From Tissues to Images: Sample Collection, Processing, and Diagnostic Interpretation

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Euthanasia and Necropsy

Euthanasia” is a noun from Greek origins: eu (meaning “good”) and thanatos (meaning “death”). In other words, euthanasia is death that is induced with minimal pain and distress. Euthanasia of an animal should be performed in a humane manner. The techniques used should cause rapid unconsciousness, respiratory or cardiac arrest, and loss of brain function.

Approved methods for euthanasia are typically chemical or physical, and the optimal choice in a particular situation varies based on age, use, and species differences. The method of euthanasia selected should be based on compatibility with postmortem data collection needs.

Agents used for euthanasia may produce changes in research data and should therefore be carefully selected. Some physical methods of euthanasia may pose safety issues for personnel; for example, the guillotine, if improperly used, can cause injury to the user, and human exposure to inhalant anesthetics is associated with liver and kidney damage, cancer, and complications during pregnancy.

Necropsy: is an important procedure for diagnostic investigations of laboratory animals and for obtaining valuable data in biomedical research. The origin of the term “necropsy” is from the Greek words nekros (meaning “corpse”) and opsis (meaning “to view”), and together they mean “to look at the dead body with naked eyes”; that is, macroscopic examination of a dead body.

Although “autopsy” and “necropsy” are synonymous, “necropsy” is the conventional term for postmortem examination of non-human species, and “autopsy” is used only for postmortem examination of humans. Because there is only one opportunity to perform the necropsy of an animal, it is important to conduct a thorough macroscopic examination with identification and detailed description of all lesions. The necropsy procedure includes not only the dissection of the dead animal and macroscopic examination of all organs but also collection of appropriate tissue samples and measurements of the carcass, internal organs, and body fluids (i.e. weight, size, length, volume). The gross lesions observed at necropsy should be documented promptly in a descriptive written report and by taking good-quality photographs.

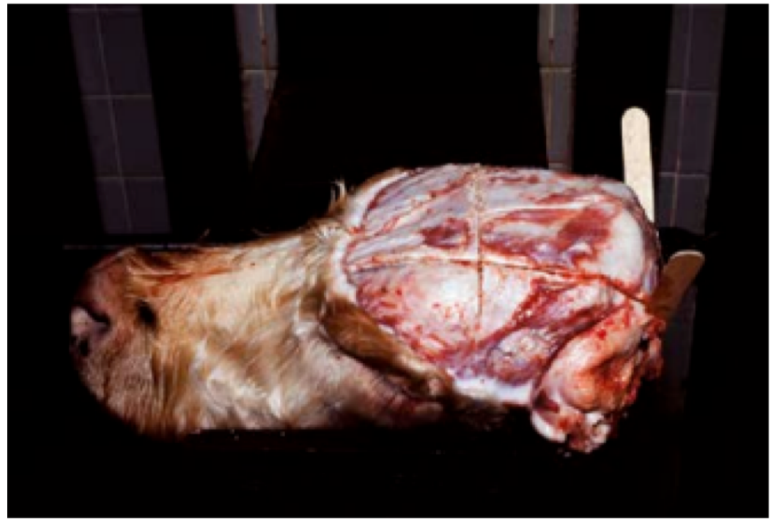


Figure 1: Lateral view of the head of a calf demonstrating the location of cuts needed to remove the brain. The location of these cuts is similar in all species with minor modification depending upon the shape of the cranium.

