

STANDARD OPERATING PROCEDURE:

Performing an eye dissection

Note: To be undertaken only by trained personnel in conjunction with a current Safety Data Sheet (SDS) and site-specific risk assessment.

1. Introduction

Eye dissections are conducted to examine the structure of an eye and to consider how the components of the eye work separately and together. Good hygiene practices should be observed. Eyes suitable for dissections include fresh cow, sheep or pigs eyes purchased from a butcher, abattoir or a supplier that has passed relevant health inspections. Fresh eyes need to be used as soon as possible as the lenses go cloudy after a few days.

2. Context

- These instructions are for the use of experienced science teachers and technicians.
- Students must be closely supervised when performing eye dissections.

3. Safety notes

- A site specific risk assessment should take into consideration the maturity of students carrying out the dissection and should address risks associated with students using scalpels and other dissection equipment.
- Before the dissection it is recommended the teacher or laboratory technician trial the dissecting instruments (scalpels, scissors and pointed forceps) to establish that they are sufficiently sharp enough and to determine the most appropriate equipment for the task considering the student behaviour.

Fainting signs and symptoms:

- Fainting may occur during this type of activity. Please read the first aid information in section 7 before conducting the dissection.
- Fainting is caused by a sudden drop in blood pressure. Common causes include heat, pain or distress and the sight of blood.
- The possible symptoms include the following.
 - Dizziness
 - Light-headedness
 - A pale face
 - Perspiration
 - Heightened anxiety and restlessness
 - Nausea
 - Collapse
 - Unconsciousness, for a few seconds
 - Full recovery after a few minutes¹

Handling specimens:

- The eyeballs should never be held in the hand to dissect
- Eyes differ from standard offal because they are not sold as food. Bacteria and viruses could be present.
- If using preserved eyes, it is important to take note of the preservative solution that the eyes are in:
 - Rinse the preserved eyes under running water immediately upon removal from the preservative solution.
 - Work in a well-ventilated area.
 - It is recommended that people wearing contact lenses should not dissect eyes that are in preservative solution. The fumes from the solution can penetrate between the eye and contact lens causing irritation to eyes. It is recommended to wear safety glasses over prescription glasses instead OR prescription safety glasses.
- Good hygiene practices should be observed at all times.
- Keep hands away from mouth, nose, eyes and face during and after dissection and wash hands immediately after handling dissection material.

Safety with scalpels and dissecting instruments:

- Store all dissecting instruments securely.
- Care should be taken with sharps such as scalpel blades and scissors. Some school science departments restrict the use of scalpels unless specifically requested by a teacher, and prefer to only issue scissors, probes and forceps to students for dissections.
- It is suggested that the teacher and/or laboratory technician use a scalpel to make the initial slit in the eyes for students, who are then able to continue the dissection using scissors. This removes the need for the students to handle scalpels.
- Ensure students demonstrate responsible behaviour while using scalpels and other dissecting instruments.
- Scalpels should be provided in and returned to a lined container, blade end down
- Students should not walk around the lab with the dissecting instruments, in particular with a scalpel or pointed scissors, forceps or probes.
- To reduce the possibility of stab wounds or cuts from slippage always point sharp instruments such as scalpels and scissors away from yourself and others
- Hold the instruments so that any sharp points or exposed sharp edges point down onto the dissection board or tray. If there is any slippage when using the instrument, the point/exposed edge will be absorbed by the board/foam or wax tray.

Scalpel Blades:

- Only staff should carefully attach and remove scalpel blades using pliers, forceps or a commercial blade remover.
- The scalpel blade size and handle must be compatible e.g. number 4 handle and number 23 blades.
- Keep the blade in the foil wrapper and attach to the handle with the sharp side of the blade pointing away from the body.
- An alternative is to use disposable scalpels.

