Skeletal muscle (Item No.: P1443001)

Curricular Relevance

Area of Expertise: Biologie
Education Level: Klasse 7-10
Topic: Biologie der Zelle, Mikroskopie
Subtopic: Spezialisierte Zellen, Gewebe und Organe
Experiment: Skelettmuskel

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Easy	10 Minutes	30 Minutes	1 Student

Additional Requirements:

- Physiological saline solution
- Beef
- Heart

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Information
Your skeletal muscles make it possible that you can move, hold your body in an upright position when you are standing or sitting, or your face can smile. The muscles of all mammals possess a similar basic structure.

Information on obtaining material
The study material can be easily obtained from a butcher’s shop. The experiments described here were tested with beef and bovine heart. However, skeletal muscles from any other mammal species may also be experimented with, if it should be better available.

Information on the structure of muscles
We distinguish striated musculature (skeletal musculature) and smooth musculature which is found in the intestines.
Muscles are attached to bones by means of tendons. Muscles are composed of muscular fiber bundles which are surrounded by connective tissue and which, again, are composed of numerous muscle fibers. Muscle fibers have developed by the fusion of muscle cells and therefore contain many nuclei. Each muscle fiber consists of several hundred thin myofibrils. The striation recognizable under the microscope is induced by the arrangement of the proteins myosin and actin that are lined up like a string of beads. The striation effect is produced by the myofibrils lying next to each other in one and the same plane. Actin and myosin overlap somewhat and can slide over each other yet more, an action which induces the contraction of the muscle.


Hazards

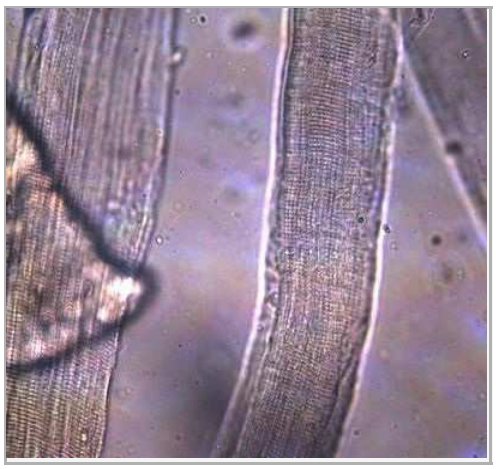
- Carmine acetic acid is highly corrosive!
- Put on protective glasses!

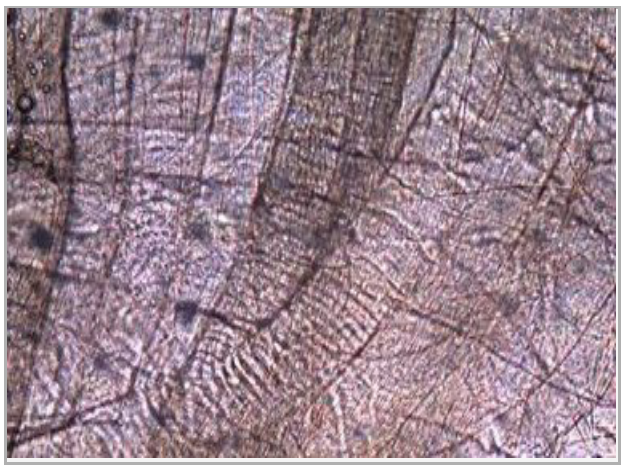
Hazard and Precautionary statements

Carmine acetic acid:	
H314:	Causes severe skin burns and eye damage.
P280:	Wear protective gloves/protective clothing/eye protection/face protection.
P260:	Do not breath vapour.
P301 + P330 + P331:	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P302 + P352:	IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P309 + P310:	IF exposed or if you feel unwell: Immediately call a POISON CENTER or doctor/physician.

