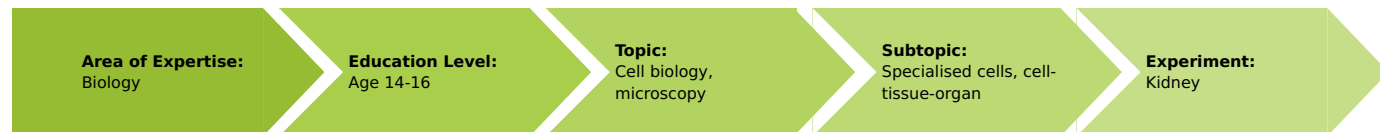


Kidney (Item No.: P1443201)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



30 Minutes

Recommended Group Size



1 Student

Additional Requirements:

- Water
- Kidney (mammal)

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Information

Compared to the liver, the kidney is a rather small organ, however, it is the most significant excretion organ in humans apart from the skin and the lungs. Water and the substances dissolved in it are first transferred to the renal corpuscle (Malpighian body). The liquid travels through delicate tubes, i.e. renal tubes, while a part of the substances is returned to the blood. Ultimately, the excessive proportion of water, salts, and decomposition products are passed on to the urinary bladder and then excreted.

Information on obtaining materials

Mammal kidneys can be ordered at the meat counter of a supermarket or picked up directly from a butcher's shop. It is important that the kidney is rinsed and chilled immediately after the animal is slaughtered, and that it is prepared on the next day during lessons, as otherwise decay will ensue very fast (odor).

Information on practical performances

1. Kidney anatomy

The students should make themselves familiar with the various anatomical structures of the kidney. They should know in advance that the renal bodies are situated in the marginal zone of the kidney, the cortex, and that these bodies appear as small globular objects. They should also possess fundamental knowledge about kidney function and the further route of the urine into the bladder. Individual substances which are eliminated with water from the bloodstream can be discussed in more detail, thus going beyond the information text on the students' worksheet.

2. Kidney preparation

The students should already receive the kidneys cut in halves for their work. One half of a kidney, in turn, suffices for many preparations and mountings in class.

The kidney is cut open flat with a large very sharp knife. This is what the result should look like:



3. Microscopy

Preparation and mounting of the specimen is not difficult, if instructions are given. Preparation is considered as successful if the teacher sees that the specimen is thin enough and hence sufficiently transparent. If the students mount several specimens, they will surely be able to locate Bowman's capsules.

4. Evaluation

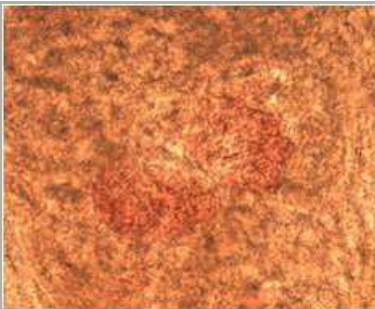
The students are supposed to recognize the principle of surface enlargement by an exemplary study of the kidney or fish gills. The densely intertwined capillaries can be seen within the renal bodies. The renal tubes are not straight, instead, they meander within the tissue. This multiplies the exchange surface between the blood and the vessels through which the glomerular filtrate passes.



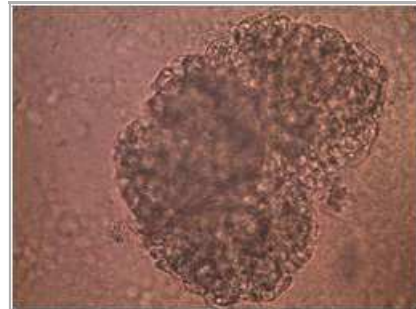
Kidney, 40x: the renal bodies are easily identifiable



Kidney, 40x: the intertwined tubules are visible; small renal bodies are separated due to crushing



Kidney, 40x: the capillaries of the renal body are enhanced on account of the intensive red color



