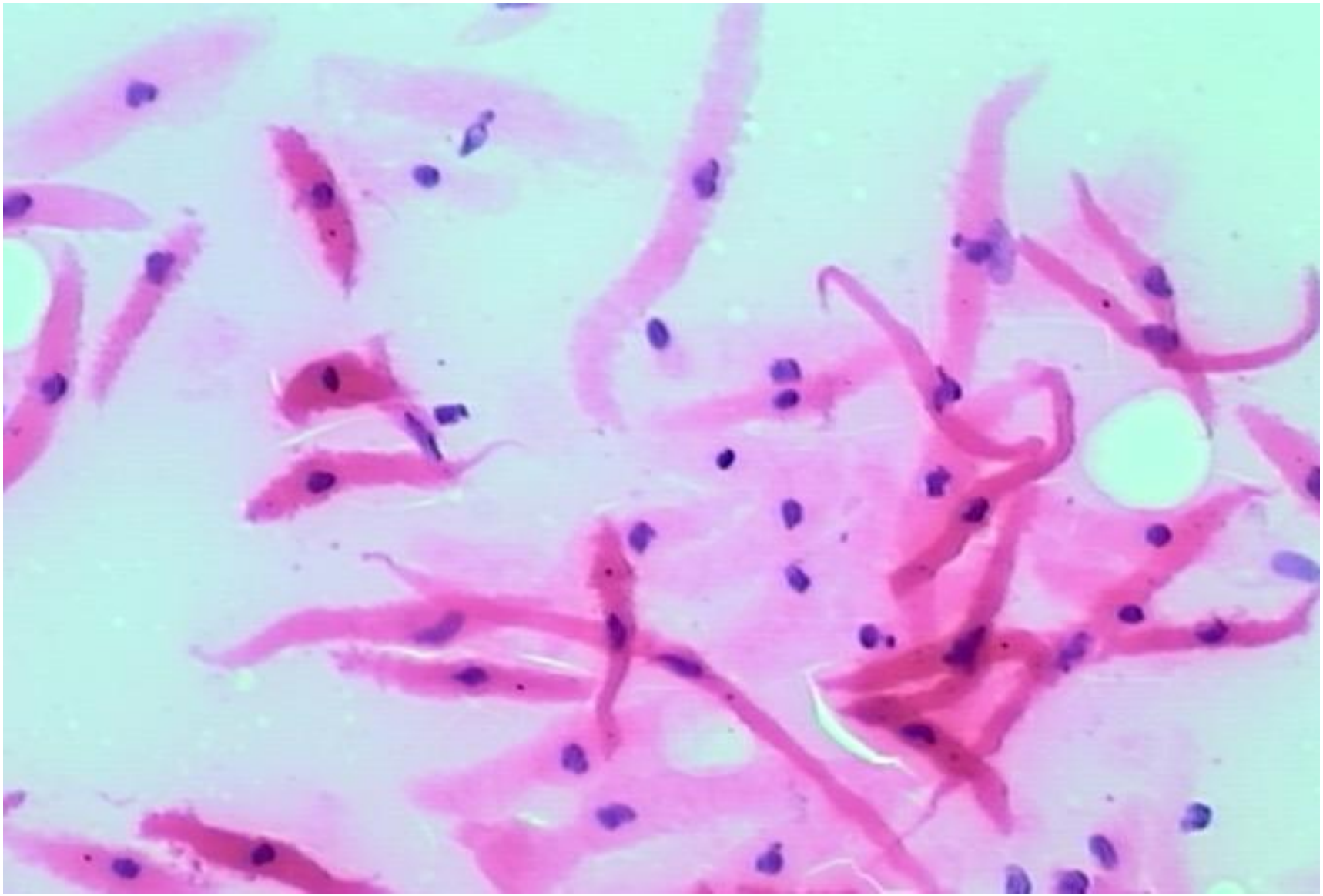
