

STANDARD OPERATING PROCEDURE:

Performing a kidney 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

Kidney dissections are conducted to explore the function of a kidney by examining the external and internal structures. The kidney filters out metabolic wastes such as urea and some salts and regulates the water and salt balance in the body. Kidneys suitable for dissection include fresh sheep or bullock kidneys purchased from a butcher, abattoir or a supplier that has passed relevant health inspections. It is best to get them left in fat if possible with some of the ureter and blood vessels left attached. The kidneys can be obtained some weeks beforehand and stored in a freezer.

2. Context

- These instructions are for the use of experienced science teachers and technicians and students under close supervision.
- When planning a class dissection activity it is best to discuss beforehand, the type of dissection to be undertaken, and warn of the possibility that there may be some blood and odours present during the dissection.
- Demonstrating the dissection to students before they begin is helpful, not only for correct procedure but allows the students to adjust to the appearance of the material, and any blood that may be present after the dissection material has been washed.
- Let students know they don't have to participate in the dissection and can be excused from the class. Alternative arrangements can be made for students who don't wish to participate, by giving them worksheets to complete and relocating them to a private study area

3. Safety notes

- A site-specific risk assessment should take into consideration the maturity of students carrying out the dissection and 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:

- If using frozen kidneys defrost overnight in a refrigerator and use within 24 hours. Consistent with safe food handling procedures, all meat products should be stored below 5^o C prior to dissections.
- 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.
- 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 obtained from a butcher's shop, abattoir or biological supplier is suitable for dissection. In some jurisdictions, all dissections need to be reported to the school animal ethics committee.

5. Equipment

- PPE (Lab coat/apron [it is recommended to use plastic disposable aprons], safety glasses and gloves)
- Scalpels (optional subject to a site specific risk assessment)
- Point-end scissors, Forceps, Probes
- Dissecting boards 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

- If any blood is associated with the kidneys rinse them in cold running water.
- 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 the instruments to students. Scalpels, scissors, forceps and probes should be counted out, and counted in when returned.

Dissecting the kidney

1. Place the kidney on the dissecting board or tray. Remove any protective fatty tissue surrounding the kidney using dissecting scissors taking care not to damage any of the tubes emerging from the kidney.
2. Examine the external structure of the kidney.
3. Gently separate, as much as possible, the three tubes emerging from the kidney's concave side (these may have been cut from the kidney).

Figure 1 shows a photo of sheep kidney before dissection.

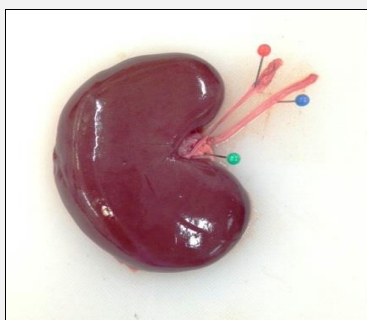


Figure 1. External view of a sheep kidney. The red pin identifies the renal artery and the blue pin shows the renal vein. Below the green pin identifies the ureter which has been cut close to the kidney. (Image by K. Szalai, 2015)

Operating procedure cont.....

4. Try to identify the:

- renal artery, a narrow tube with thick elastic walls which takes blood into the kidney
- renal vein, a wide tube with limp walls which carries blood out of the kidney
- ureter, a tough white tube which carries urine from the kidney to the bladder.

5. Cut the kidney in half lengthways using sharp pointed dissecting scissors or scalpel, starting from the concave side just to one side of the centre line. Leave the tubes intact in one side of the dissection.

6. Observe the internal appearance and structure of the kidney.

7. Identify the cortex, medulla and pelvis of the kidney. Note the colour, thickness and texture of these structures.

Figure 2 shows photo of completed dissection of sheep kidney.



Figure 2. Two halves of the kidney. On the left side the green pin identifies the medulla, the white pin shows the pyramid and the yellow pin identifies the cortex. On the right side the black pin shows the pelvis. (Image by K. Szalai 2015)

Figure 3 shows the labelled structure of the kidney.