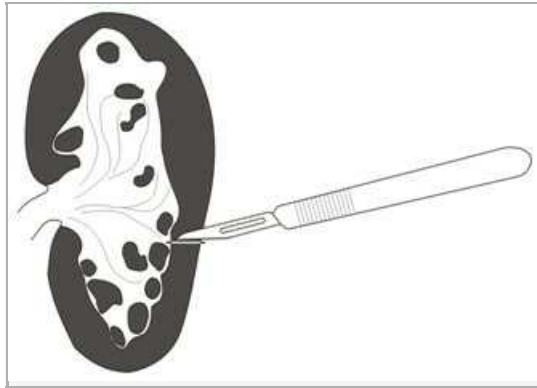
Renal bodies, 100x

Kidney (Item No.: P1443201)

Task and equipment

Task

Explore and explain the morphology of the renal corpuscles.



Equipment

Position No.	Material	Order No.	Quantity
1	Euromex BioBlue BB.4250 microscope	EUR-BB-4250	1
2	Microscopic slides, 50 pcs	64691-00	1
3	Cover glasses 18x18 mm, 50 pcs.	64685-00	1
4	Beaker, 250 ml, low form, plastic	36013-01	1
5	Dropping pipette with bulb, 10pcs	47131-01	1
6	Tweezers, straight, pointed, 120mm	64607-00	1
7	Scalpel holder	64615-00	1
8	Scalpel blades, rounded tip, 10 off	64615-02	1

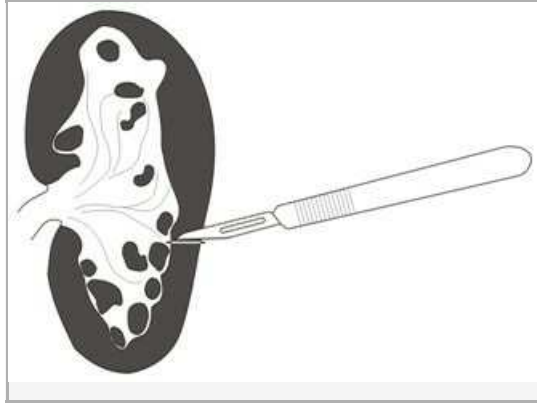
Set-up and procedure

1. Anatomy of the kidney

Gather information on where the kidneys are located in the body, for example, from your biology textbook. Look at a schematic representation of a kidney and label the drawing below with the following terms: renal cortex, renal pelvis, ureter.

2. Preparation of a kidney

Cut a small strip of tissue out of the renal cortex with the scalpel. Excise a specimen from the marginal area of the tissue only. Prepare a section which is as thin as possible on top of a slide.



3. Microscopy of the kidney

A section of the specimen which is as thin as possible is searched for on the slide. Add aliquots of water continually to prevent the specimen from drying up.

A crush preparation is now made from the specimen as follows:

- Place a second slide on top of the specimen and squash it by exerting downward pressure with your thumbs.
- You can do this with several pieces of renal cortex and choose the best specimen.
- The water has also been pressed out from between the slides, therefore move both slides a little bit against each other and apply the water on a slide using the pipette, then it will flow between the glasses.
- Alternatively, you can tear up the piece of renal cortex. This way you will obtain very thin specimens as well.
- View the specimens under the microscope with lowest power. If you discover a renal body you may switch to higher powers.

4. Evaluation

- a. Describe the morphology of a renal body (Bowman's capsule) in the report! What do you see inside?
- b. Describe the course of the renal tubes in the report!
- c. There are structures in many organisms in which the internal surface has greatly become enlarged in the course of evolution. For example, this principle is realized in the case of the gills of fishes, the lungs, and the membranes of chloroplasts. Compare these statements with a view to the structure of kidney components. What are the physiological advantages revealed by the anatomy of the kidney?

Report: Kidney

Result - Observations 1

Describe the morphology of a renal body (Bowman's capsule)! What do you see inside?

Result - Observations 2

Describe the course of the renal tubes!

Evaluation - Question 1

There are structures in many organisms in which the internal surface has greatly become enlarged in the course of evolution. For example, this principle is realized in the case of the gills of fishes, the lungs, and the membranes of chloroplasts. Compare these statements with a view to the structure of kidney components. What are the physiological advantages revealed by the anatomy of the kidney?

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