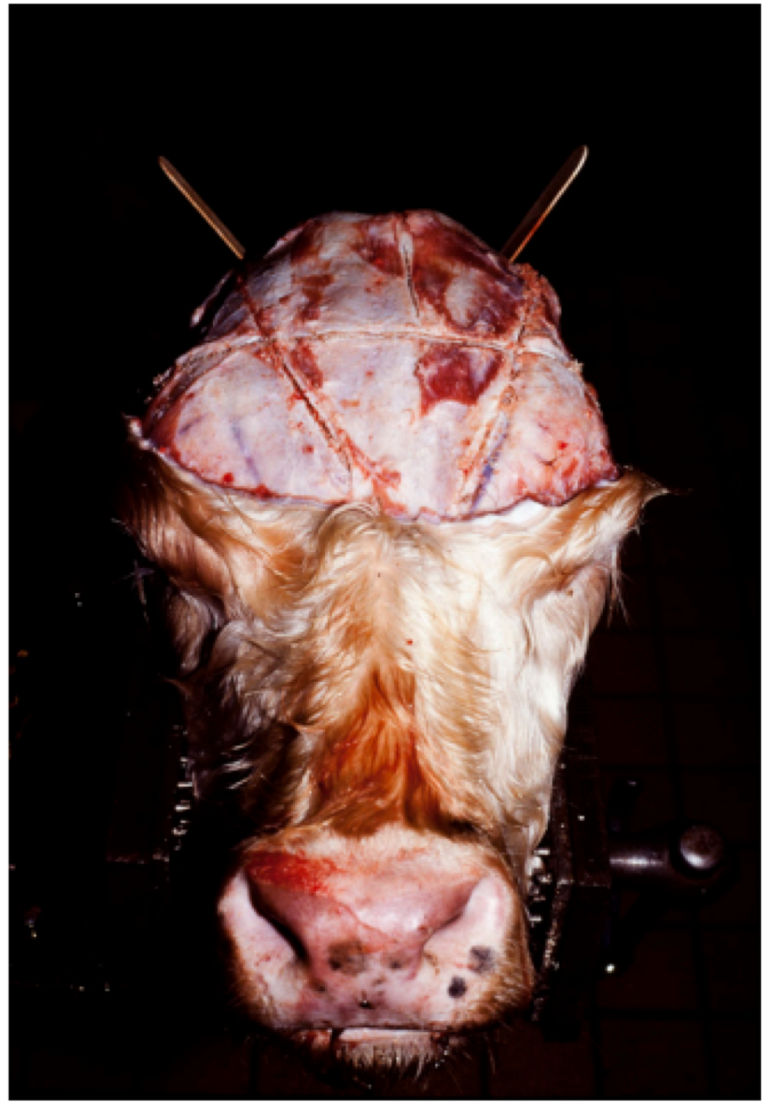


Figure 3: Frontal view of calf head in Figure 1

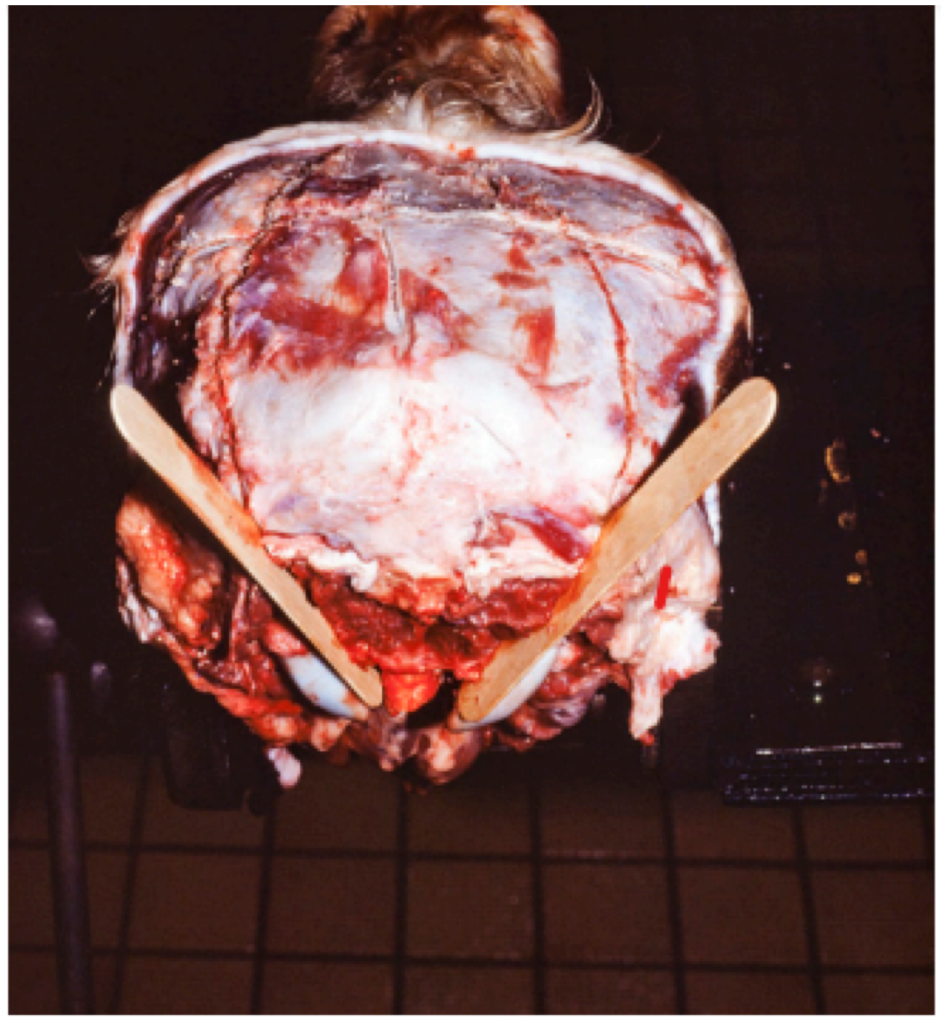


Figure 2: Caudal view of calf head in

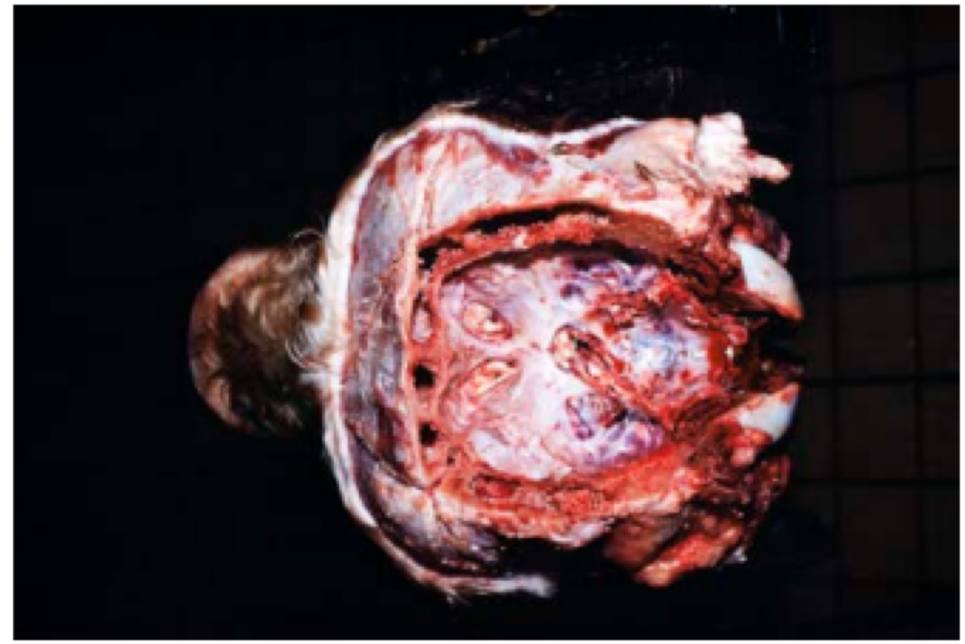


Figure 4: Caudal view of the calf head with cranial cap and brain removed.

The necropsy procedure includes not only the dissection of the dead animal and macroscopic examination of all organs but also collection of appropriate tissue samples and measurements of the carcass, internal organs, and body fluids (i.e. weight, size, length, volume).

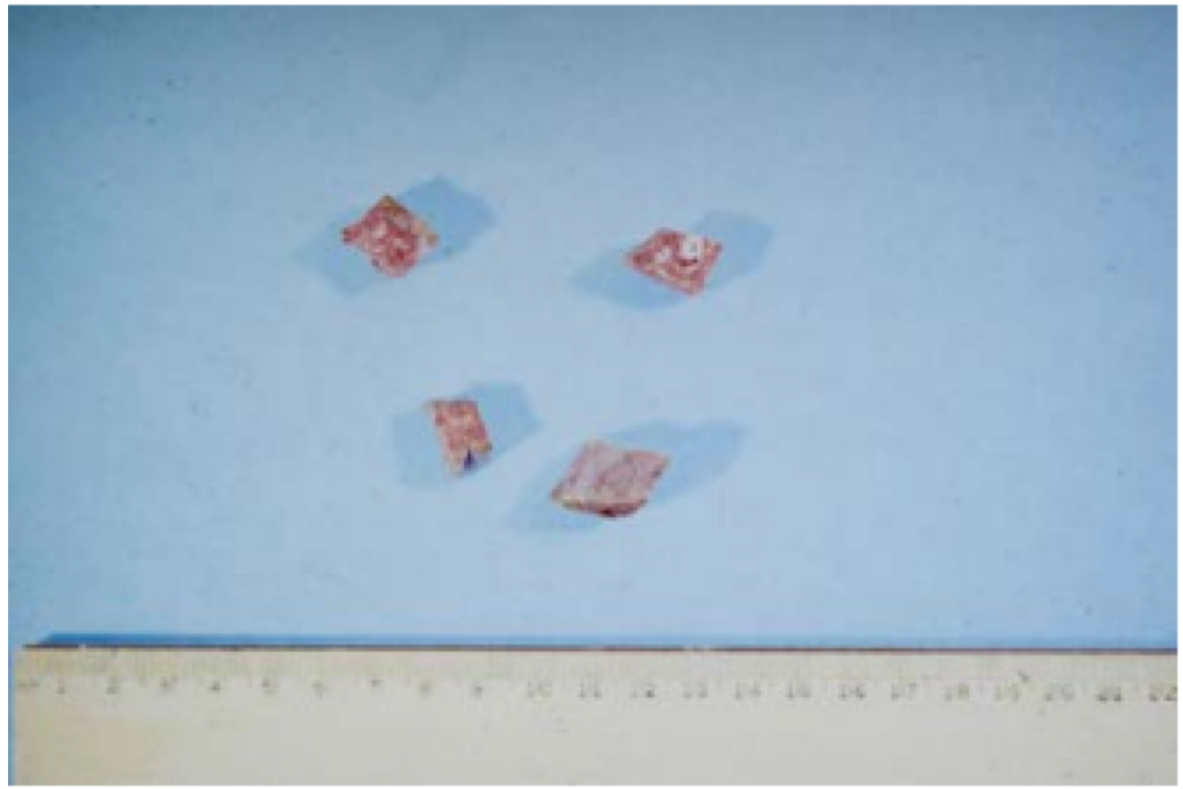


Figure 6: Samples of lung of an appropriate size to allow formalin penetration and complete fixation within 12 hours.

a. Glass specimen jar containing a large hardened formalin,
fixed piece of lung that cannot be retrieved through the neck of the bottle.
b. retrieval of the sample by smashing the bottle. This results in fragments of glass that pose a safety hazard. Small
pieces of glass can become embedded in the specimen, inducing artifacts andcausing a safety hazard.