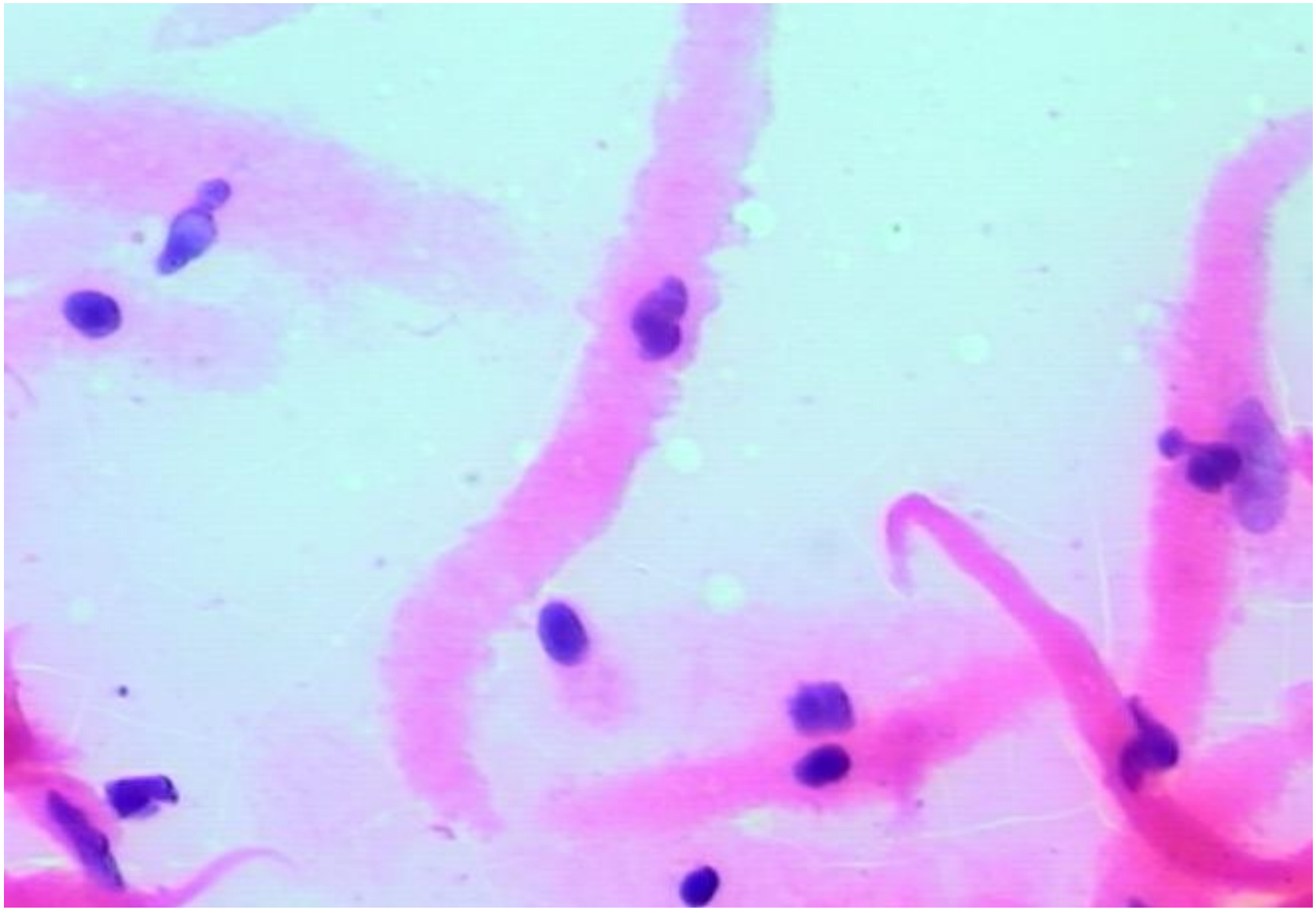
