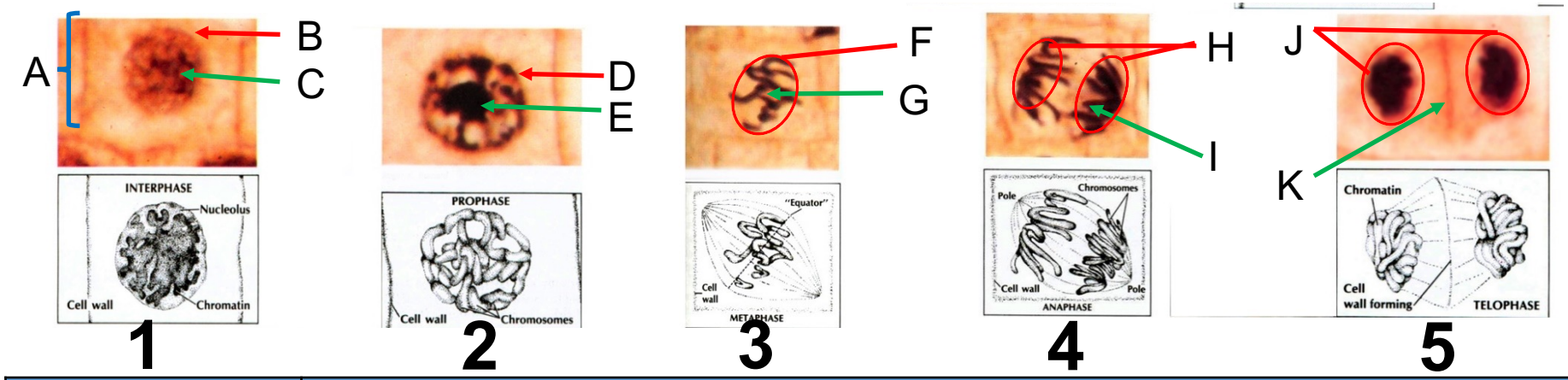
РНИМУ
им. Н.И. Пирогова

Кафедра биологии имени академика В.Н. Ярыгина ИБПЧ

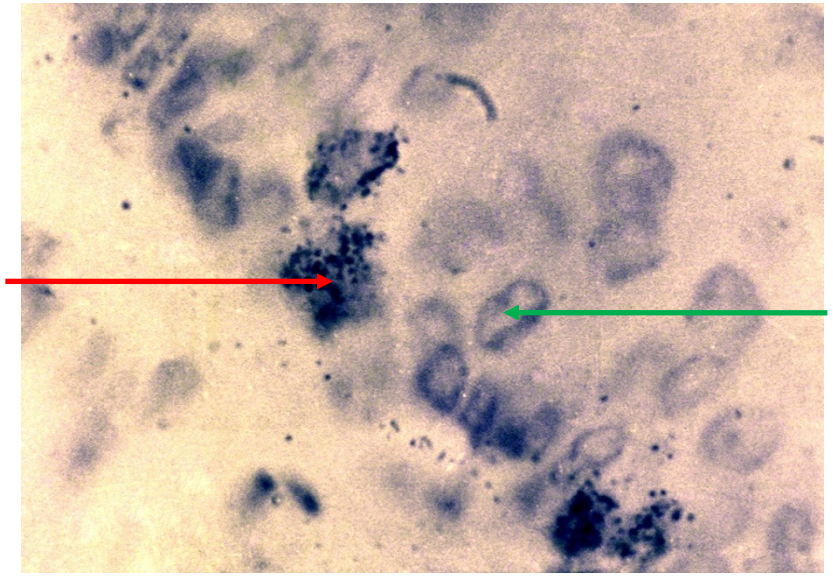
Slides
Mitosis and meiosis

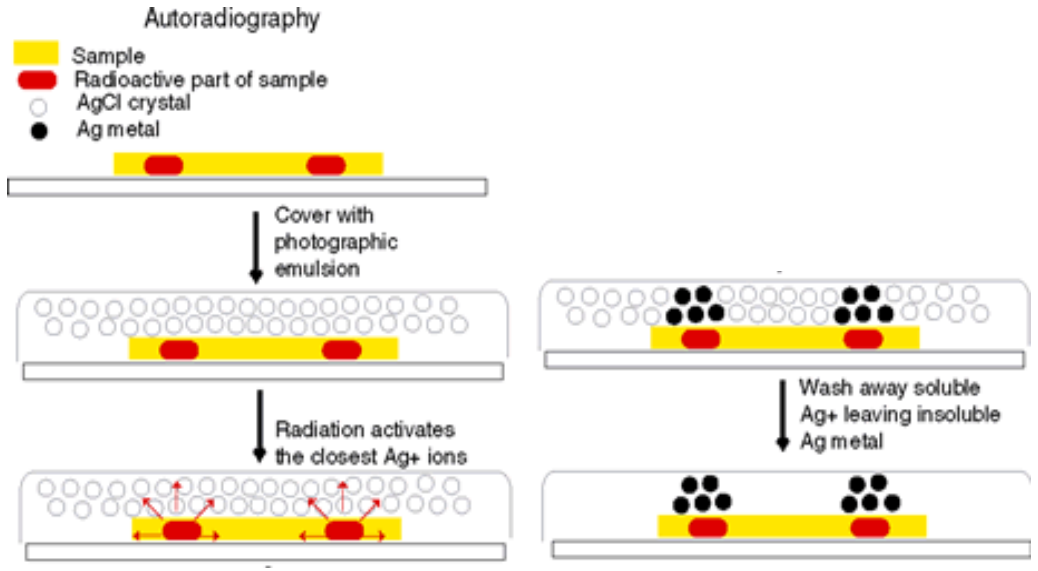
The general scheme of mitosis



Название препарата	Описание
The general scheme of mitosis	Micrographs and diagrams of the cell cycle. (Here are plant cells and they have a dense cellulose cell wall (A)).
1 – Interphase	The preparation shows a nucleus with a clear contour of the nuclear envelope (B). Chromatin of varying degrees of condensation is located inside the nucleus, lumps of heterochromatin are visible (C).
2 – Prophase	The preparation shows that the nucleus swells, the nuclear membrane begins to disappear -- its contour is interrupted (D). Chromatin condensation occurs inside the nucleus, which manifests itself in the appearance of chromosomes in the form of long thin strands arranged randomly. The nucleolus (E) begins to dissolve.
3 – Metaphase	The nucleus is seen no more. The maximally condensed two-chromatid chromosomes (F) line up at the equator of the cell, and a metaphase plate (G) is formed.
4 -- Anaphase	Daughter chromosomes (chromatids) (H) move towards the poles of the cell (I) due to the reduction of the spindle microtubules.
5 – Telophase	Chromosomes are located at the poles of the cell, their decondensation begins, J). Cytotomy (cytokinesis) in a plant cell occurs by forming a cell plate from the center of the cell to its periphery (K). By the end of the telophase, a nuclear envelopel and a nucleolus are formed again.

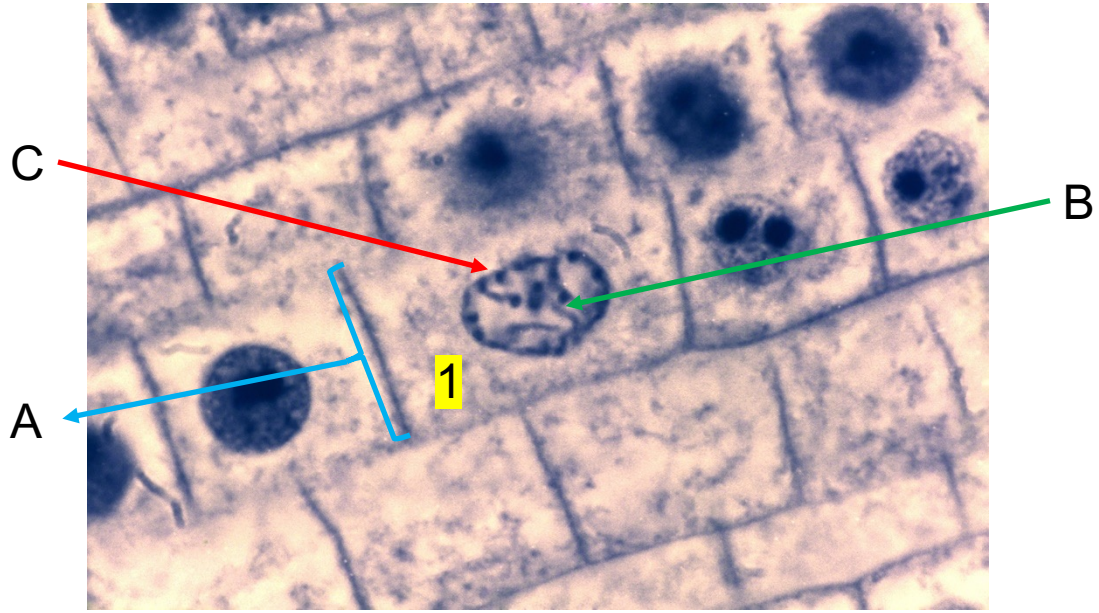
Rat esophageal epithelial cells labeled with radioactive thymidine at the S-phase of the cell cycle