4. Regulations, licences and permits

Offal that has passed a health inspection by a meat inspector or procured from a butchers shop, abattoir or biological supplier is suitable for dissection. Eyes can be obtained for educational purposes with safe handling procedures put in place. In some jurisdictions, all dissections need to be reported to the school animal ethics committee

5. Equipment

- PPE (Lab coat/apron, gloves and safety glasses)
- Scalpel (optional subject to a site specific risk assessment)
- Scissors, Forceps
- Dissecting board covered in newspaper, or disposable foam tray
- Newspaper to protect bench and for wrapping biological materials after dissection
- Paper towel
- Disinfectant – hospital grade general purpose disinfectant (the label on the front of the pack must state 'hospital grade', which is a general purpose hard surface disinfectant which will kill micro-organisms).
- 70% v/v ethanol

6. Operating procedure

Preparation

- Prepare disinfectant solution according to manufacturer's instructions. Place disinfectant in a container ready for instruments to be placed at the end of the dissection.
- Ensure students have appropriate PPE.
- Distribute instruments to students. Scalpels and scissors should be counted out, and counted in when returned.

Performing an eye dissection

1. Place the eye on the dissection board or tray. With forceps and the scissors, carefully remove the fatty tissue from around the eyeball.
2. Locate the transparent skin of the cornea and note that the eyeball is protected by a tough protective layer (sclera).
3. Locate the optic nerve. It should look like a thick white tube at the back of the eye. You may have to remove some fat to see it.

Figure 1 shows the eyeball and optic nerve.



Figure 1. External view of bullock's eye. The probe points to the optic nerve at the back of the eye. At the front of the eye note the sharp curve of the sclera coating the cornea. (Image by K. Szalai, 2015)

(Operating procedure cont....)

4. Look at the coloured part of the eye (iris) and the black part in the centre (pupil).
5. The cornea of the eyeball is tough and extra care is required when trying to cut into it. Using a scalpel* or scissors carefully cut a small window in the side of the eyeball, just behind the iris. Some aqueous or vitreous humour fluid may ooze out. Do not squeeze the eyeball too tightly, whilst doing this or the fluid will spurt out due to the pressure. Try looking through this window and record your observations.

*Safety note: It is suggested that the teacher and/or laboratory technician use a scalpel to make the initial slit in the eyes for students, who are then able to continue the dissection using scissors. This removes the need for the students to handle scalpels.

6. Starting from this window, using scissors cut forward and around the iris so you have cut the eye into two parts.

Figure 2 shows the two halves of the eye

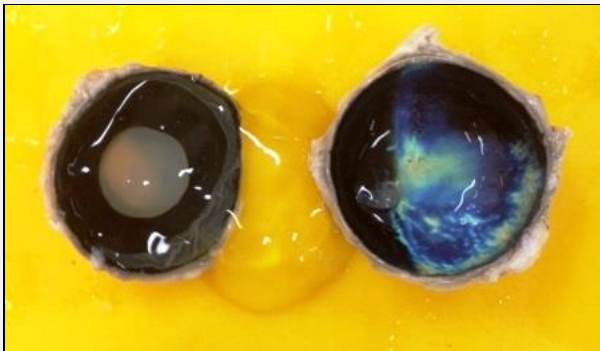


Figure 2. On the left the iris and pupil can be seen with the lens in the centre and jelly-like material of the vitreous humour. On the right the black, pearly-green inside layer the *tapetum lucidum* and the retina can be seen. (Image by K. Szalai, 2015)

7. With forceps lift off the top part of the eye; this consists of the cornea, iris and pupil, aqueous humour and lens.
8. Carefully separate the lens from the rest of the eye with forceps. Some of the jelly-like material of the vitreous humour may adhere to the lens. Rinse the lens with water and put it on a piece of newspaper. Try gently squeezing the lens from the side as you look. Note what you observe.
9. Gently remove the rest of the vitreous humour from the eyeball, rinse out the inside of the eye with water and notice the black, pearly-green inside layer. Observe the retina.
10. Examine the back of the front part of the eye from which you took the lens. The muscular ring-like structure of the iris surrounding the pupil is now exposed.

