

DISSECTING RODENTS

BACKGROUND

The first mammals developed about 200 million years ago. The mass extinction of dinosaurs and other reptiles took place 65 million years ago, which paved the way for the success story of mammals as there were many ecological niches available for them. This was the reason for the diversification of mammals.

Rats and mice are often used as model organisms. Model organisms are useful in research because they help scientists to study e.g. human diseases and genetics. Most mammals (including these rodents) have following features:

- hair and exocrine glands (sweat and mammary glands)
- giving birth to living offspring and taking care of them
- homeothermic (warm-blooded)
- good senses
- complex brains

The animals in this task are obtained from a research lab and have been used as laboratory animals in scientific research. Dead animals are used for educational purposes or to feed zoo animals in Korkeasaari.

PRE-TASK QUESTIONS

- What features gave mammals the competitive edge over the dinosaurs?
- What were the first mammals like? Do any of the existing mammals have the same features as the early mammals?
- Mammals live in many kind of habitats (environments). How is the habitat reflected in their anatomy? Give examples.
- Mammals can use many different kind of nutrition. How can you see the nutrition from the dentition (teeth)? Give examples.
- Most lab animals are used for scientific purposes. Why do we need them in research?

EQUIPMENT

- Scissors
- Forceps
- Scalpel
- Plastic or cork platform
- Pins
- Paper towels
- Pasteur pipettes

INSTRUCTIONS

1. EXTERNAL FEATURES

Can you find the features of a mammal in your rodent? Find the features and structures that help the rodent to survive in its habitat.

Find the eyes, the ears, the whiskers and the anus. Try to determine the sex.

2. ORAL CAVITY

Grab the lower jaw with forceps and use the **scissors** to cut the jaw (see the black arrows in image 1). Cut the jaw bones and spread the oral cavity open.

The rodents have two front teeth in both upper and lower jaw – those teeth are growing constantly. In addition, they have three pairs of molars. Between the front teeth and molars, there is an area without teeth called *the diastema*.

Rodents have a hardened, ridged palate (roof of the mouth) and very strong buccinator muscles (cheek muscles). A rat can chew its way through concrete!

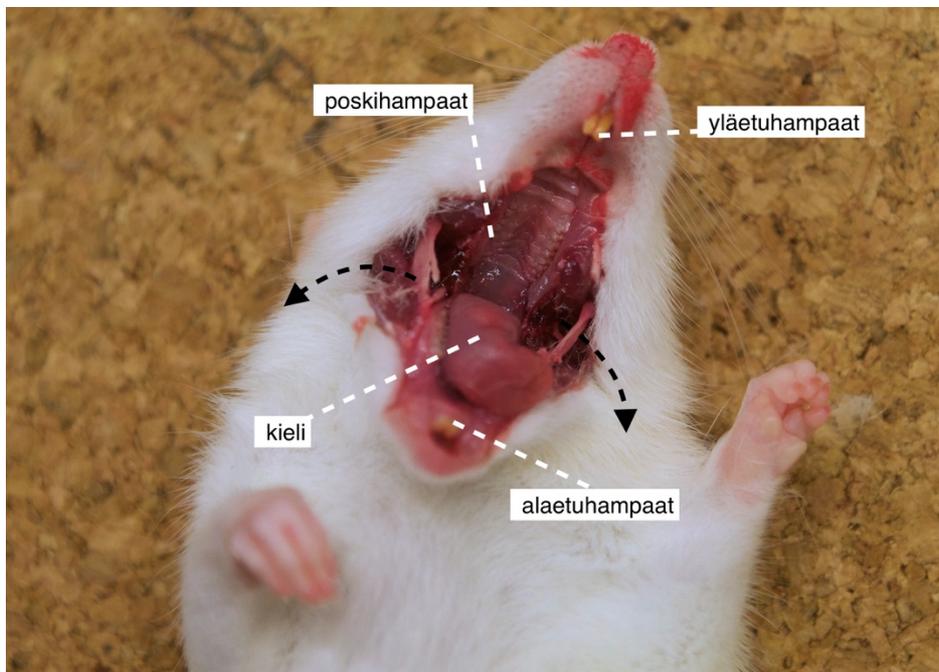


Image 1. Cut the mouth open and clip the jaw bones as well. Locate the parts mentioned in the image.