Название препарата	Описание
Rat esophageal epithelial cells labeled with radioactive thymidine at the S-phase of the mitotic cycle	The nucleoside thymidine is labeled with tritium, a radioactive isotope of hydrogen, resulting in the formation of 3H-thymidine. It is added to the culture of dividing cells or injected into laboratory animals. Being a precursor of the nucleotide with thymine, 3H-thymidine is incorporated into the nuclei of cells in the S-phase of the mitotic cycle, where DNA synthesis takes place. The preparations are coated with a photoemulsion, exposed for a certain time, then the photoemulsion is developed and 3H-thymidine leaves an "autograph" (trace) in the form of silver grains. Thus, by the method of autoradiography, it was proved that DNA replication occurs in the MC interphase, and in a certain period (S-phase). Labeled (A) and unlabeled (B) epithelial cell nuclei are visible on the preparation. The labeled nuclei are in the synthetic period of the mitotic cycle.

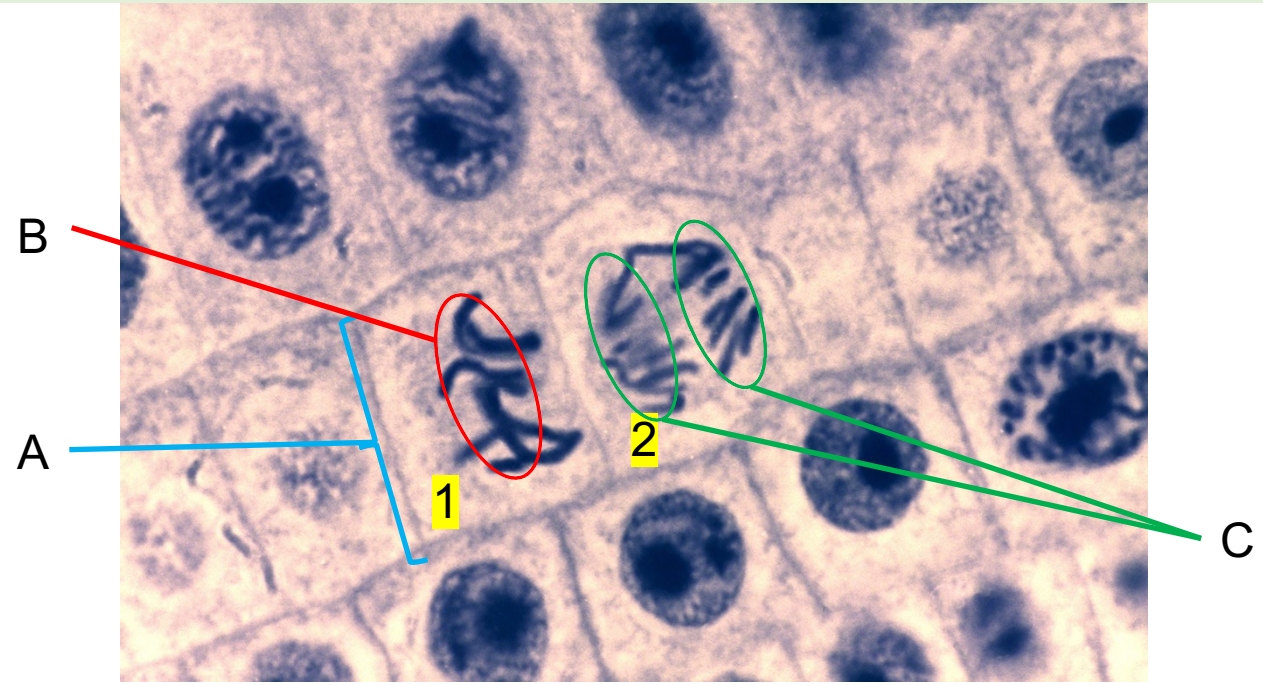
Prophase of mitosis in the cells of the onion root



Название препарата	Описание
Prophase of mitosis in onion root cells. Cross section.	The preparation contains plant cells, they have a clear shape, are arranged in an orderly manner due to the presence of a dense cellulose cell wall (A). In the center of the preparation is a cell (1), which is in the stage of mitosis prophase. The chromosomes are arranged randomly, they look like long strands with thickened chromosomes (B), some of them repeat the outlines of a swollen nucleus (C). The nuclear shell of the cell is fragmented, the nucleolus is missing (its remains are visible in the center). Other cells on the preparation are in interphase. Clear contour of nucleus and one or two nucleoli are seen.

РНИМУ им. Н.И. Пирогова

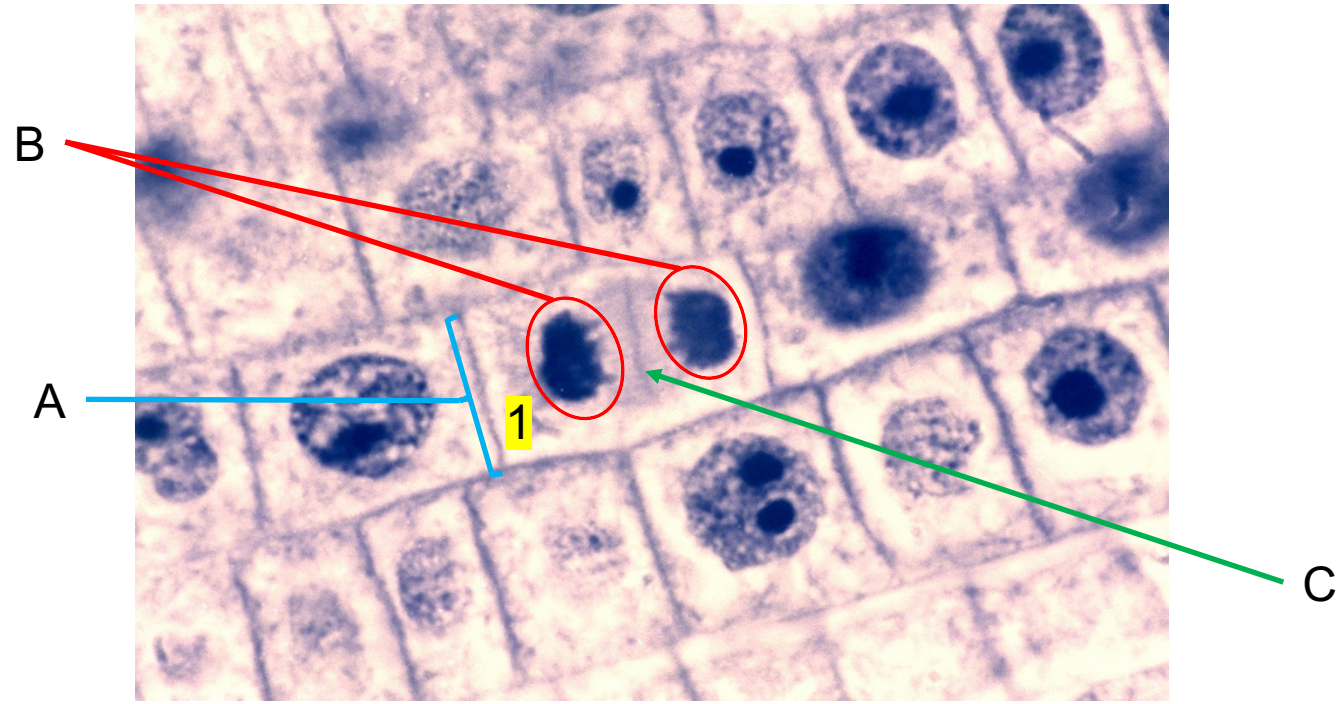
Metaphase and anaphase of mitosis in onion root cells



Название препарата	Описание
Metaphase and anaphase of mitosis in onion root cells	The preparation contains plant cells, because they have a clear shape and are arranged in an orderly manner due to the presence of a dense cell wall made of cellulose (A). Two cells are located in the center of the preparation: 1 – a cell in the metaphase stage of mitosis. In the cytoplasm of the cell, the maximally condensed two–chromatid chromosomes are visible, which are located at the equator of the cell (B). 2 - In the cytoplasm of the cell, single-chromatid chromosomes, diverge to the poles of the cell (C) due to the reduction of the spindle microtubules.