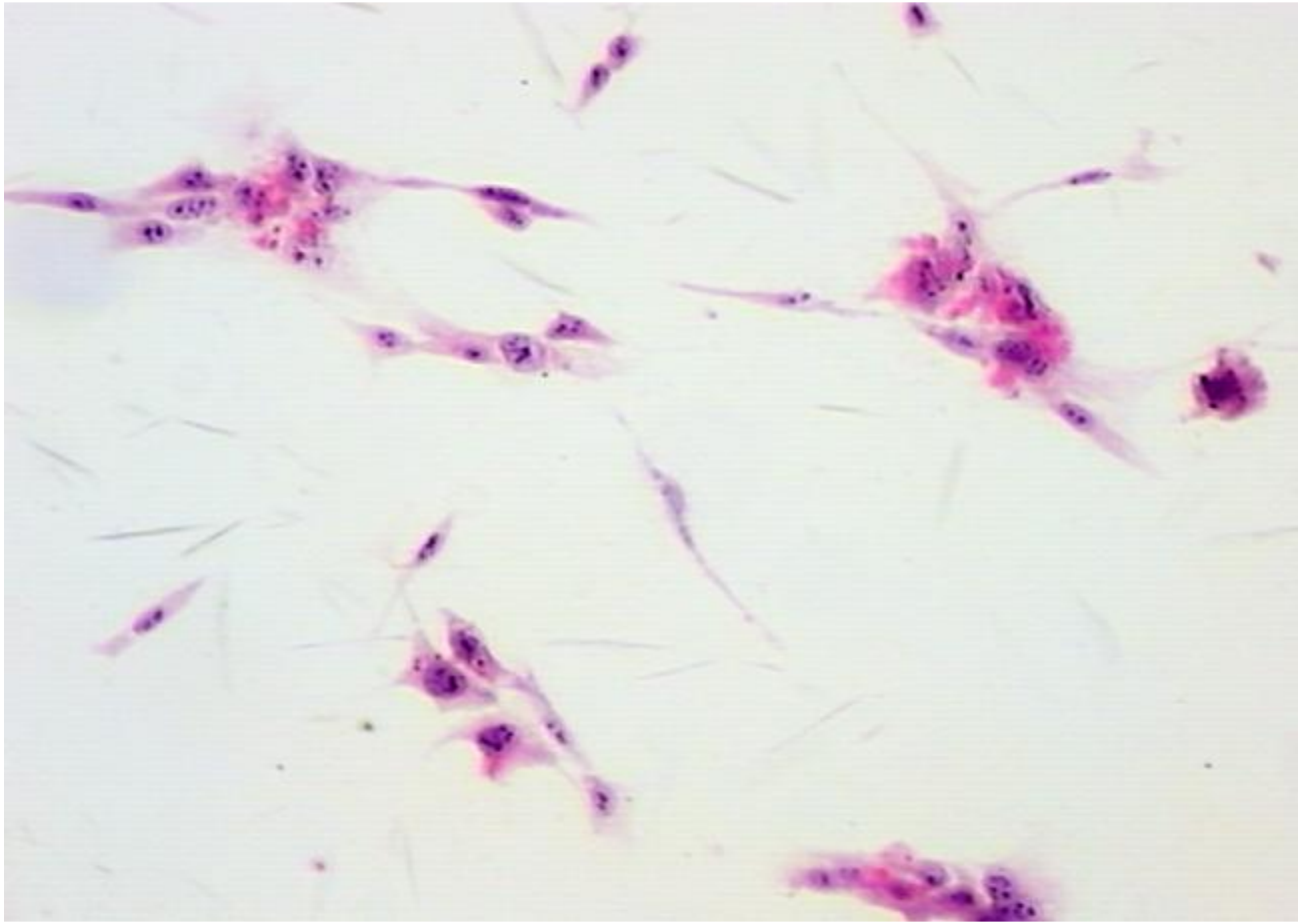