3. SKINNING THE RODENT AND OPENING THE ABDOMINAL CAVITY

Use pins to attach the rodent in the platform (ventral side up). Use forceps to lift the skin and cut the skin with your **scissors** (see image 2). Dissect carefully not to damage the abdominal cavity. Peel gently the skin from the muscles, using scissors and forceps.

NB! Do not use your fingers to support the animal when cutting – always use the forceps only.

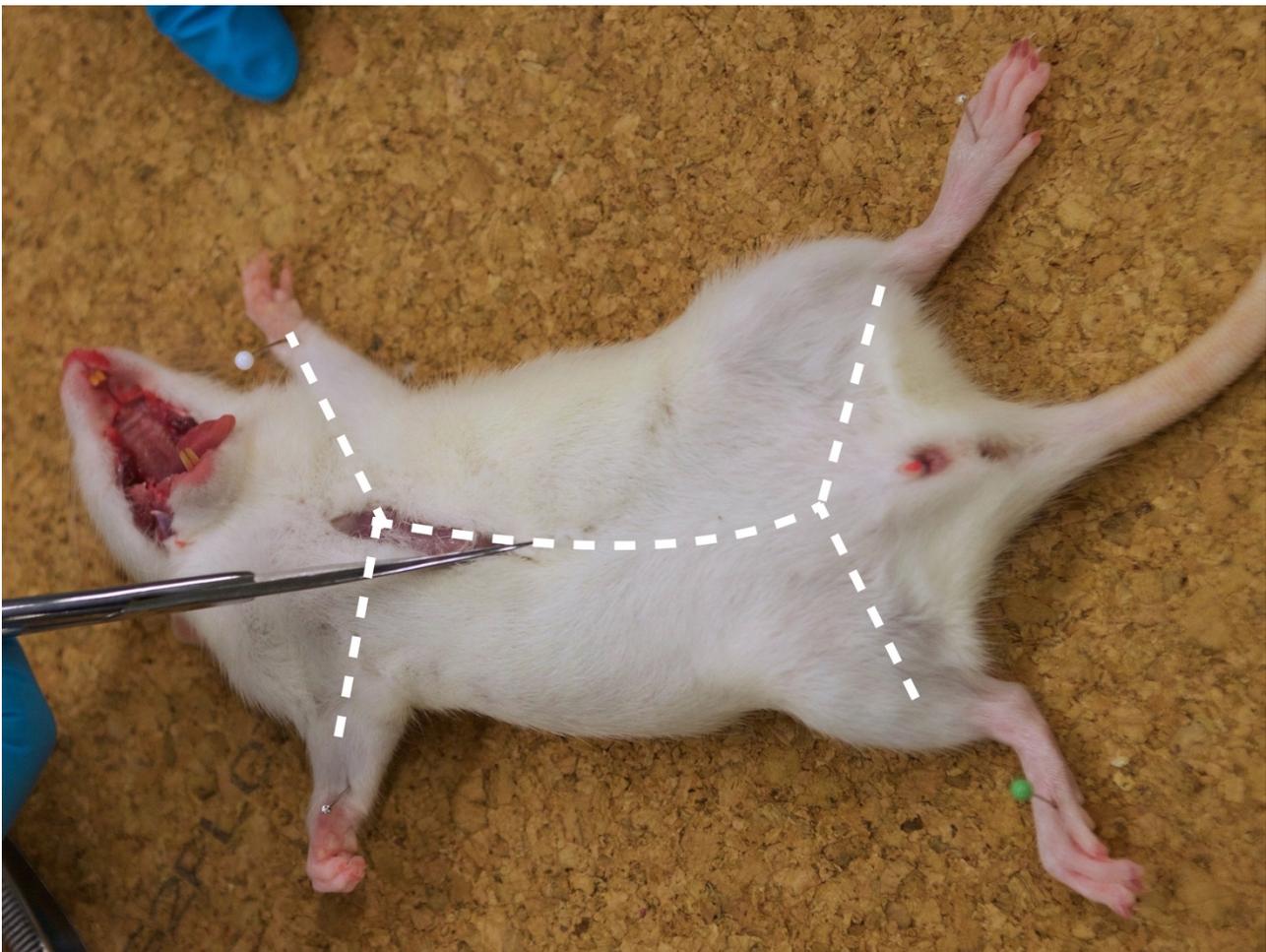


Image 2. Cut the skin from the white lines. Do not damage the abdominal cavity.