РНИМУ им. Н.И. Пирогова

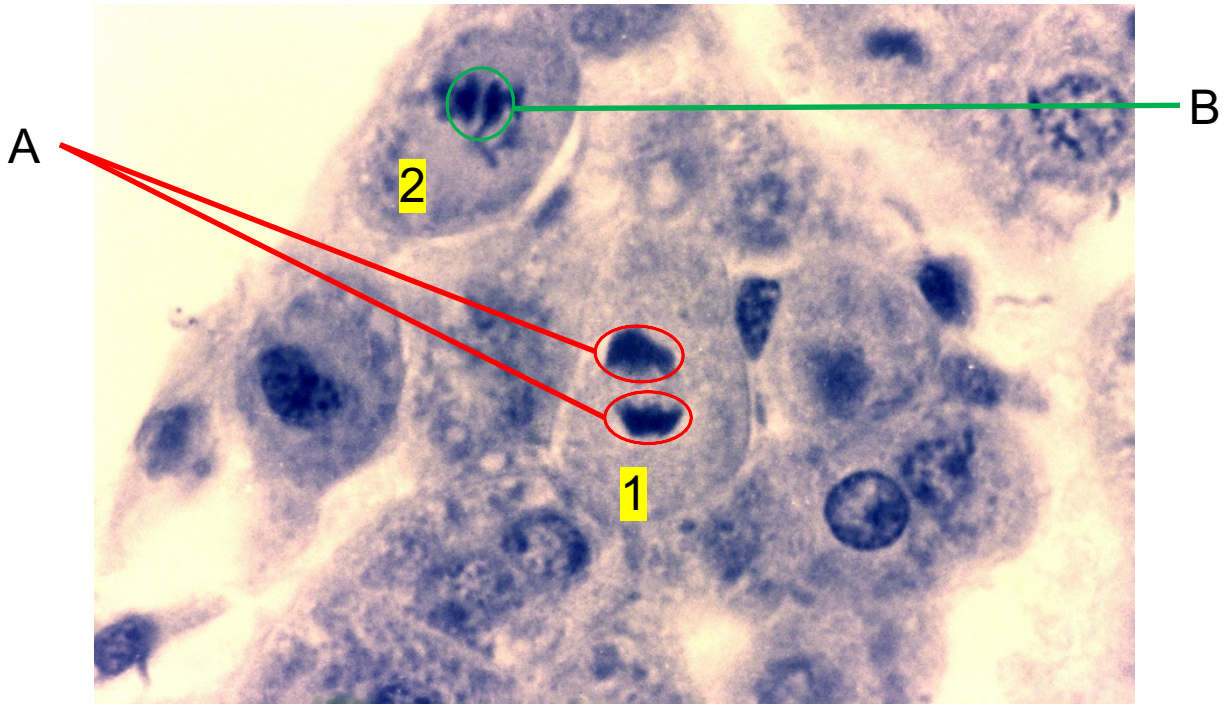
Телофаза митоза в клетках корешка лука



Название препарата	Описание
Mitosis telophase in onion root cells	Plant cells are represented on the preparation, they have a clear shape and are arranged in an orderly manner due to the presence of a dense cellulose cell wall (A).Chromosomes are located at the poles of the cell, their decondensation begins, therefore the contours of strongly converging chromosomes are indistinct (B). Cytotomy (cytokinesis) in a plant cell occurs by forming a cell plate from the center of the cell to its periphery (C). By the end of the telophase, a nuclear envelope and a nucleoli are formed.

РНИМУ им. Н.И. Пирогова

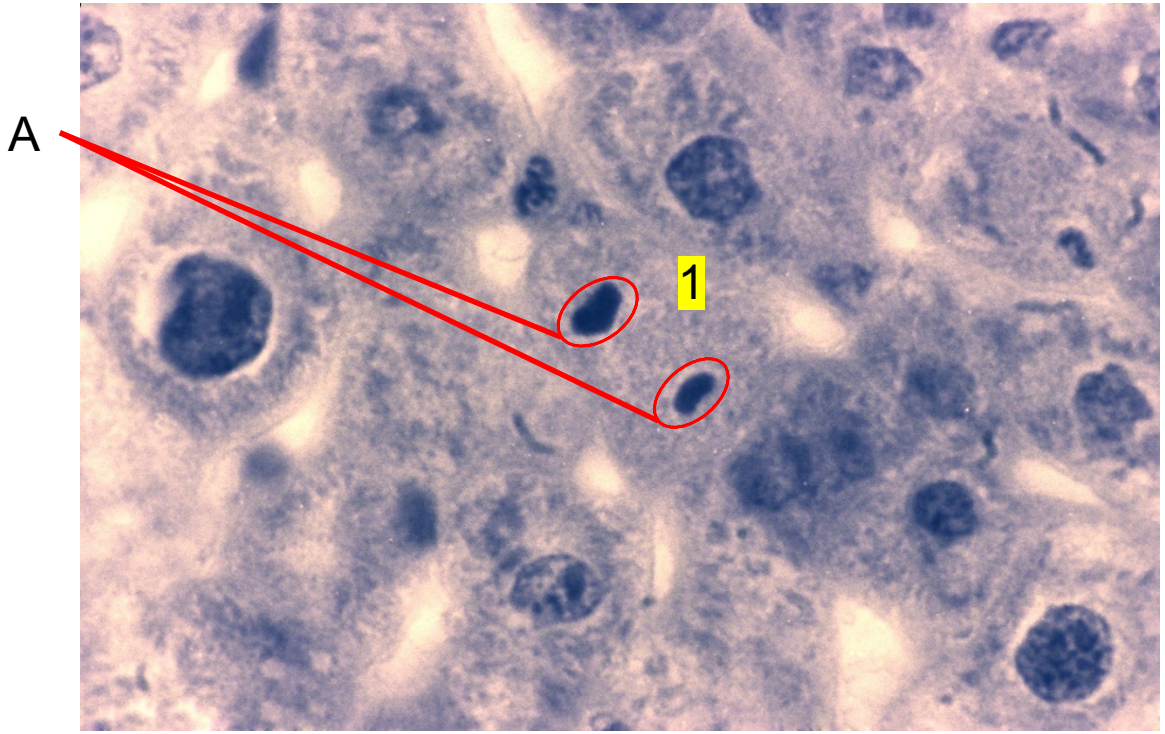
Metaphase and anaphase of mitosis in rat liver cells



Название препарата	Описание
Metaphase and anaphase of mitosis in rat liver cells	Animal cells are represented on the preparation, because they have an uneven, mostly rounded shape due to the coating of cell membranes with a soft glycocalyx and are arranged randomly. In the center of the slide there is a large cell (1), which is in the anaphase stage of mitosis. In the cytoplasm of the cell, single chromatid chromosomes are moving to the poles of the cell (A) due to the reduction of the spindle filaments. Cell #2 is in the metaphase stage of mitosis. The metaphase plate (B) is formed.