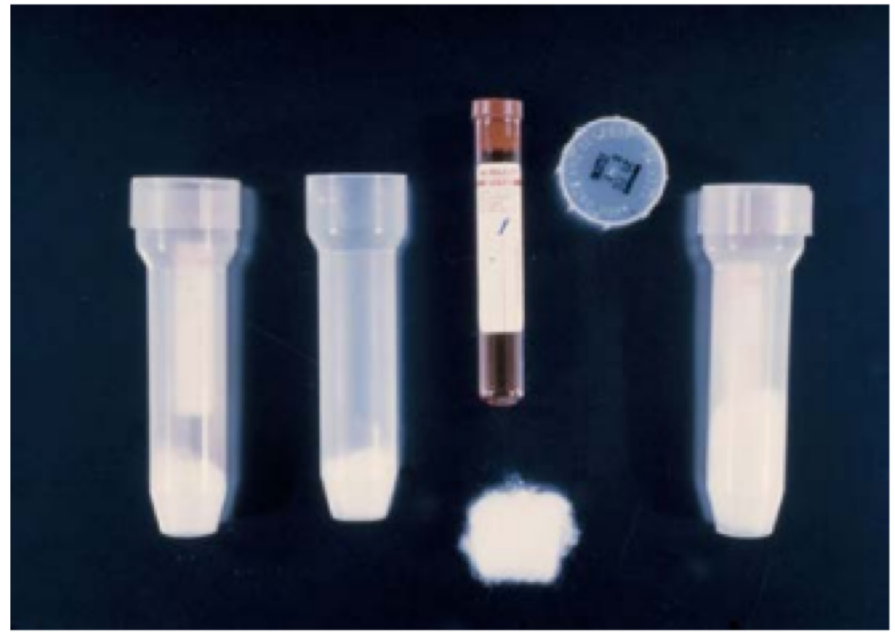


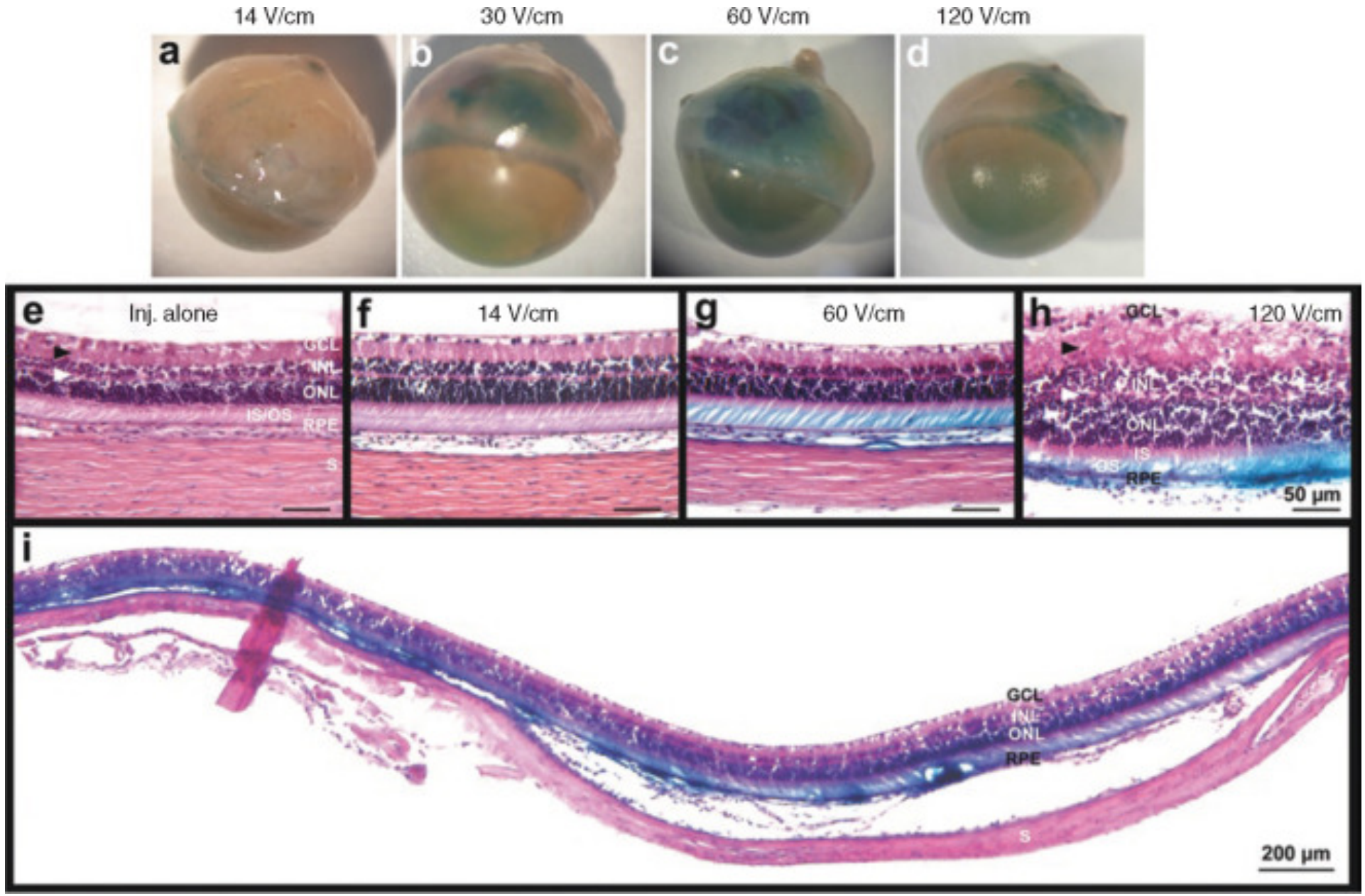
Figure 9: A well packaged submission of blood tubes. The tube is padded top and bottom inside a syringe case. Addition of absorbent material between the outside of the blood tube and the inner wall of the syringe case would make this shipment meet the packing regulations for dangerous goods.