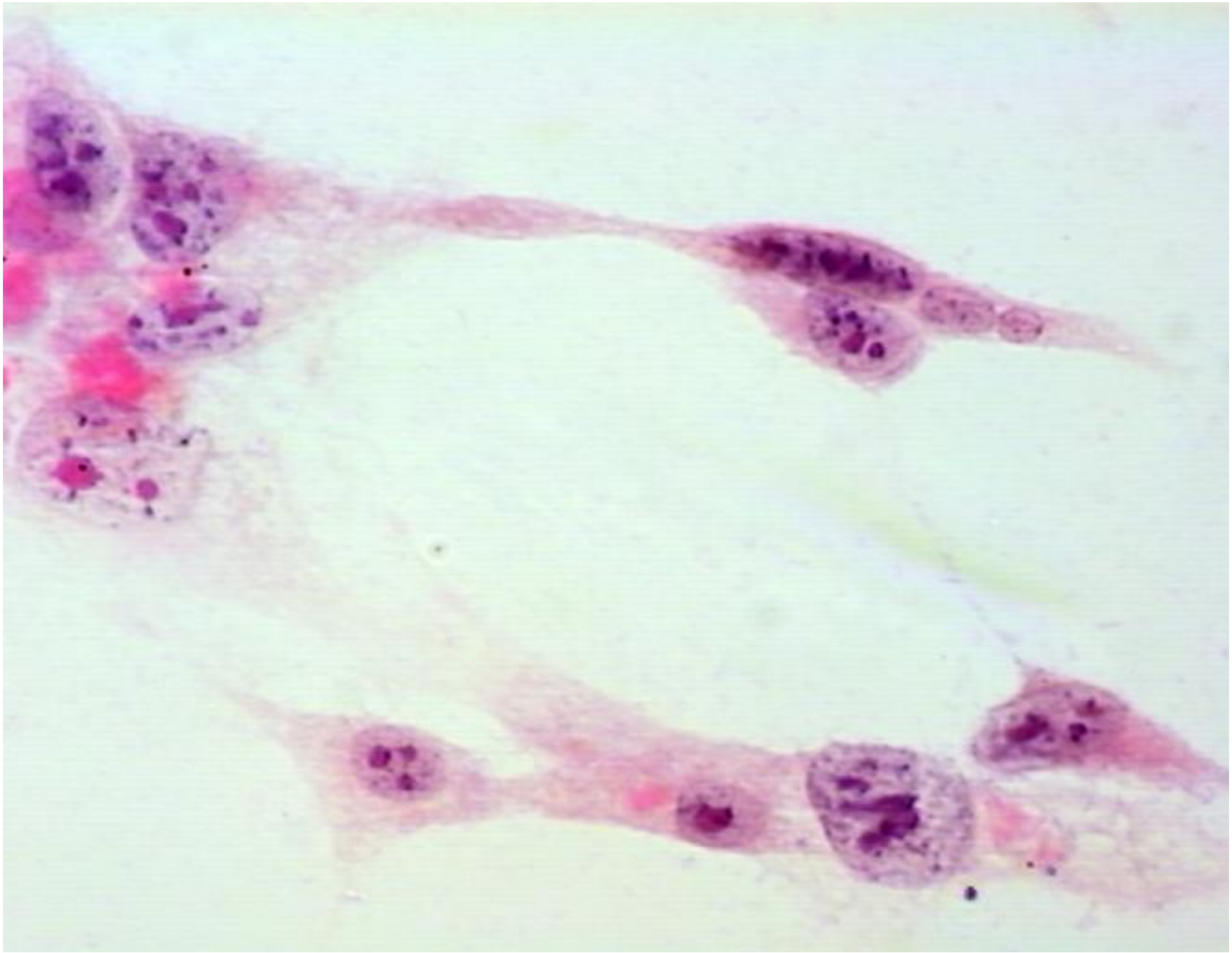
19. Isolated smooth muscle cells x40



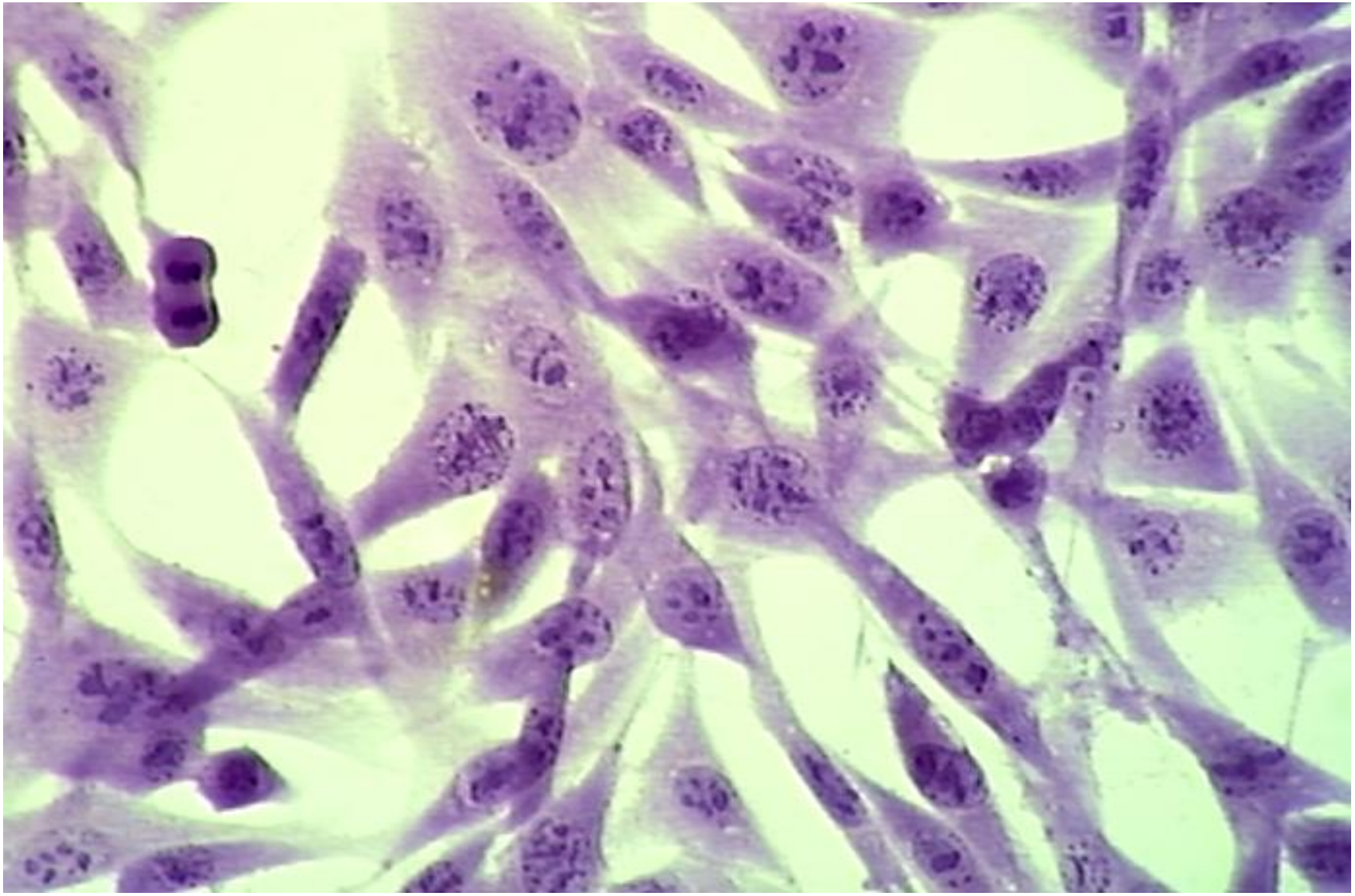
97. Fibroblasts x10



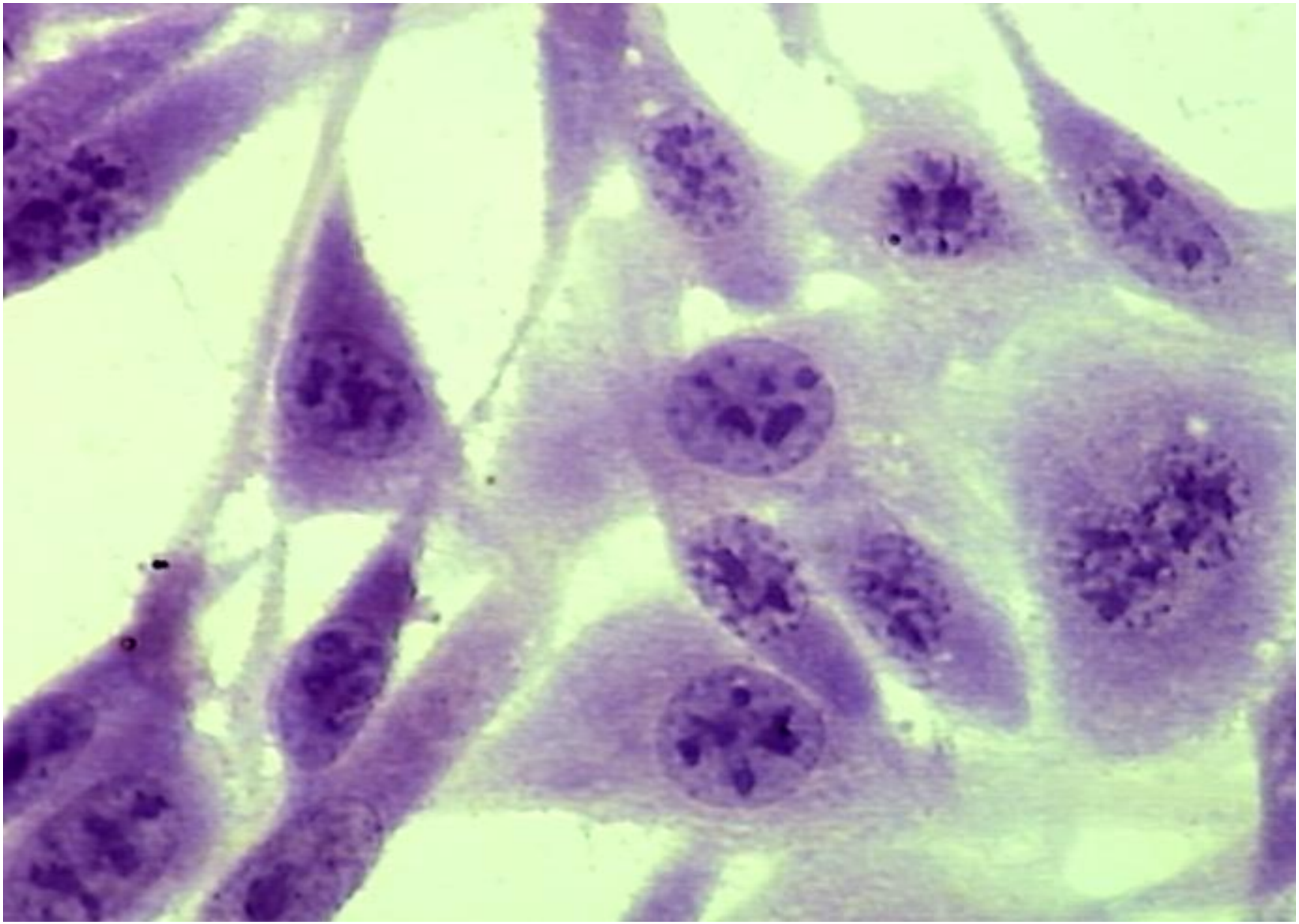
97. Fibroblasts x40