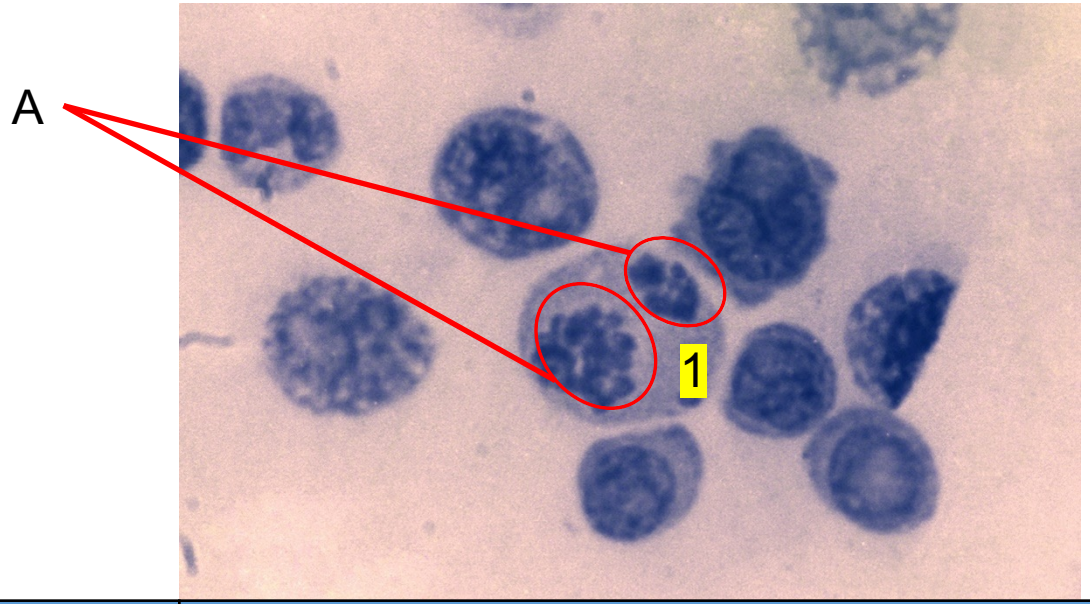
РНИМУ
им. Н.И. Пирогова

Telophase of mitosis in rat liver cells



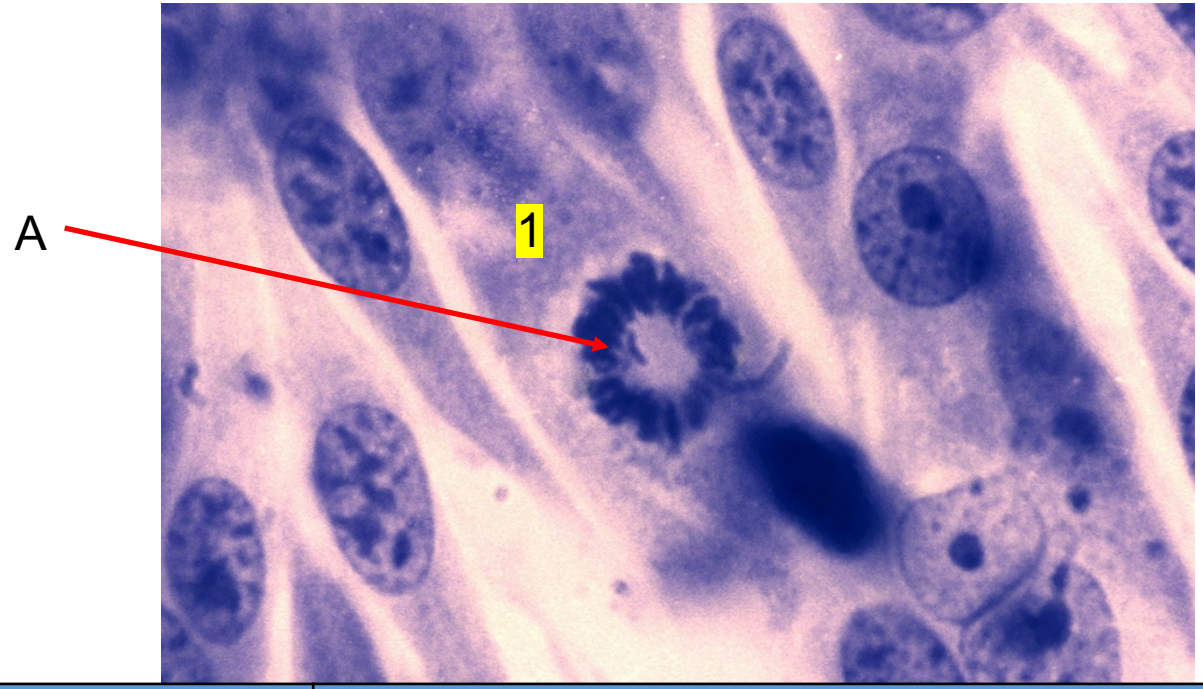
Название препарата	Описание
Telophase of mitosis in rat liver cells	Animal cells are represented on the preparation, because they have an uneven, mostly rounded shape due to the coating of cell membranes with a soft glycocalyx and are arranged randomly. In the center of the slide there is a cell (1) in the stage of telophase of mitosis. Chromosome sets are formed at the poles of the cell, daughter nuclei (A) are formed.

Colchicine mitosis. Ehrlich's ascitic carcinoma (a kind of cancer cell)



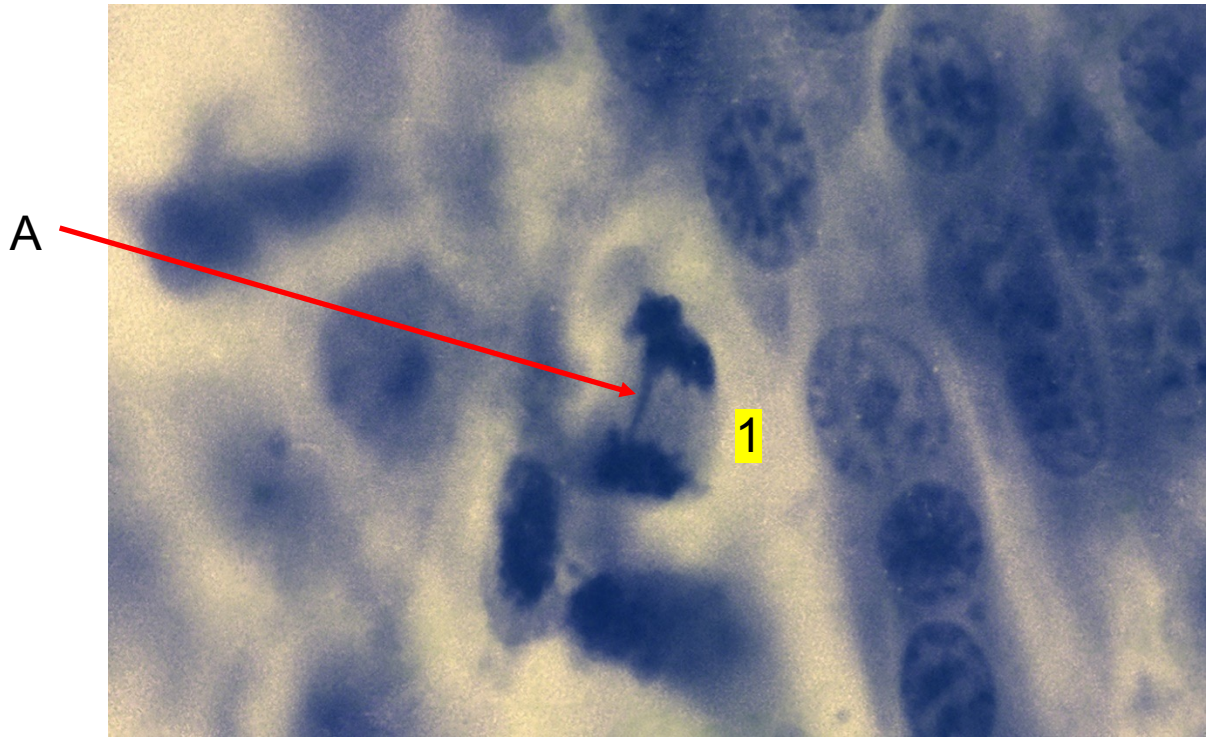
Название препарата	Описание
Colchicine mitosis. Ehrlich's ascitic carcinoma (pathological mitosis)	Animal cells are represented on the preparation, because they have an uneven, mostly rounded shape due to the coating of cell membranes with a soft glycocalyx and are arranged randomly. In the center of the slide there is a cell (1) in which pathological colchicine mitosis occurs. This mitosis belongs to the group of pathological mitoses with a violation of the mitotic apparatus (spindle microtubules) and is characterized by an arrest of mitosis in prometaphase due to disorganization of the mitotic apparatus and further hypercondensation of chromosomes – this is seen in the cytoplasm of the cell (A).

The "hollow" metaphase mitosis. Glioma (a kind of cancer cell)