Attach the skin (and muscles) with pins so that it stays away in further stages. If you have managed to skin the rodent and remove the muscles, you should see a view like in image 3. If there is any adipose tissue (fat) left on the abdominal cavity, use your forceps to remove it.

Use the **scalpel** to remove the remaining muscles and to cut the abdominal cavity (as in image 3). Do not open the thoracic cavity (under the ribs) yet. Use forceps to peel of the membranes. You can also attach the membranes with pins.



Image 3. A skinned rat, attached with pins. The abdominal cavity is opened with a scalpel.

4. INTESTINES

The darkest structure is the liver. Use your forceps to lift it upwards (carefully). You can find the stomach under the liver. You may also locate some pink, membranous pancreatic tissue below the stomach. Can you see the dark red spleen under the stomach?

Look at the intestines (see image 4) in three stages: 1) Look at the structures without moving them. 2) Use forceps to move and investigate the structures. 3) Cut the intestines out of the cavity (including the stomach and the rectum). The intestines are attached to the body cavity by *the mesentery* – cut it out as well.

Locate the small intestine, the large intestine, the cecum and the rectum. Spread the intestines on the platform and compare the lengths of different parts.

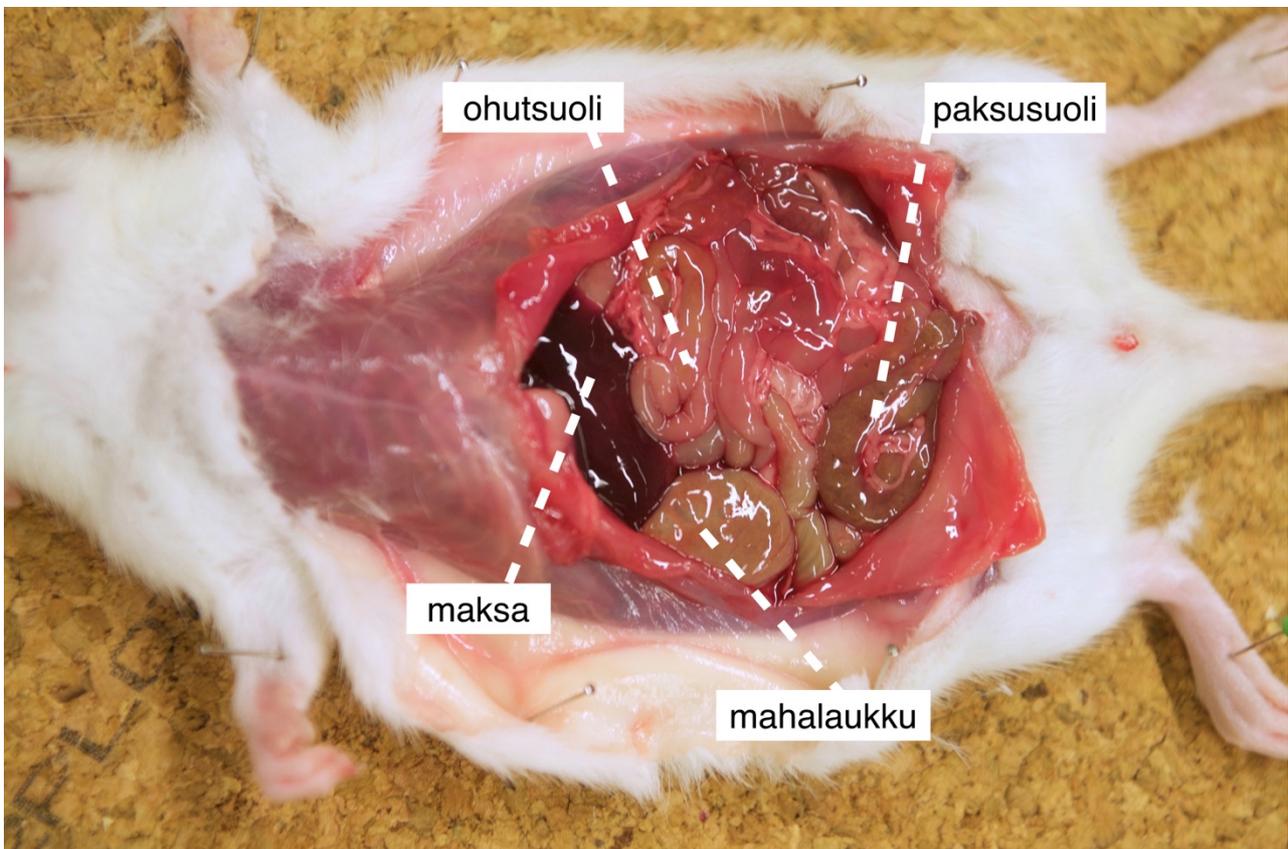


Image 4. The intestines of a rat. Locate the parts mentioned in the picture. Locate also the rectum, the colon, the spleen and the kidneys.

5. THORACIC CAVITY