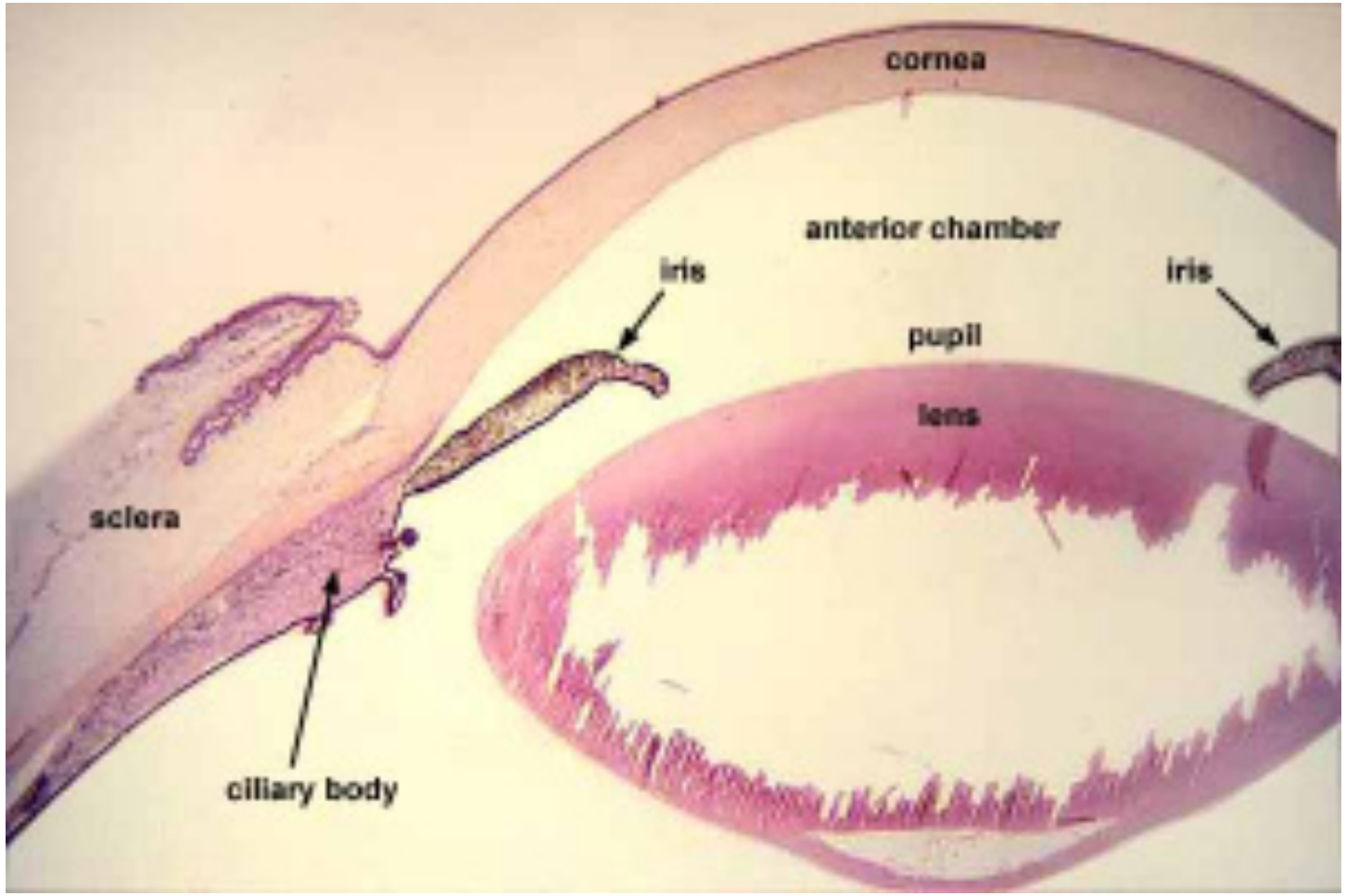
Eye

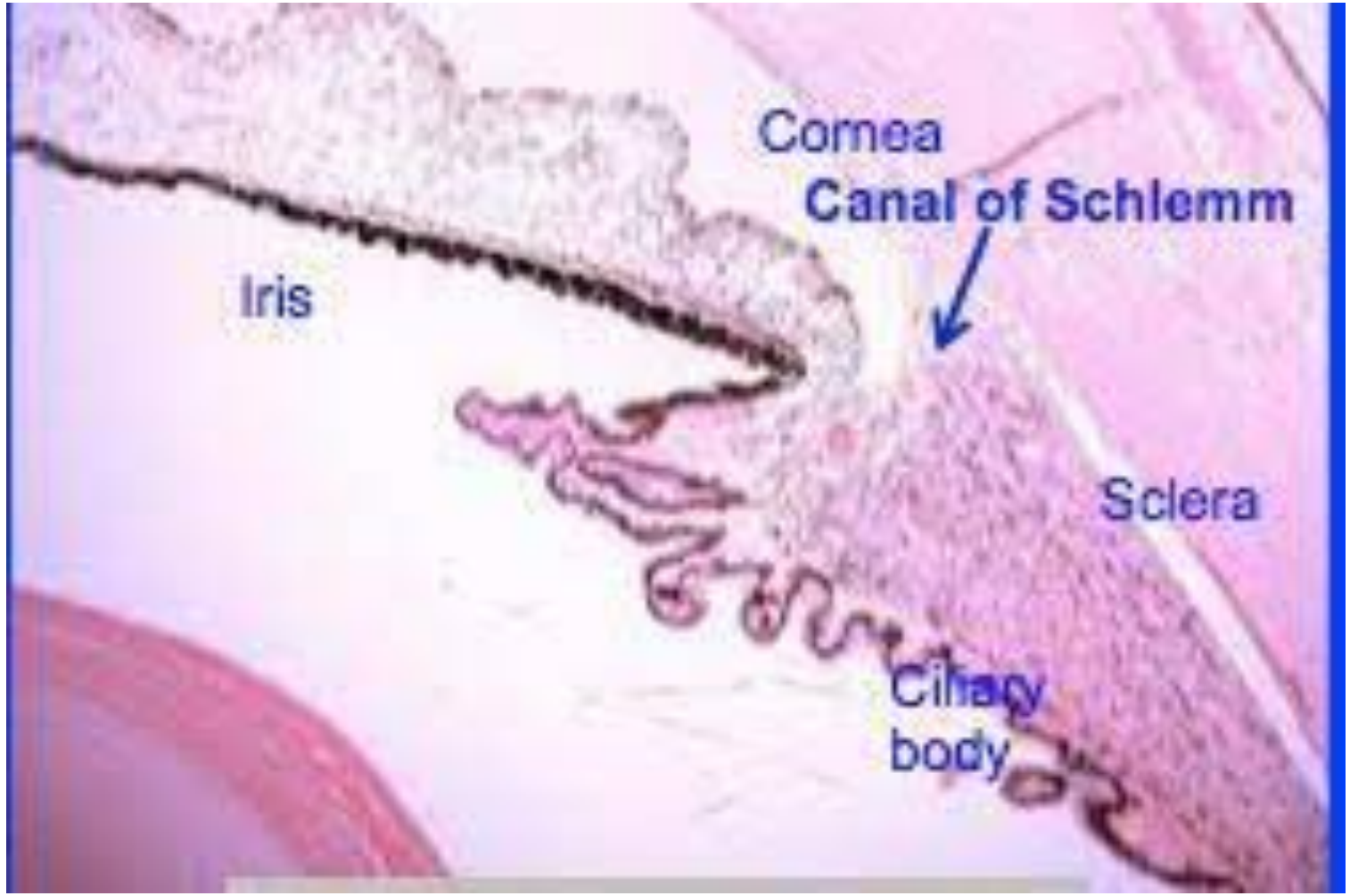
Eyes for histology present a special challenge. They are best trimmed in the laboratory by specialist personnel. The globe can be removed intact from the skull at postmortem and then fixed entire for shipment to the histology laboratory. Prior to placing into fixative, a cut should be made through the sclera halfway around the circumference of the globe with a sharp scalpel. This should penetrate the full thickness of the sclera but no further, the idea being to keep the globe intact but to allow formalin into the chambers of the eye.