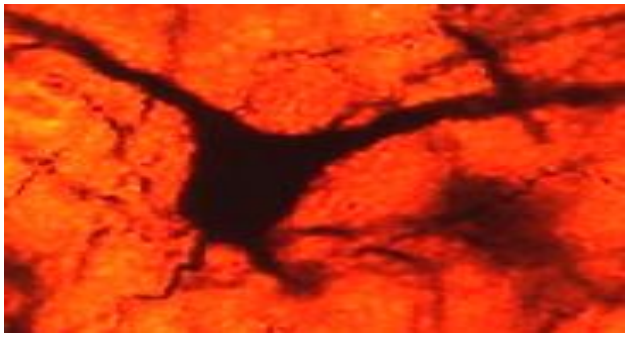
97. Fibroblasts x20

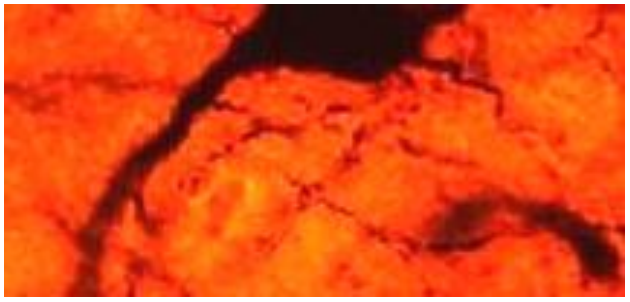


97. Fibroblasts x40



112. Nerve cells impregnated with silver nitrate



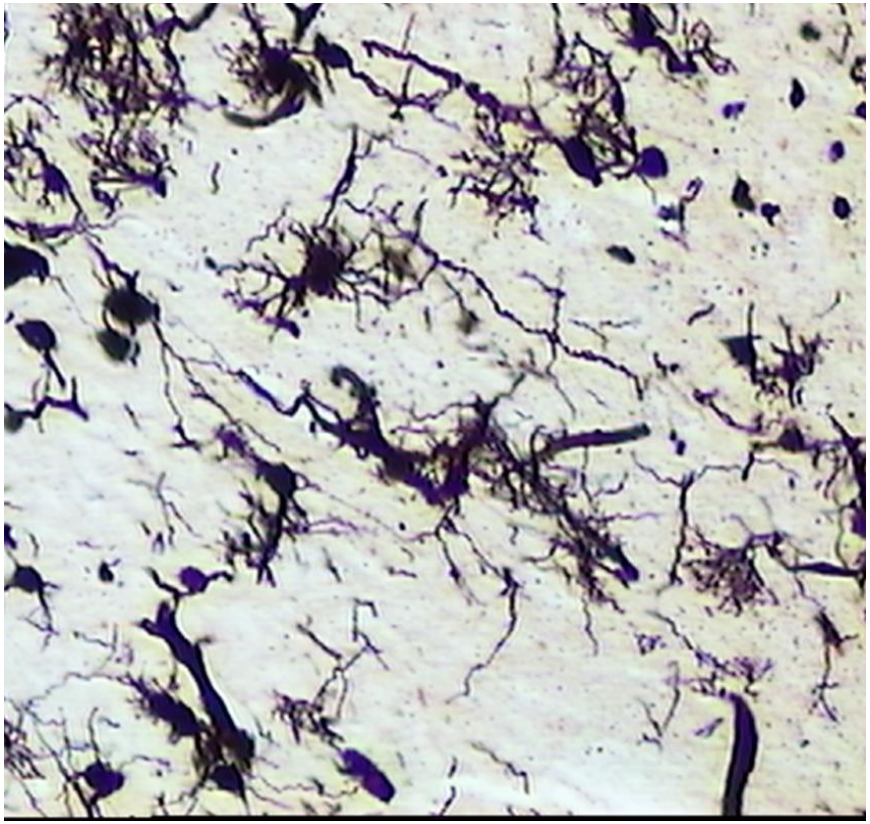