Use the **scissors** to cut open the thoracic cavity (cut the sternum as shown in image 5). Remove the ribs from the both sides.

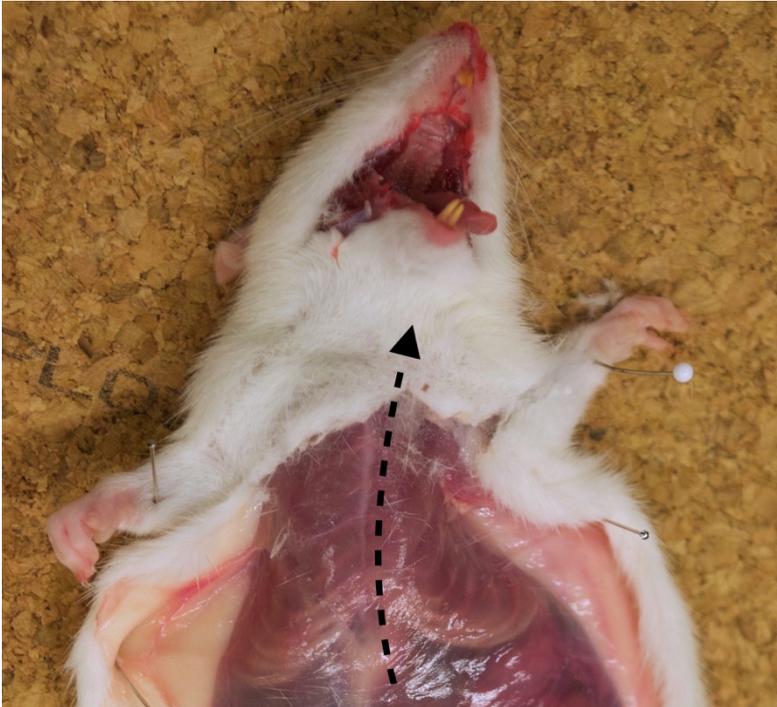


Image 5. Cut the sternum as shown in the image.

In the bottom part of the thoracic cavity, there is the heart inside *the pericardial sack*. If there is any white adipose tissue (fat) on the sack, you can remove it to see the heart.

You can also locate the thymus above the heart, but it is only visible in juveniles. You can also locate the trachea which divides into two *bronchi*. On the left side of the body, there is only one pulmonary lobe, but on the right side, there are four pulmonary lobes (a human has three lobes on the right side and two lobes on the left side). The lungs may contain some blood, which can make them look dark red.

6. CLEANING

Put your rodent and all the tissues in a separate plastic bag given by your instructor. Wash and dry all the equipment and remember to clean the inner surface of the scissors and the pins as well! Give the equipment back to your instructor.

POST-TASK QUESTIONS

- How can you see the nutrition from the dentition (teeth) of a rodent? What about the intestines?
- Find out what is *the cecum* and why it is important (for herbivores).
- What are the main differences between the intestines of a rodent and a human?
- What are the main differences between the dentition of a rodent and a human?
- Rats and mice are used as model organisms. What features make them useful study subjects?
- How is it possible to study human diseases using a rodent as a model?