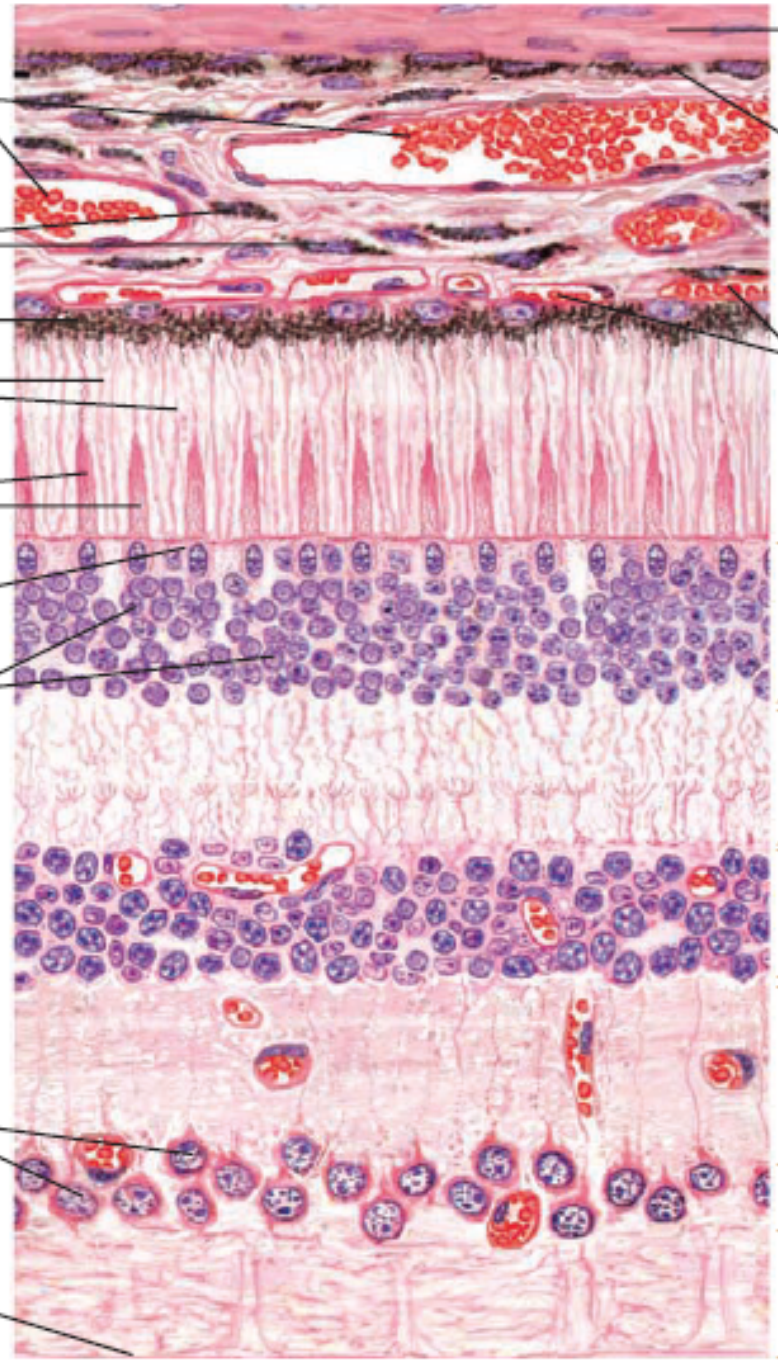
Microscopy, Light

In ophthalmology, a specialized form of microscopy called slit lamp biomicroscopy is used to visualize anterior and posterior structures of the eye. By using an adjustable slit beam of light, an observer can examine layers of the eye and appreciate depth. For example, an ophthalmologist may evaluate a corneal abrasion in a patient and characterize the severity and extension of the lesion within the layers of the cornea. Several types of illumination techniques exist, including diffuse illumination, direct focal illumination, retroillumination, specular reflection, indirect proximal illumination, and sclerotic scatter.


14 V/cm
30 V/cm
60 V/cm
120 V/cm
a
b
c
d
e
Inj. alone
GCL
INL
ONL
IS/OS
RPE
S
f
14 V/cm
g
60 V/cm
h
GCL
120 V/cm
INL
ONL
IS
OS
RPE
50 µm
i
GCL
INL
ONL
RPE
S
200 µm