Information on how to perform the experiment

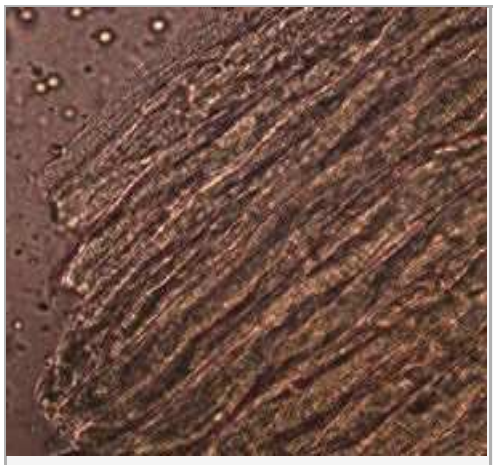
ad 1 and 2: Preparation of muscle tissue
Muscle tissue preparation should proceed in physiological saline because otherwise the surrounding membrane would detach itself. You have to observe that the students produce very thin and transparent slides and, finally, that so much sodium-chloride solution is added that microscopy will be possible free of air bubbles. The striated structure should be explained to the students or, depending on their learning potential, they should elaborate on it by themselves.



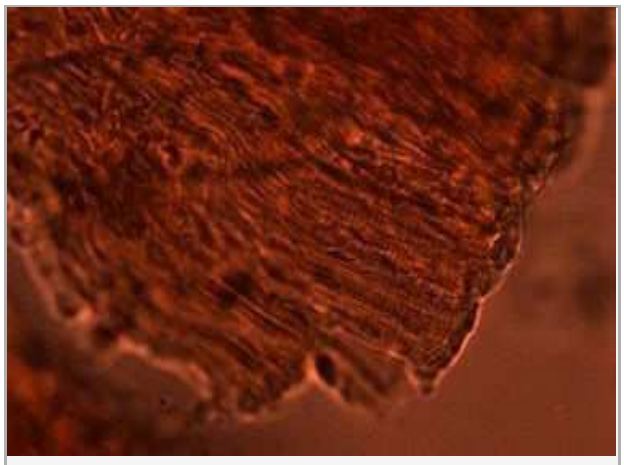


Skeletal muscle, unstained, 400x

ad 3 and 4: Examining the heart muscle
The tissue of the heart muscle is primarily darker than skeletal muscle. The striation is similarly well recognizable as is the case with skeletal muscle. Staining with carmine acetic acid can be easily managed by the students and it enhances the structures.



Heart muscle, unstained, 400x



Heart muscle, stained with carmine acetic acid, 400x

Robert-Bosch-Breite 10
D - 37079 Göttingen
Tel: +49 551 604 - 0
Fax: +49 551 604 - 107
info@phywe.de
www.phywe.com

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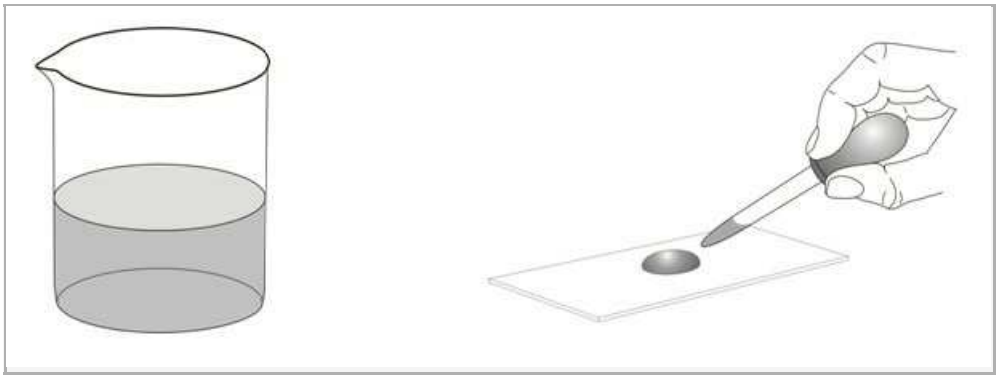
Task and equipment

Task

Skeletal muscle is also referred to as striated (striped) muscle. You will explore how this name may be explained.