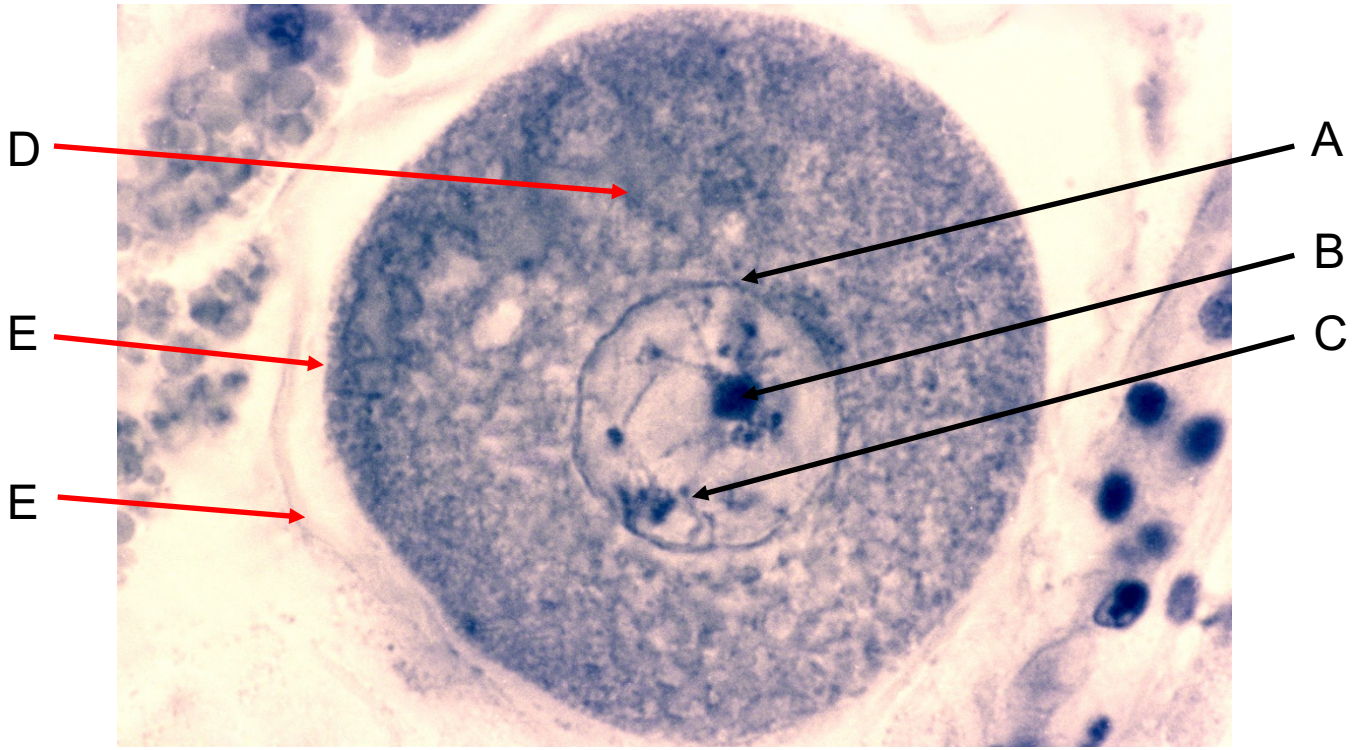
Название препарата	Описание
The hollow metaphase of mitosis. Glioma (pathological mitosis). cinoma (pathological mitosis)	Animal cells are represented on the preparation, because they have an uneven, mostly rounded shape due to the coating of cell membranes with a soft glycocalyx and are arranged randomly. In the center of the slide there is a cell (1) in which a pathological mitosis occurs - a hollow metaphase. This mitosis belongs to the group of pathological mitoses with a violation of the mitotic apparatus (hyperproduction of centrioles, leading to multipolar mitosis) and is characterized by the alignment of chromosomes in metaphase not along the equator of the cell, but along the periphery, with the formation of a ring (A).

Chromosome lag in anaphase. Glioma



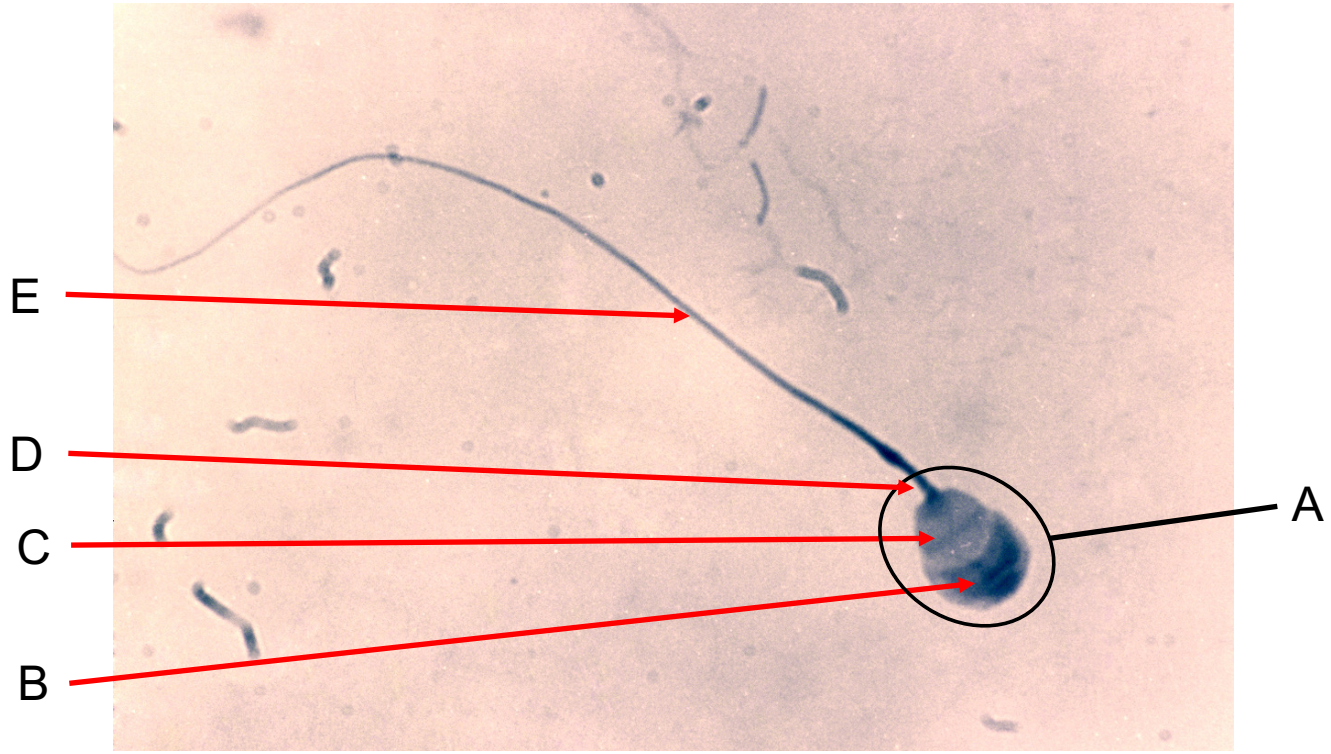
Название препарата	Описание
Chromosome lag in mitosis anaphase. Glioma (pathological mitosis)	Animal cells are represented on the preparation, because they have an uneven, mostly rounded shape due to the coating of cell membranes with a soft glycocalyx and are arranged randomly. In the center of the drug there is a cell (1) in which pathological mitosis occurs – a lag of chromosomes in mitosis anaphase. This mitosis belongs to the group of pathological mitoses with a violation of the chromosome structure in the kinetochore region and is characterized by the fact that the chromosome does not divide into chromatids and a "chromatid bridge" (A) is formed.

Egg cell (mollusk)



Название препарата	Описание
Egg cell of a Toothless mollusk 	A section of a toothless egg cell, which has a rounded shape, is presented. In the center of the cell there is a large nucleus, separated from the cytoplasm by a nuclear shell (A), inside the nucleus a nucleolus (B) and lumps of chromatin (C) are visible. The cell contains a large amount of cytoplasm with inclusions – yolk granules (D). The cytoplasm is delimited by the primary shell of the egg (E), next to which the secondary shell is located (F).