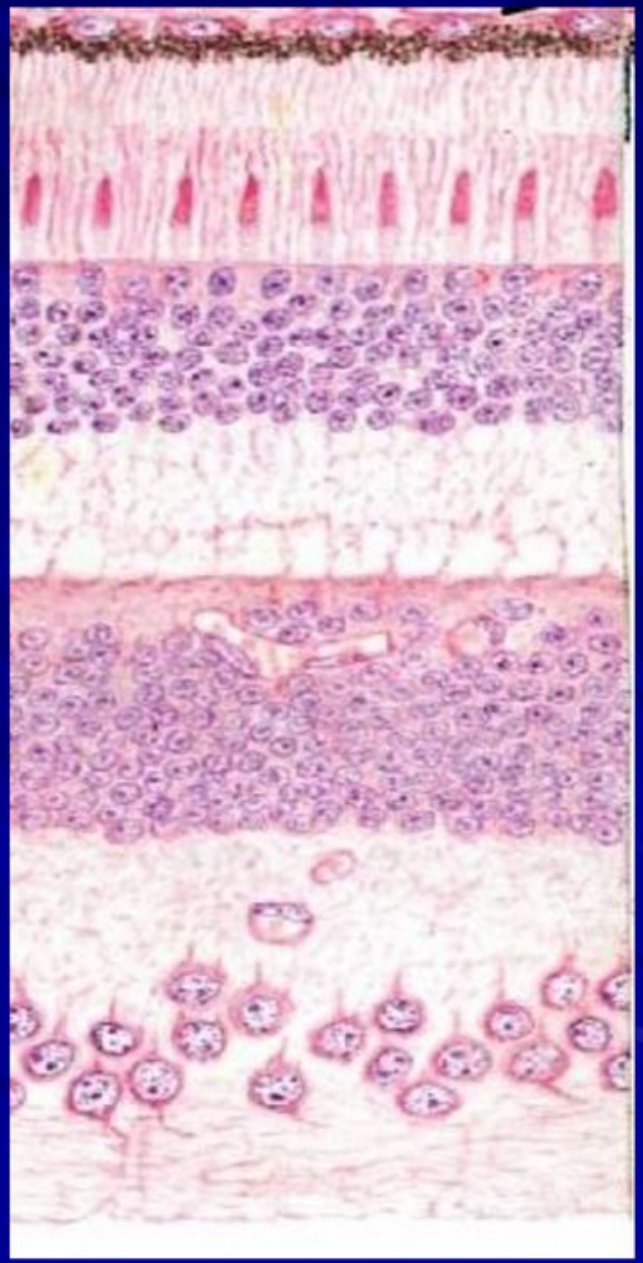

cornea
anterior chamber
iris
iris
pupil
lens
sclera
ciliary body

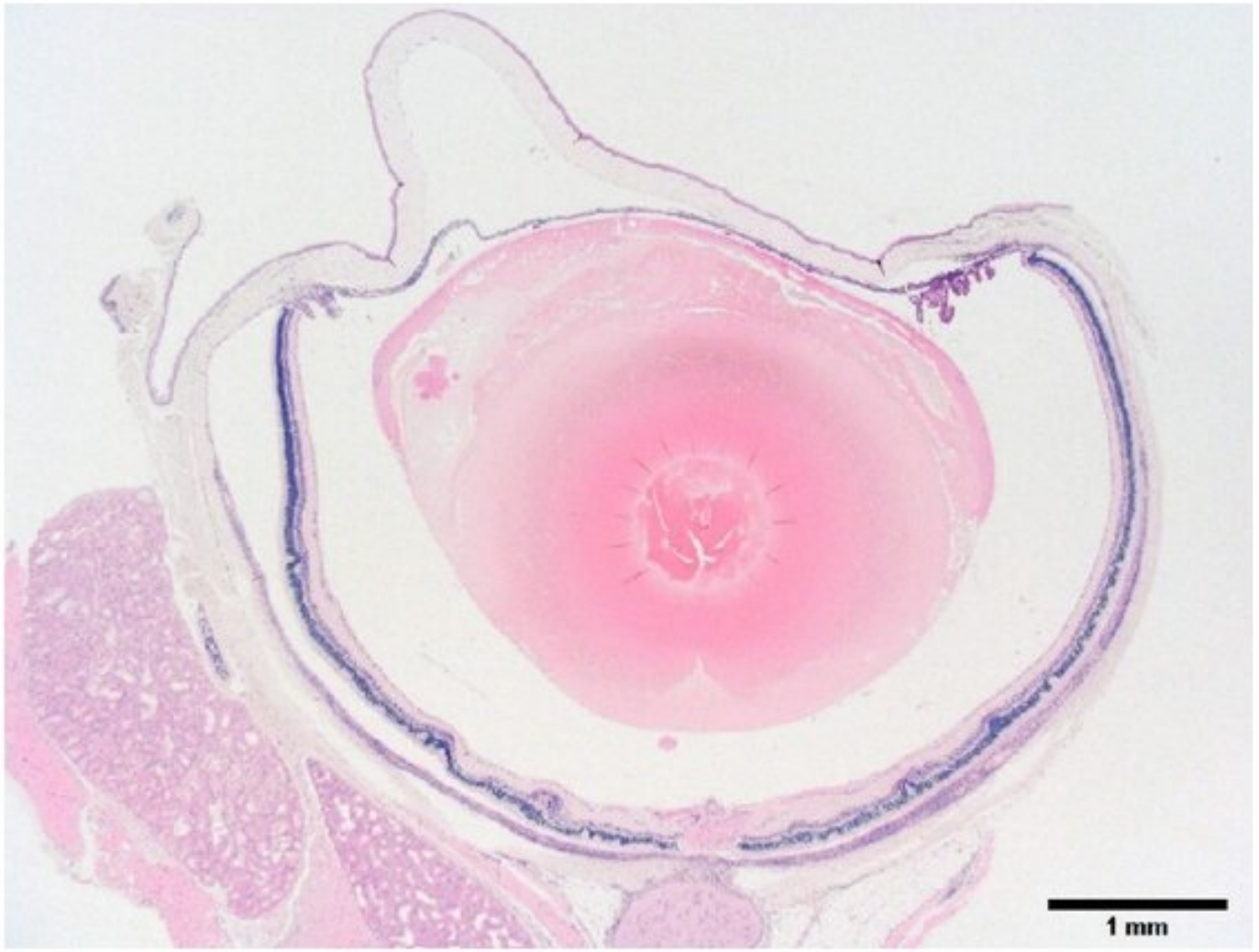

Cornea
Canal of Schlemm
Iris
Sclera
Ciliary
body


1 Blood vessels in choroid
2 Melanocytes
3 Pigment cells of retina
4 Rods
5 Cones
6 Outer limiting membrane
7 Nuclei of rods and cones
8 Ganglion cell layer
9 Inner limiting membrane
10 Sclera
11 Suprachoroidal layer with melanocytes
12 Choriocapillary layer
13 Outer nuclear layer
14 Outer plexiform layer
15 Inner nuclear layer
16 Inner plexiform layer
17 Optic nerve fiber layer