(Operating procedure cont....)

11. With forceps carefully remove the iris exposing the cornea.

Figure 3 shows the labelled structure of an eye.

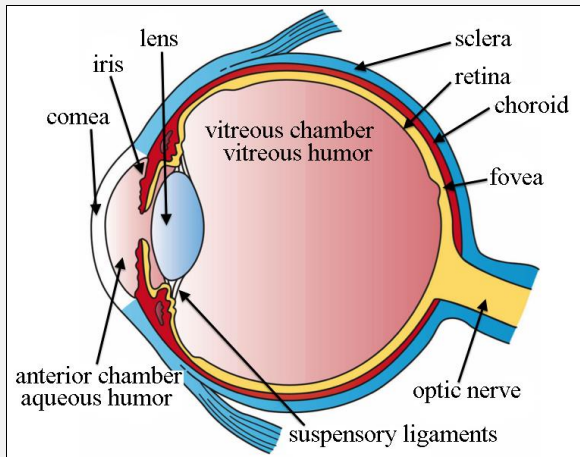


Figure 3. Shows the labelled cross-section of an eye.

Image by Holly Fischer, Three main layers of the eye, [CC BY 3.0](https://creativecommons.org/licenses/by/3.0/)
[http://commons.wikimedia.org/wiki/File:Three_Main_Layers_of_the_Eye.png#/media/File:Three_Main_Layers_of_the_Eye.p](http://commons.wikimedia.org/wiki/File:Three_Main_Layers_of_the_Eye.png#/media/File:Three_Main_Layers_of_the_Eye.png)
[ng](http://commons.wikimedia.org/wiki/File:Three_Main_Layers_of_the_Eye.png)

Clean up

- Make sure all instruments are returned.
- All parts of the eye must be wrapped in newspaper, as well as the disposable foam tray (if used) and placed in a dedicated plastic garbage bag. When all waste material is collected, double bag for disposal.
- Dissecting boards, scissors, forceps and scalpels must be immediately soaked in disinfectant, then washed in hot soapy water, then rinsed.
- After washing, dissecting instruments can be soaked in 70% alcohol for 20 minutes as an optional additional disinfectant and to avoid rusting. Dry all equipment thoroughly.
- Disinfect workplace and wash hands thoroughly.

7. Trouble shooting/emergencies

- **If fainting occurs:** If students start to feel faint, dizzy or nauseous during the dissection lie them down (if possible) and elevate their feet. They can get up slowly after ten minutes. Sending them outside for some fresh air can also help. If they don't recover quickly, always seek urgent medical attention. '*Do not sit the patient on a chair with head between knees*'ⁱⁱⁱ
- Any health concerns should be referred to the school first aid officer for assessment, accompanied by the relevant latest SDS if applicable. Follow your school's accident and incident policy and reporting procedures.
- First aid: See latest disinfectant SDS of any chemicals used for more detailed information
 - **If swallowed:** Do not induce vomiting. Rinse mouth with water, and then give water to drink. Seek urgent medical attention.
 - **If in eyes:** Hold open and irrigate with copious quantity of water for at least 15 minutes. Seek medical attention.
 - **If on skin/clothes:** If spilt on skin or clothes quickly wipe off with a dry cloth to absorb as much liquid as possible. Remove contaminated clothes and drench the area with excess water under a safety shower. Seek medical attention.

- **If inhaled:** Remove to fresh air and seek medical attention if symptoms persist.
- For further advice contact the Poisons Information Centre on 131 126.
- See safety notes if it is necessary to remove broken or used scalpel blades.
- First aid: cuts and lacerations should be washed under running water in the first instance and referred to the school first aid officer for assessment.