the image you see depends on section

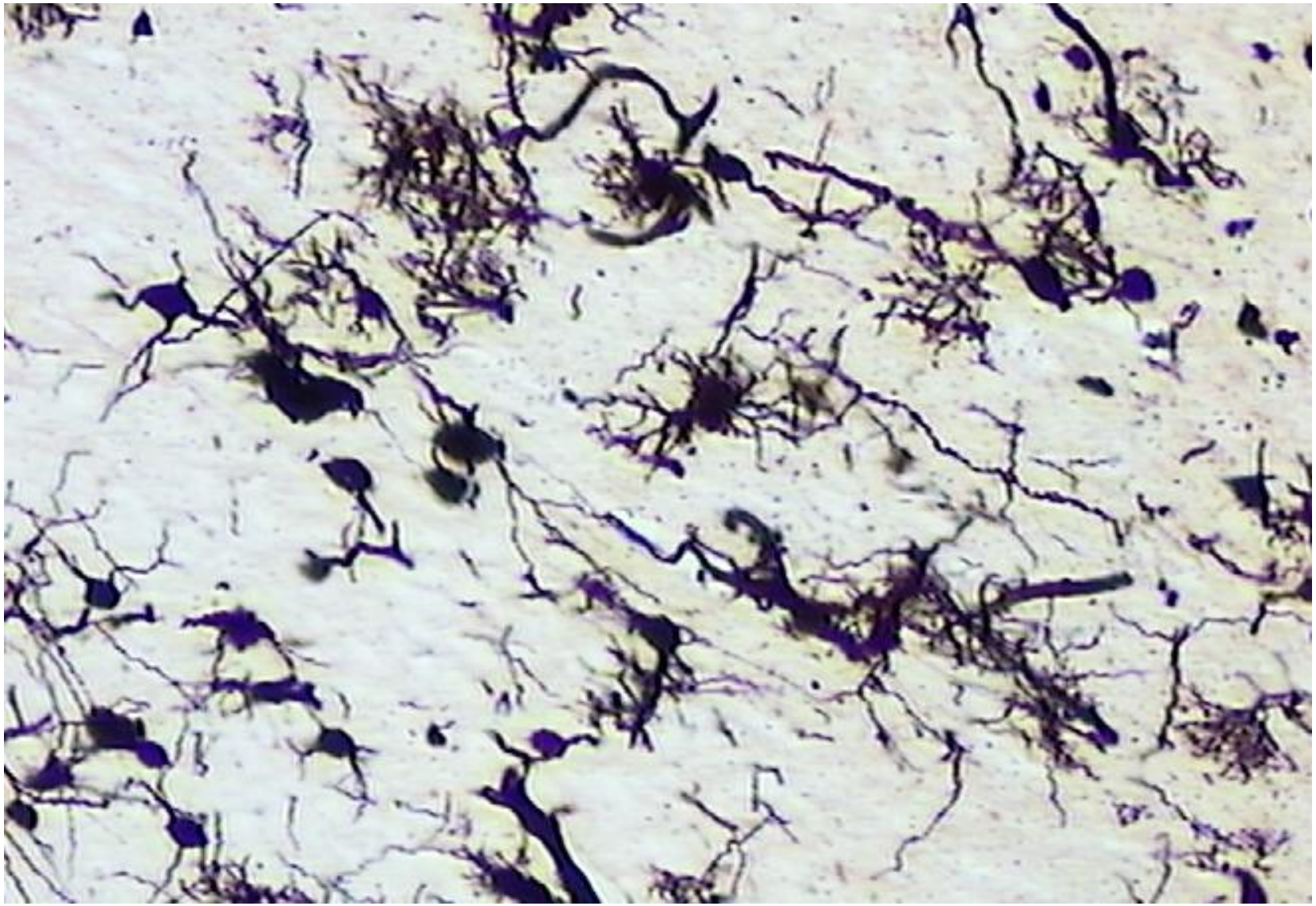
Impregnation with silver nitrate

Because the thin filamentary processes of nerve cells (the axon and the dendrites) are too slender and transparent to be seen with normal staining techniques - the impregnation method is better to visualize the whole cells. In this procedure the processes and cell body, are clearly stained in brown and black