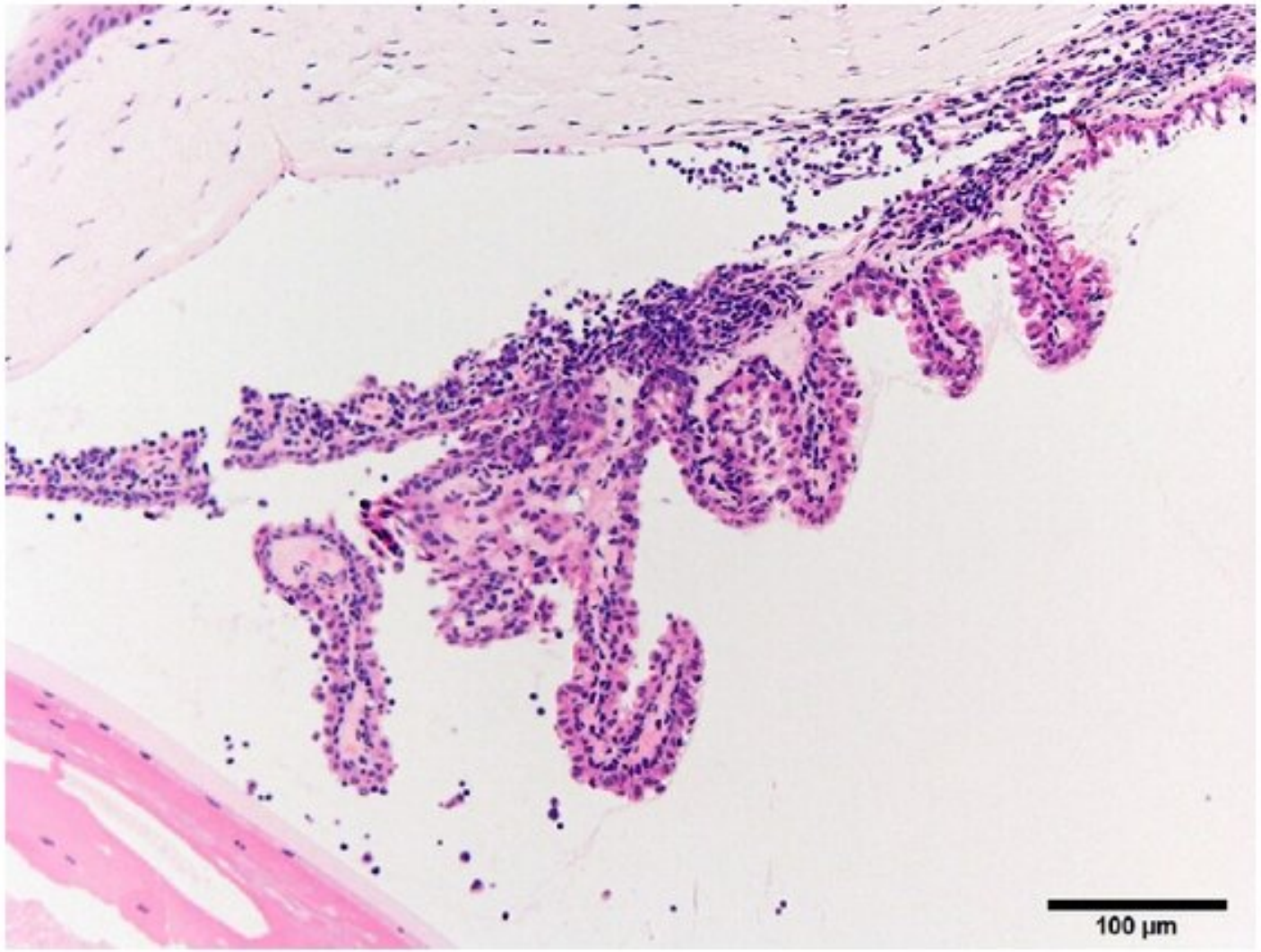
LAYERS OF RETINA

1. Pigment cell layer
2. Layer of rods & cones
3. External limiting membrane
4. Outer nuclear layer
5. Outer plexiform layer
6. Inner nuclear layer
7. Inner plexiform layer
8. Ganglion cell layer
9. Nerve fiber layer
10. Internal limiting membrane