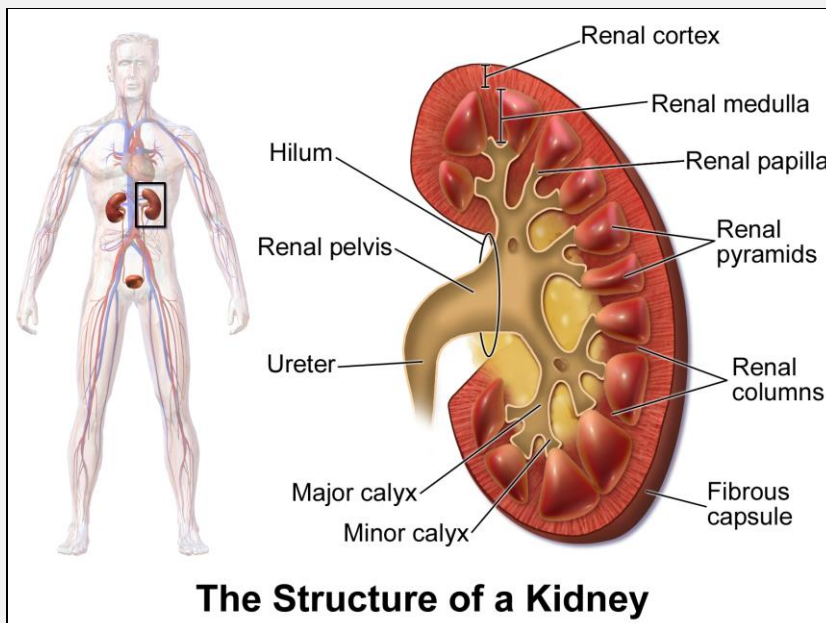


Figure 3. Labelled kidney.

Image by BruceBlaus Kidney Anatomy, [CC BY 3.0](https://commons.wikimedia.org/wiki/File:Blausen_0593_KidneyAnatomy_02.png), http://commons.wikimedia.org/wiki/File:Blausen_0593_KidneyAnatomy_02.png

Clean up

- Make sure all instruments are returned.
- All parts of the kidney as well as the disposable foam tray (if used) must be wrapped in newspaper and placed in a dedicated plastic garbage bag along with gloves and disposable aprons (if used). When all waste material has been collected, double bag for disposal. Freeze material if unable to dispose of immediately.
- If blood is present on dissecting boards, scissors, forceps, probes and scalpels they must be immediately soaked in disinfectant. Otherwise wash equipment in hot soapy water, and rinse or place in a dishwasher to minimise handling.
- After washing, dissecting instruments can be soaked in 70% v/v 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''**
- First aid: See latest 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.
- 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.
- 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.
- See safety notes if it is necessary to remove broken or used scalpel blades

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

References:

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

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

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

Andrews, C. 2002. Active Science skills and experiments book 2. Oxford University Press

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

<http://science.cleapss.org.uk/Resource-Info/G268-Dissection-a-guide-to-safe-practice.aspx>

(Subscription required.)

'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)

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

Glossary

Blood – fluid carried by the blood vessels through the body, containing plasma, red and white blood cells, platelets, dissolved gases, nutrients, hormones and salts.

Fibrous capsule – thin collagenous connective tissue envelope that surrounds the outer surface of the kidney.

Hilum – recessed central fissure in the kidney where the vessels, nerves and ureter pass.

Major calyx – chambers of the kidney – two or three minor calyces converge to form a major calyx through which urine passes before continuing through the renal pelvis into the ureter.

Metabolic waste – waste products produced by the body for excretion.

Nephron – tiny structures that produce urine in the process of removing waste substances from the blood.

Renal artery – artery that brings waste-filled blood from the aorta to the kidney for filtering in the nephron.

Renal columns – anchor the renal cortex between the renal pyramids.

Renal cortex – the outer portion of the kidney between the renal capsule and the renal medulla.

Renal medulla – the innermost part of the kidney that is critical for regulating blood pressure.

Renal papilla – part of the kidneys that urine passes through on its way to the renal pelvis and the ureter.

Renal pelvis – area at the centre of the kidney. Urine collects in the renal pelvis and is funnelled into the ureter.

Renal pyramids – located inside the inner kidney. They consist of tubules, which collect urine from the outer kidneys and transfer them to the calyces, which store urine before it passes to the ureter and bladder.

Renal vein – there are two renal veins, a left and a right. They branch off the inferior vena cava and drain oxygen-depleted blood from the kidneys.

Urea – nitrogen-rich waste produced by the body.

Ureter – a tough white tube which carries urine from the kidney to the bladder.

History of reviews

Date	Version Number	Notes
April 2015	Version 1.0	
Sept 2016	Version 2.0	Additional safety information included <ul style="list-style-type: none"> • Fainting information • Safe food handling procedures • the use of scalpels and dissecting instruments Glossary included