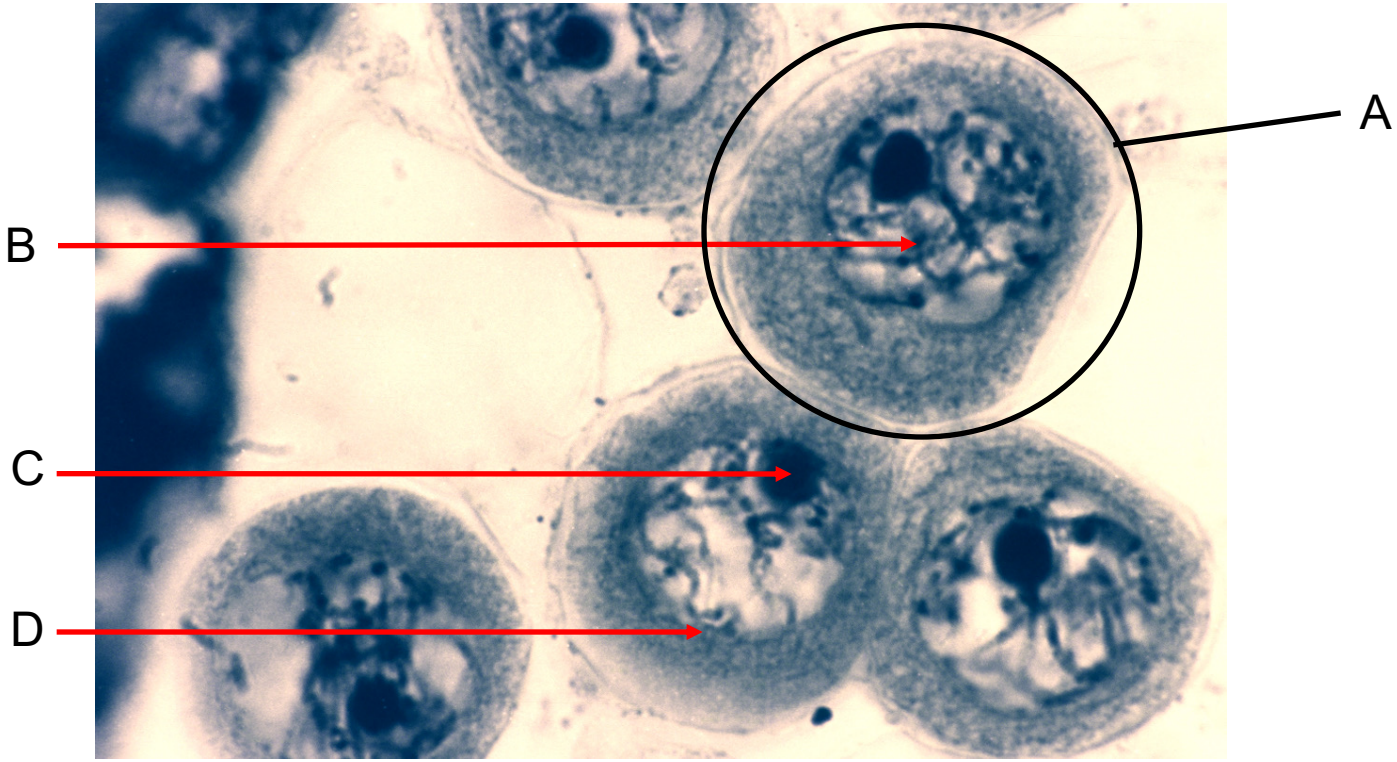
Guinea pig sperm



Название препарата	Описание
Guinea pig sperm	In the sperm, (A) the head with an acrosome (B) and a nucleus (C), a short neck (D), and a tail (E) are distinguishable.

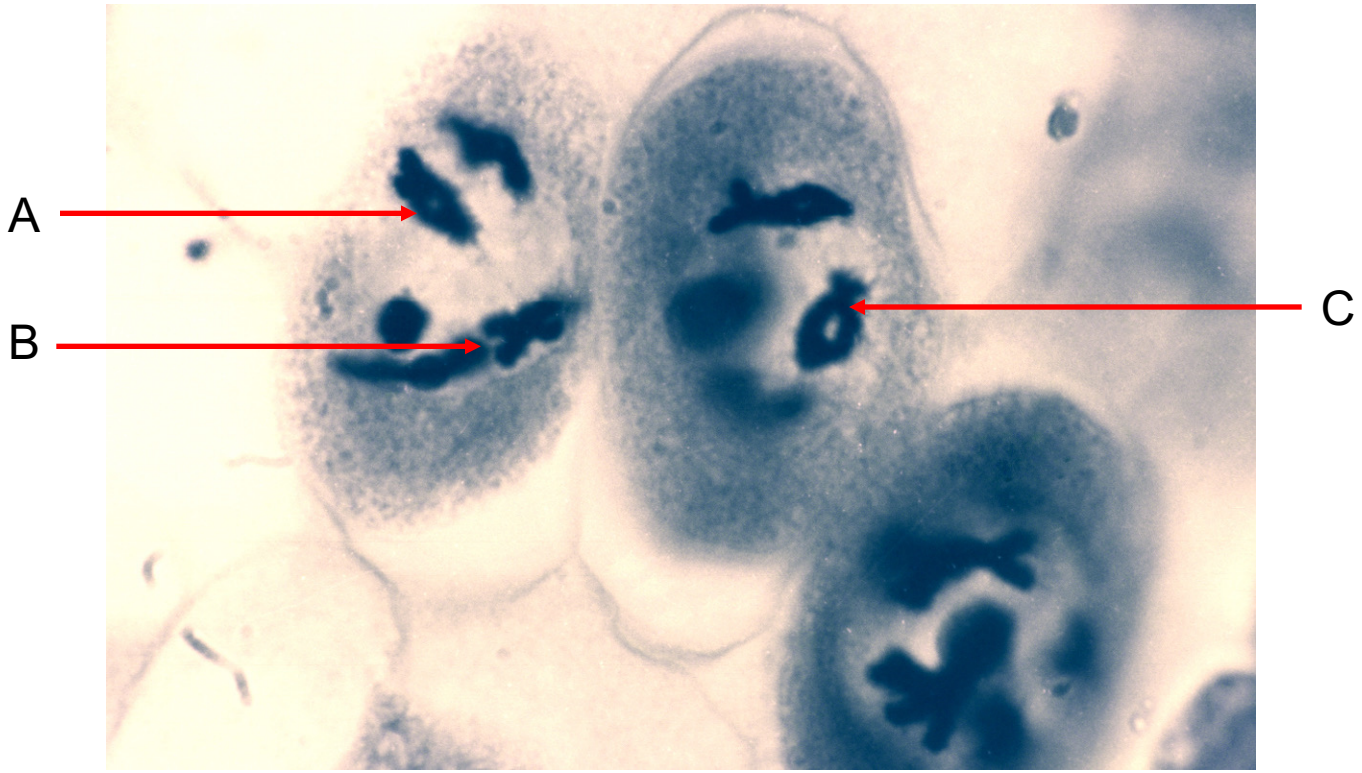
РНИМУ им. Н.И. Пирогова

Leptonema in the anthers of the Thunberg lily flower



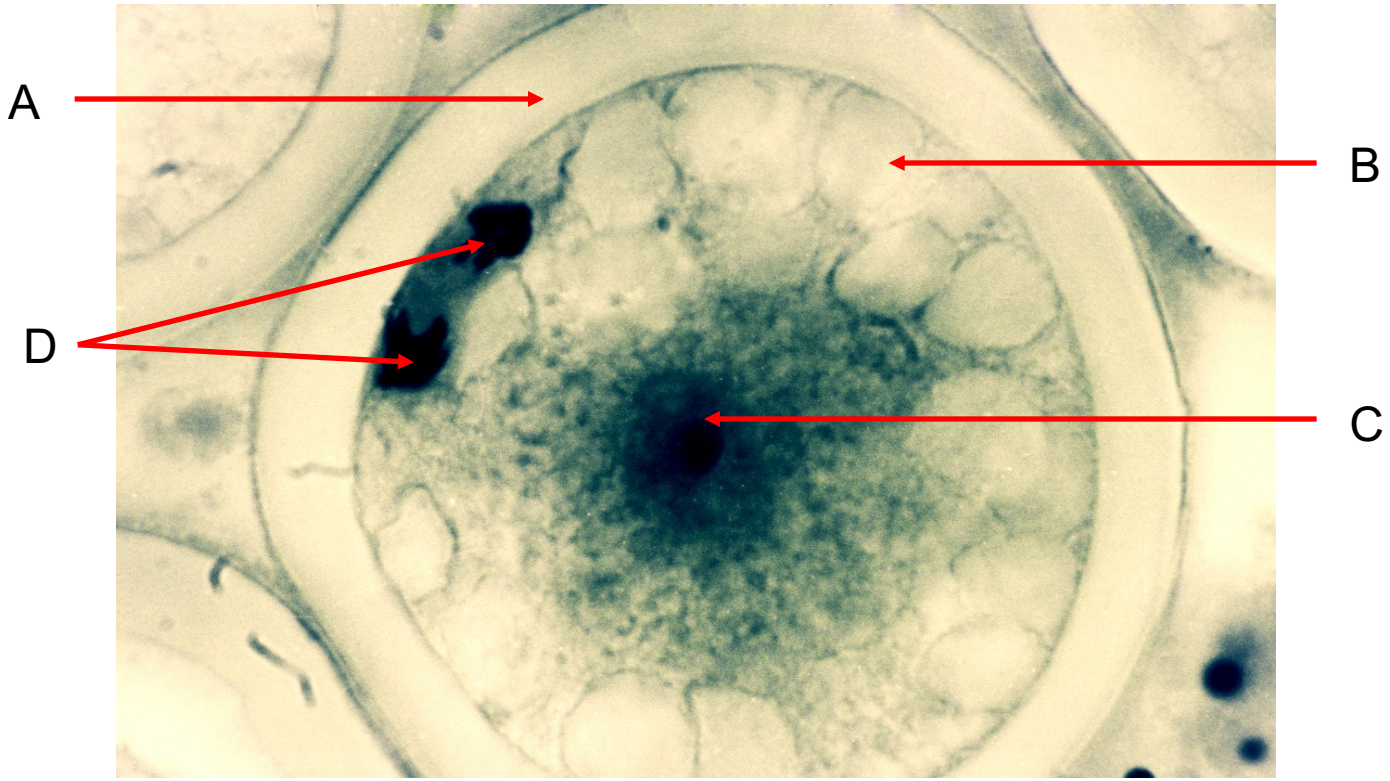
Название препарата	Описание
Leptonema in the anthersof the Thunberg lily	The preparation shows anther chambers (microsporangia) filled with large diploid cells(A), which are called pollen mother cells. Most of them are in the leptotene stage, the first stage of prophase of the first meiotic division. Thin long filamentous chromosomes (B) are visible in the nuclei. The nuclei have one or more nucleoli (C) and a clear nuclear envelope(D).