8. Waste disposal

- Used and damaged scalpel blades must be placed in an approved sharps container after use.
- Biological material must be wrapped in newspaper, placed in a double plastic garbage bag and sealed for immediate disposal in the industrial bins.

9. Related material

- Risk Assessment
- Manufacturer's Safety Data Sheet for disinfectant
- Manufacturer's Safety Data Sheet for preserved specimens

References:

ⁱ 'Fainting', Better Health Channel website, State Government of Victoria:

<http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Fainting> (August 2014)

ⁱⁱ St John Ambulance Australia. 2011. *Australian First Aid*. Barton, ACT

Cash, S; Quinton, G; Tilley, C 2012. *Oxford Big Ideas Science 9 Australian Curriculum*. Oxford University Press Australia

Chemwatch Gold. 2013. *Safety Data Sheet: Hospital grade disinfectant*.

<http://jr.chemwatch.net/chemwatch.web> (subscription required accessed October 2014).

CLEAPSS. 2014. *G268 Dissection: a guide to safe practice*. Uxbridge UK.

'Dissection safety tips', Flinn Scientific website.

<http://www.flinnsci.com/media/396301/dissectionsafety.pdf> (2010)

'Dissection Safety Policy and Procedures' Flinn Scientific website.

<http://www.flinnsci.com/media/948812/sf10490.pdf> (2013)

'Eye', Wikipedia website, <https://en.wikipedia.org/wiki/Eye> (Accessed July 2016)

'Safety note – Preserved specimens', Southern Biological website,

http://file.southernbiological.com/Assets/Products/Specimens/Preserved_Specimens/SafetyNotePreservedSpecimens.pdf (Accessed February 2016)

'Specimens in Carolina's Perfect Solution®', Material Safety Data Sheet, Carolina Biological Supply Company, Southern Biological website,

http://file.southernbiological.com/Assets/Products/Specimens/Preserved_Specimens/PerfectSolutionSpecimens.pdf (April 2011)

Glossary

Aqueous humour – a transparent, watery fluid filling the front chamber of the eye between the back of the cornea and the front of the iris and pupil

Bacteria – a group of microscopic, single-celled organisms lacking a nucleus

Cornea – the transparent curved front part of the eye that covers the iris and pupil and initially bends light rays into the lens

Choroid – a brownish membrane between the retina and the white of the eye

Fovea – a small depression located in the macula of the retina that provides the clearest vision of all

Iris – the coloured part of the eye

Lens – the part of the eye that focuses light to produce an image on the light-sensitive cells of the retina

Macula – is an oval-shaped pigmented area near the centre of the retina

Optic nerve – nerve fibres transmitting visual light signals from the eye to the brain

Pupil – the dark circular opening at the centre of the iris in the eye, where light enters the eye

Retina – a light-sensitive membrane in the back of the eye containing rods and cones that receive an image from the lens and send it to the brain through the optic nerve

Sclera – a protective layer coating the cornea of the eyeball that forms the white of the eye

Suspensory ligaments – a fibrous membrane that holds the lens of the eye in place

tapetum lucidum – a layer of cells in the wall of the eye of nocturnal and deep-sea animals that reflects light back onto the retina, enhancing visual sensitivity in dim light. Light reflected by this layer is responsible for the shining eyes of cats seen when they are illuminated at night.

Viruses – a sub-microscopic parasitic particle of a nucleic acid surrounded by protein that can only replicate within a host cell

Vitreous humour – a transparent, jelly-like fluid that fills the space in the eye between the lens and the retina

History of reviews

Date	Version number	Notes
July 2014	Version 1.0	
April 2015	Version 2.0	First aid for disinfectant included Photos and diagrams added
April 2016	Version 3.0	Fainting and preservative information included
Aug 2016	Version 4.0	Additional safety information included regarding the use of scalpels and suggestion for staff to make initial cut into eye Detail regarding the tapetum lucidum added in Figure 2 Glossary added