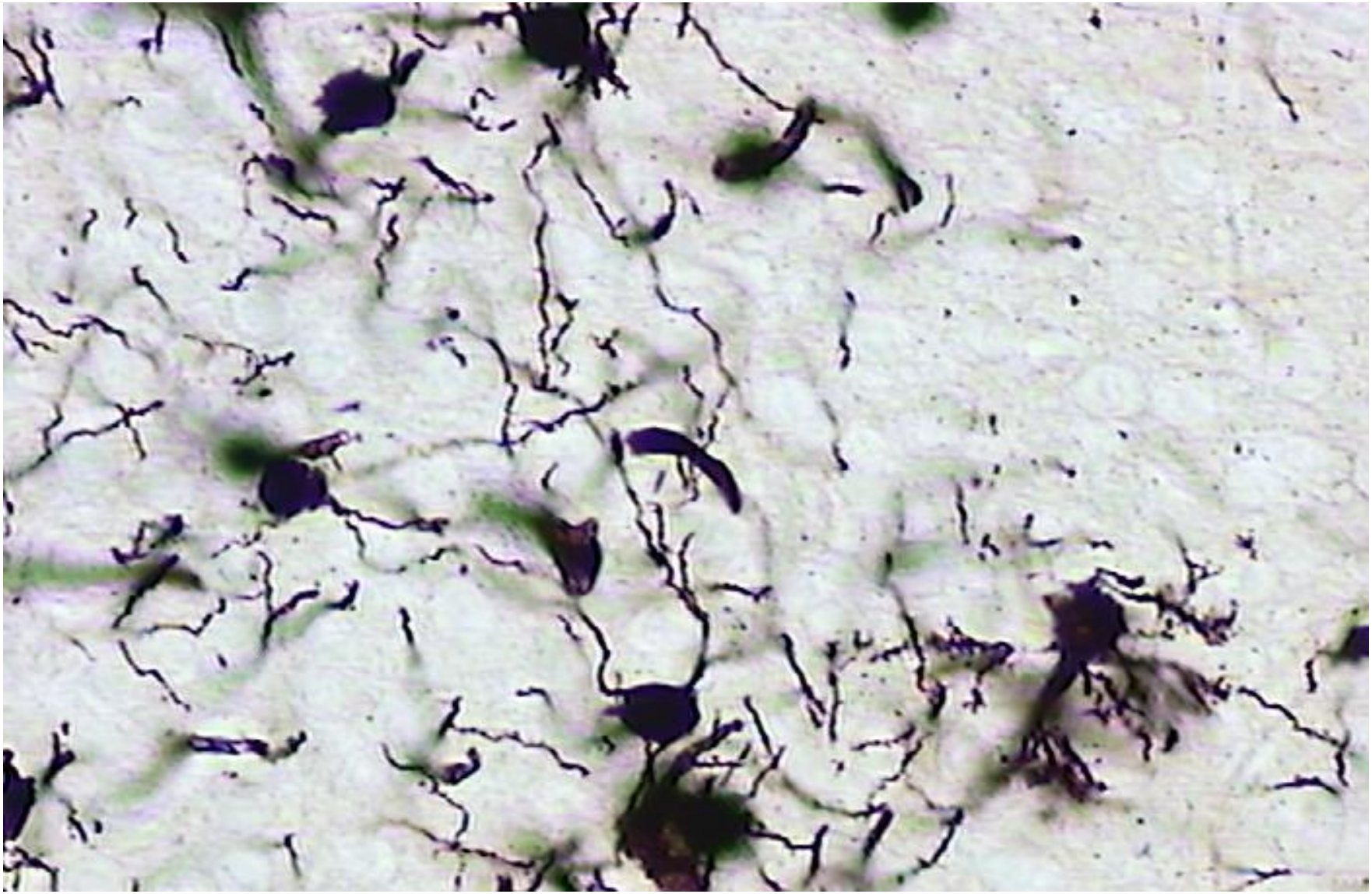
Impregnating fixed nervous tissue with silver nitrate. Cells are filled by microcrystallization of silver chromate.



112. Nerve cells impregnated with silver nitrate x10



112. Nerve cells impregnated with silver nitrate x20



112. Nerve cells impregnated with silver nitrate x40