Diakinesis in the anthersof Lilia Thunberg



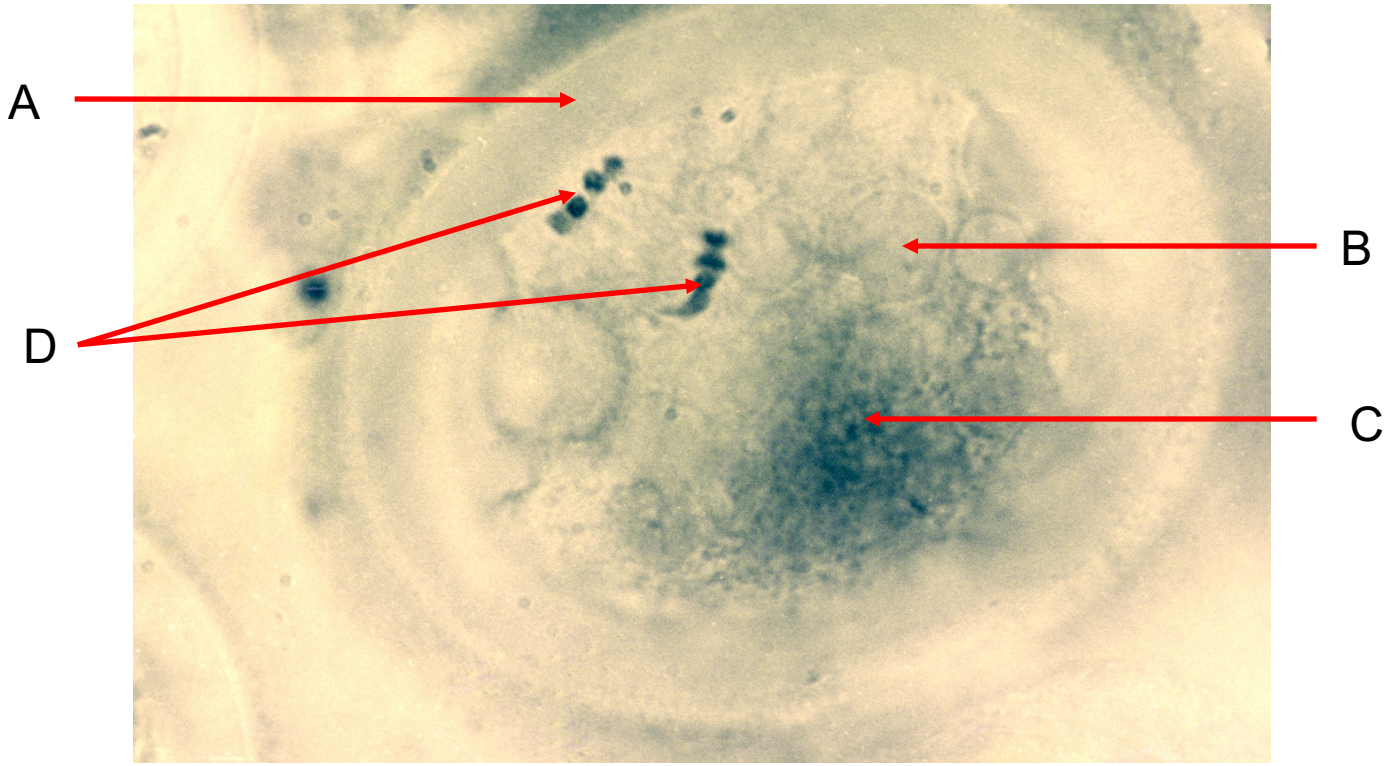
Название препарата	Описание
Diakinesis in the anthers of lilia flower.	The anther cells are in the stage of diakinesis. Chromosomes (compared to those in the leptotene stage) have become shorter and thicker. The bivalents (A, B) formed as a result of conjugation of homologous chromosomes, are clearly visible. In some bivalents, the chromosomes are crossed with each other, i.e. they form chiasmata (C), which indicates crossing over.

Metaphase of the first division of meiosis in ascaris



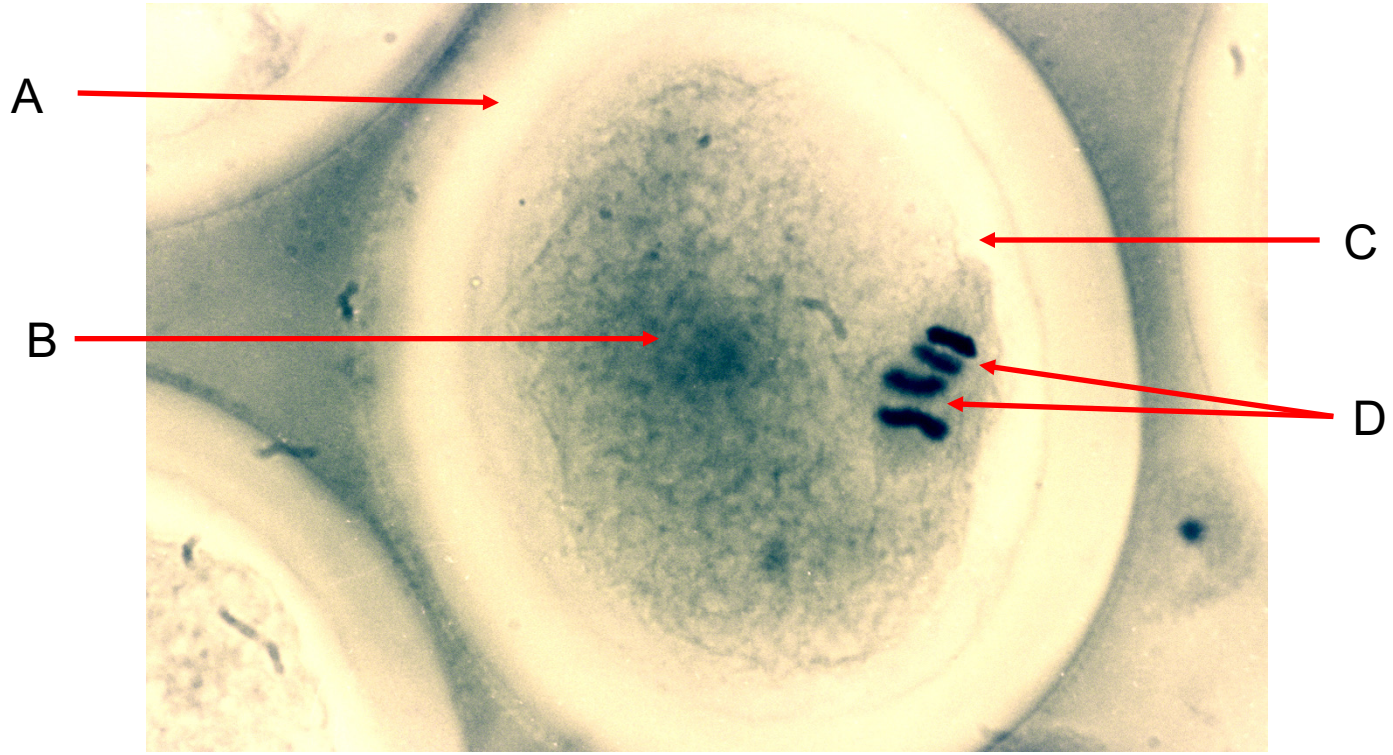
Название препарата	Описание
Metaphase of the first division of meiosis in ascaris	A large cell is visible on the preparation, surrounded by a dense thick fertilization ennvelope (A). On the periphery of the cell there are rather large granules of yolk (B), and in the center there is a sperm nucleus (C), which penetrates into the egg even before the onset of egg-cell meiosis. Considering that there are 4 chromosomes in the karyotype of the equine ascaris, at the stage of metaphase of meiosis I we see 2 bivalents (D) shifted to the periphery, where there is an inclusion-free cytoplasm.