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	Scissors,straight,pointed,l 110mm	64623-00	1
5	Dissecting needle, pointed	64620-00	1
6	Dissecting needle, lancet-shaped	64621-00	1
7	Tweezers,straight,pointed,120mm	64607-00	1
8	Chemicals set for TESS advanced Microscopy	13290-10	1

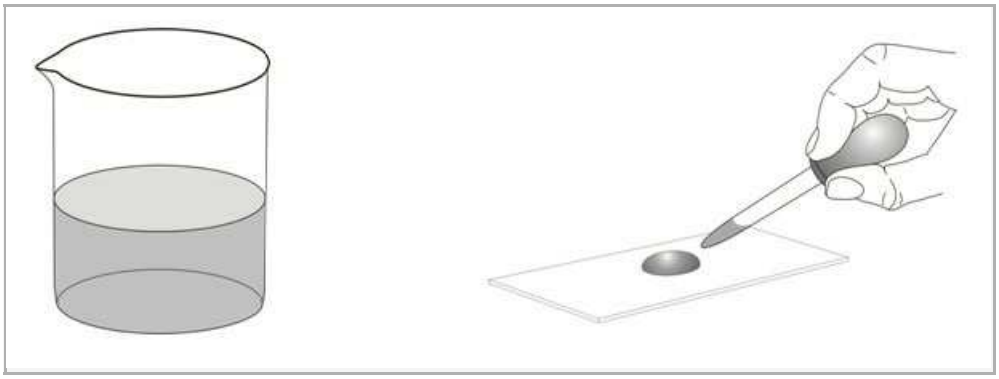
Set-up and procedure

Hazards

- Carmine acetic acid is highly corrosive!
- Put on protective glasses!

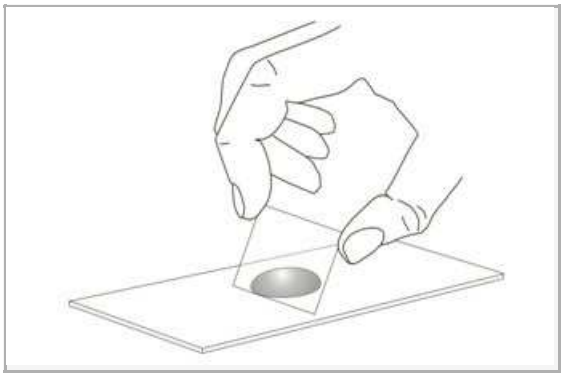

Information
Your skeletal muscles make it possible that you can move, hold your body in an upright position when you are standing or sitting, or your face can smile. The muscles of all mammals possess a similar basic structure.

Methods and observations
1. Preparation of a muscle
a) Pipette two drops of physiological saline onto a slide (see P1440901)



b) Cut a small piece of meat alongside the muscle fibers using the dissecting scissors.
Tear the meat in the salt solution until you obtain very thin fibers.

2. Microscopical examination
If necessary, add another drop of physiological saline before you start with microscopy.



View the specimen in three steps up to the highest power.
Describe the observations you make in the report.

Additional tasks

3. Heart musculature
Examine a piece of heart muscle in the same way.

4. Staining with carmine acetic acid
Proceed as described under Task 1, then apply some carmine acetic acid to the mounted slide and view the specimen under the microscope after 3 minutes.
Describe your observations ensuing Tasks 2 and 3 in the report.

Robert-Bosch-Breite 10
D - 37079 Göttingen
Tel: +49 551 604 - 0
Fax: +49 551 604 - 107
info@phywe.de
www.phywe.com

Report: Skeletal muscle

Result - Observations 1

View the specimen in three steps up to the highest power.

Describe the observations you make! Explain why these muscles are called "striped".

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Result - Observations 2

Note your observations when examining a piece of heart muscle in the same way.

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Result - Observations 3

Describe your observations ensuing staining.

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