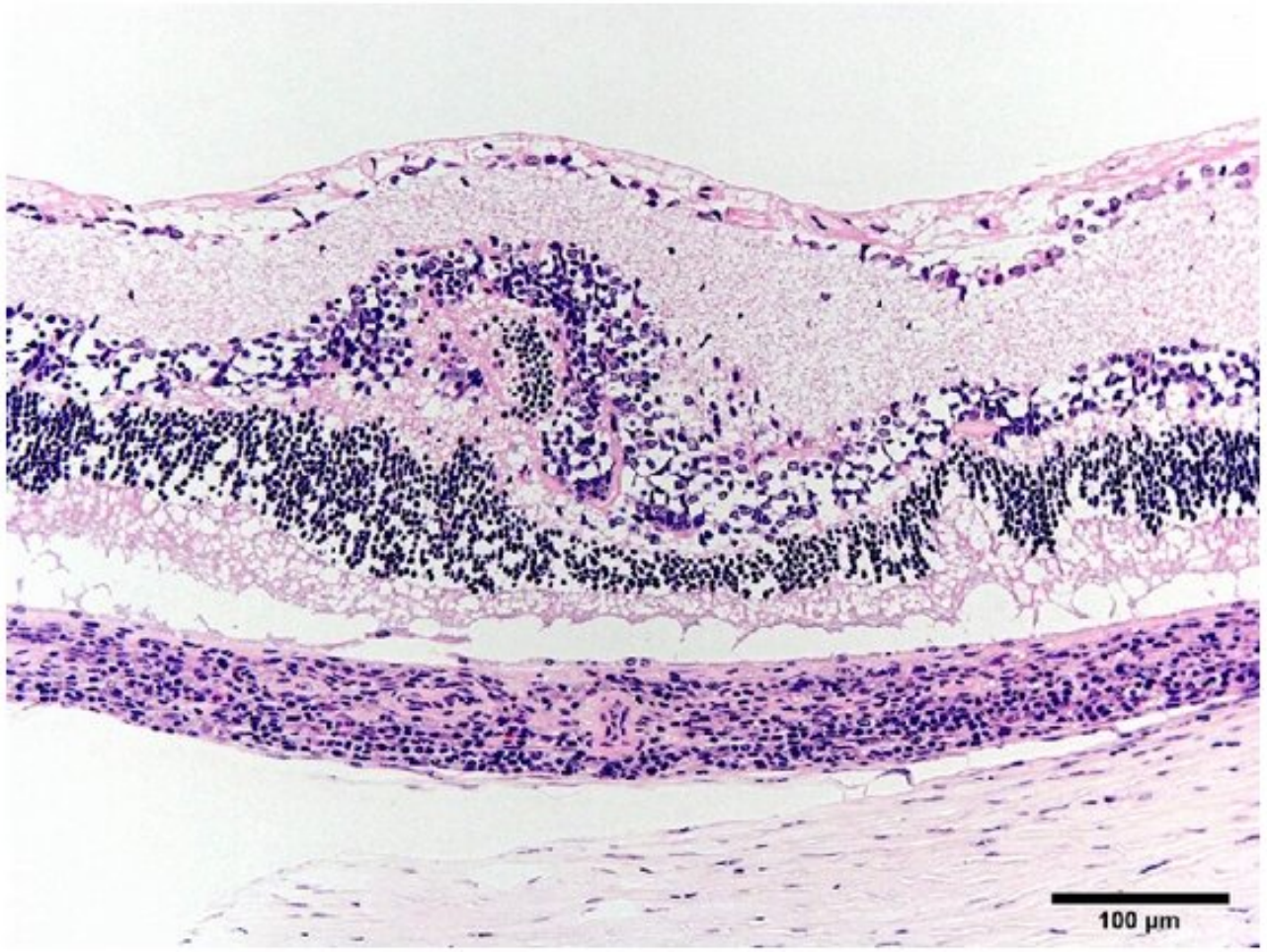




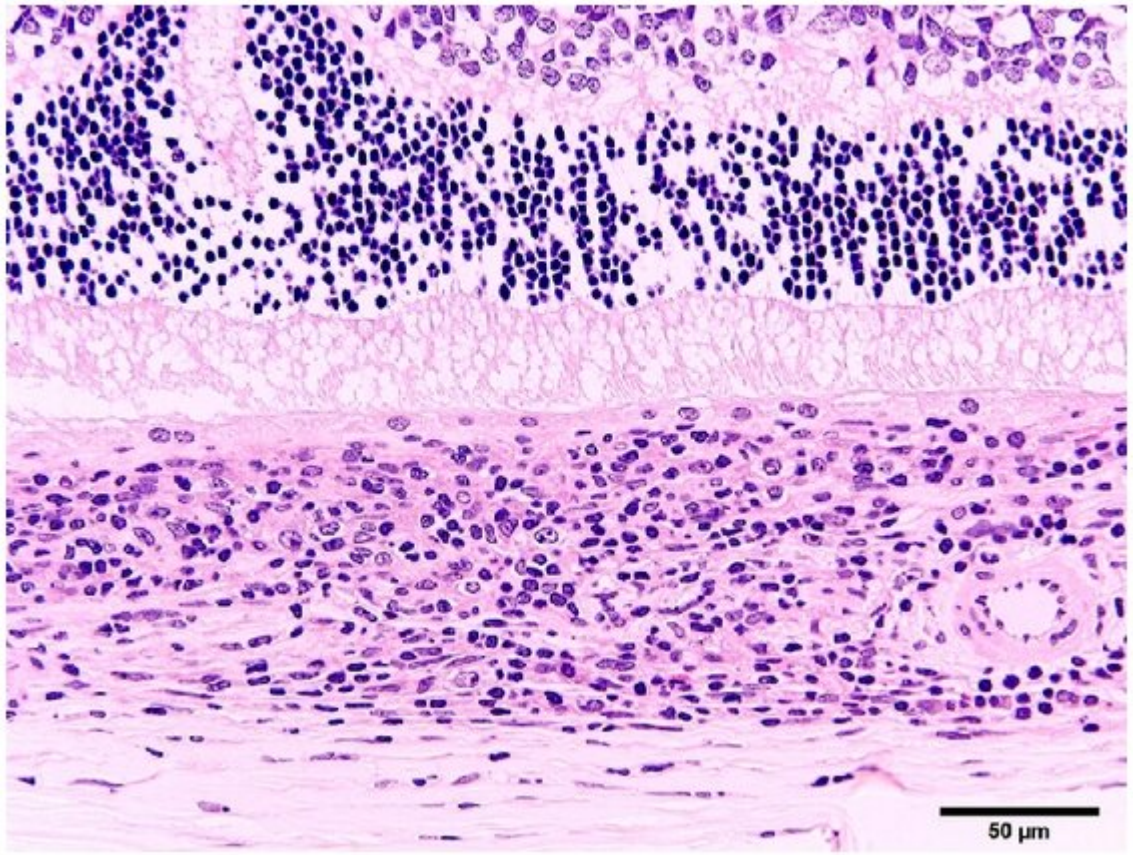
Photomicrograph of the eye of a 50-week-old female SDT fatty rat. Low power magnification of an eye showing deformation of lens, disarrangement of the retina (retinal fold), and infiltration of inflammatory cells in the uveal tract. Bar = 1 mm. Hematoxylin and eosin.



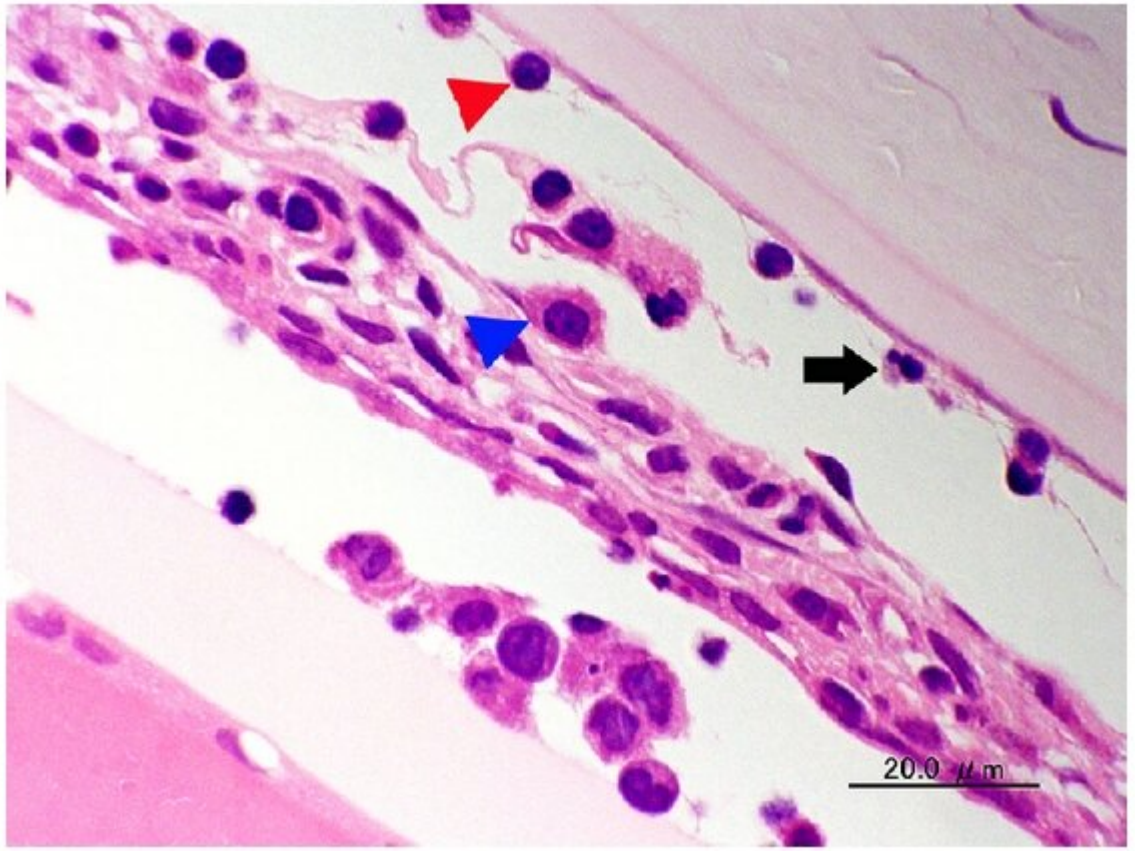
Photomicrograph of the ciliary body/iris of the eye from a 50-week-old female SDT fatty rat. There is infiltration of inflammatory cells in the ciliary body, iris, the anterior and posterior chambers, and the angle of anterior chamber. Bar = 100 µm. Hematoxylin and eosin.



Photomicrograph of the retina and choroid of the eye from a 50-week-old female SDT fatty rat. There is infiltration of inflammatory cells in the choroid and the retinal fold characterized by disarrangement and thickness of the retinal layers. Bar = 100 µm. Hematoxylin and eosin.



Photomicrograph of the choroid of the eye from a 50-week-old female SDT fatty rat. There is diffuse infiltration of inflammatory cells in the choroid. Inflammatory cells are partly spreading to the surrounding area in the sclera. Bar = 50 µm. Hematoxylin and eosin.



Photomicrograph of the iris of the eye from a 50-week-old female SDT fatty rat. There are inflammatory cells including a neutrophil (arrow), a macrophage (blue arrow head), and a lymphocyte (red arrow head) in the iris and the anterior and posterior chambers. Bar = 20 μm. Hematoxylin and eosin.


Thank you!