Anaphase of the reductive (first) division of meiosis in ascaris



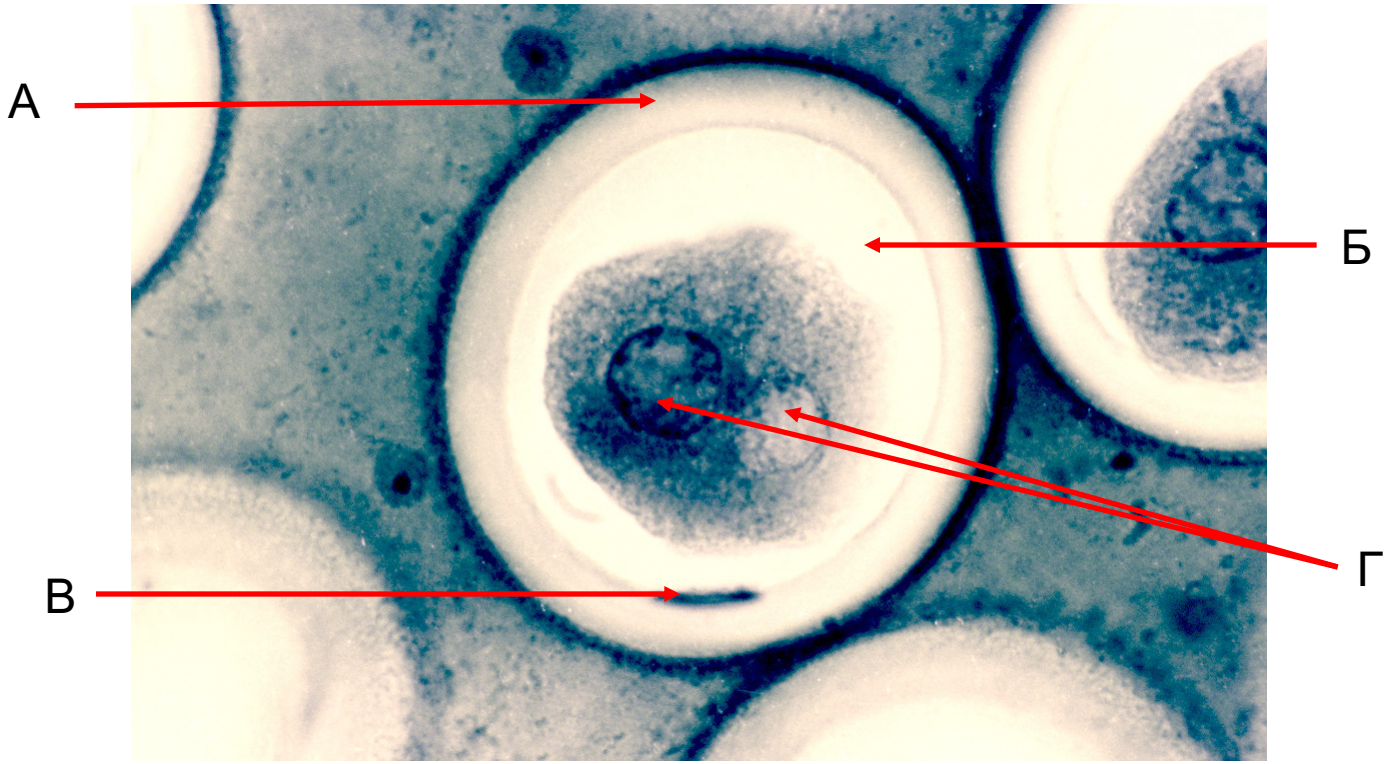
Название препарата	Описание
Anaphase of the reductive (first) division of meiosis in ascaris	A large cell is visible on the preparation, surrounded by a dense thick fertilization shell (A). In the cytoplasm of the cell, quite a lot of large yolk granules (B) are visible, as well as the nucleus of the sperm (C). Given that there are 4 chromosomes in the karyotype of the equine ascaris, then at the stage anaphase I, two two-chromatid non-homologous chromosomes (D) diverge to the poles of the cell.

Anaphase of the second division of meiosis in ascariids



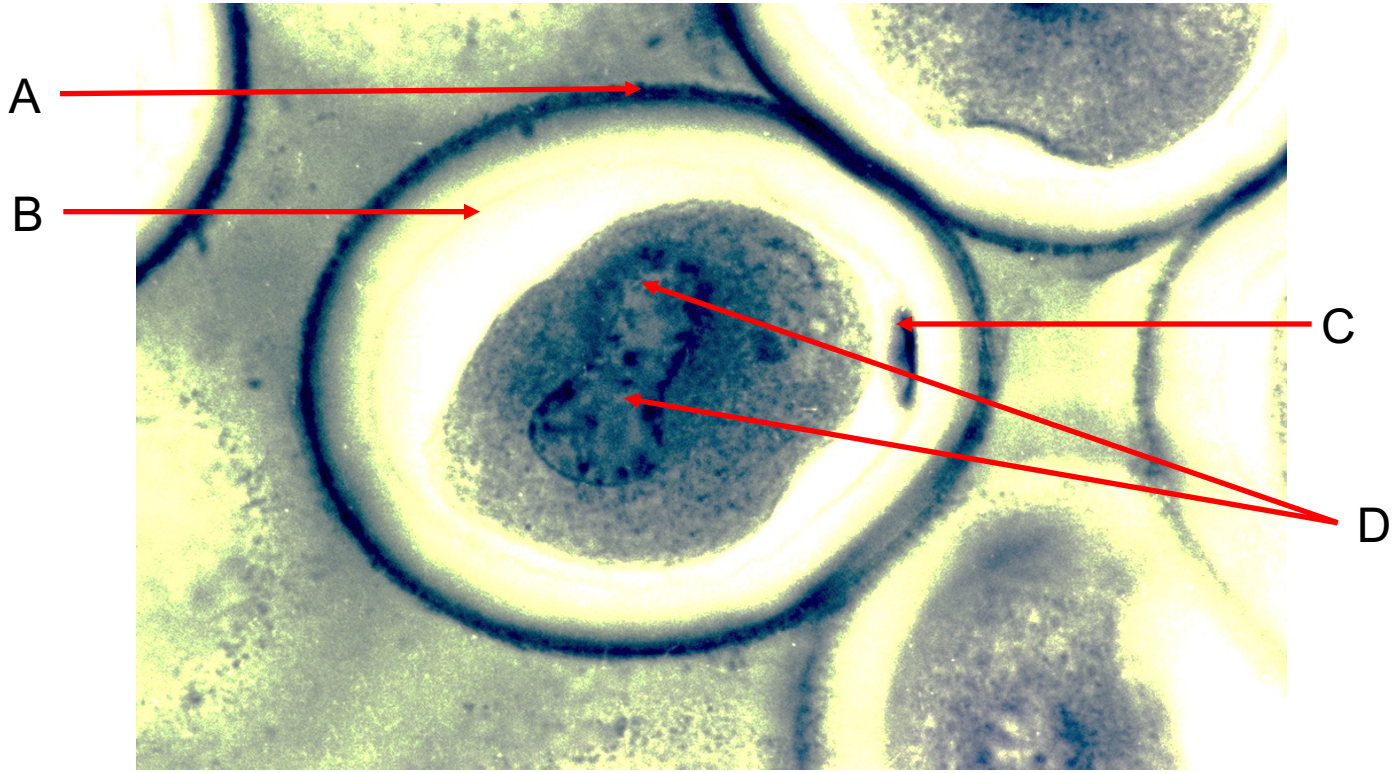
Название препарата	Описание
Anaphase of the second division of meiosis in ascariids	The preparation shows a large cell surrounded by a dense thick fertilization envelope(A). The nucleus of the sperm (B) and the slit-like perivitellin space (C) are visible. Given that the karyotype of the equine ascaris has 4 chromosomes, two two-chromatid non-homologous chromosomes (dyads) are visible at the stage of metaphase of meiosis II on the periphery of the cytoplasm (D).

The synkarion of ascaris



Название препарата	Описание
The synkarion of ascaris	A large cell is visible on the preparation, surrounded by a dense thick fertilization shell (A). The perivitelin space (B) is well expressed, in which the first reduction body (C) is located. There are two nuclei in the center of the cell: the sperm nucleus and the egg nucleus(D).

Karyogamy in ascaris



Название препарата	Описание
Karyogamy in ascaris	A large cell is visible on the preparation, surrounded by a dense thick fertilization envelope (A). The perivitellin space (B) is well expressed, in which the remains of the first reduction body (C) are located. In the center of the cell, the pronuclei of the sperm and the egg (D) are fusing to form a diploid nucleus of zygote.