Blood cells (Item No.: P1443101)

Curricular Relevance

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

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

Additional Requirements:

- Blood
- Cotton swabs

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Information

Every human being possesses 5 to 7 liters of blood which constantly circulates in the body. When circulating, it transports nutrients and heat to wherever needed. The blood also has many other functions, for example, it is responsible for the closure of wounds and it is capable of eliminating various pathogens. But blood itself may be a carrier of pathogens (hepatitis viruses and HIV), even if people appear to be healthy. **Any direct contact with the blood of another person must therefore be avoided by all means**. For this reason, animal blood or a permanent slide may also be used in the following experiments.

Information on obtaining materials

Whether human blood may be examined during school lessons depends on the safety regulations of each state. **Any contact with blood might lead to an infection with the pathogens HIV, hepatitis, etc. Dried blood might also result in the transmission of hepatitis viruses, for example. For this reason, the general rules of hygiene must be observed by all means (see below).**
Alternatively, these studies may be conducted with fresh, yet unclotted animal blood samples. It can be ordered at a butcher’s shop and must be treated for the following experiments with an anticoagulant (e.g. citrate) upon its withdrawal.

Safety measures

- Ethanol is extremely flammable. Extinguish all open flames!
- Giemsa solution contains methanol. Avoid contact with skin!
- Wear protective glasses and gloves!

Hazard- and Precautionary-Statements

Ethanol:

H225:	Highly flammable liquid and vapour.
P210:	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Giemsa solution:	
H301:	Toxic if swallowed.
H311:	Toxic in contact with skin.
H331:	Toxic if inhaled.
H370:	Causes damage to organs.
P260:	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P280:	Wear protective gloves/ protective clothing.
P301 + P310:	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P311:	Call a POISON CENTER or doctor/ physician.

Information on practical performances

1. Blood constituents

The students should make themselves familiar with the various blood constituents in advance. The blood cells (red blood corpuscles and platelets), of which the red blood cells predominate by number, stand in the center of interest.

2. Blood source

Variant A: Small amounts of animal blood pretreated with citrate are made available to the students in a beaker. All the following tests can be performed with this one sample.

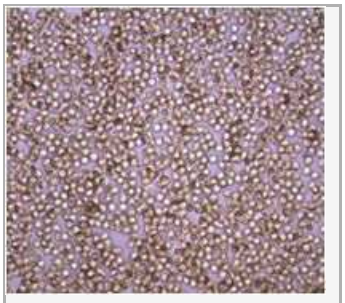
Variant B: **The following safety rules must be observed:**

- Isopropanol or ethanol (or a mixture of both) and swab (tissue paper, or similar) must be in reach.
- The puncture site must be disinfected before a sample is taken and protected from being contaminated by pathogens afterwards (plaster).
- Hemostylets must only be used once and are then discarded in a sealed container, so that other persons are safe from injury or infection.
- All work top surfaces and materials (slides) which might have been in contact with the blood must be disinfected after the experiment.

3. Rapid blood examination

A rapid examination is necessary because plasmolysis of the cells will ensue. In this experiment (without staining) only red blood corpuscles are recognizable, predominately occurring in the shape of round discs. That they are lentiform or plate-shaped may be seen exceptionally, for example, when the cells are visible from an oblique angle. This happens only when a spacer is used (cf. information in the students' worksheet).

Blood (human) 400x, unstained



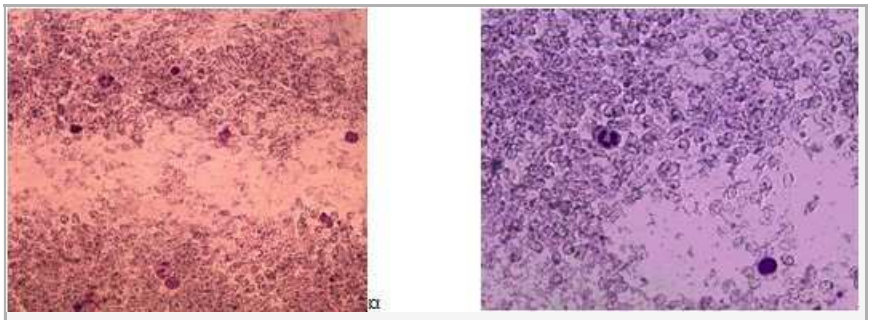
Blood (mammal) 400x, unstained

4. Staining

The students are to handle staining agents with care in order not to contaminate tables and clothing. Working on tiled surfaces with a sink is recommended.

5. Microscopy of the blood smear

The quite large and diverse white blood cells are stained differentially. With some luck, the irregularly shaped platelets may also be seen in groups.



Blood smear 400x, stained with azure II eosin methylene blue

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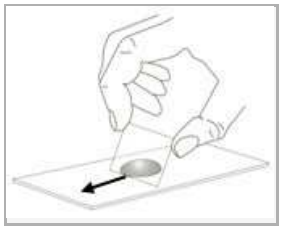
Task and equipment

Task

Blood appears to be a homogenous red fluid. Try to make single solid components visible!



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	2
5	Dropping pipette with bulb, 10pcs	47131-01	1
6	Blood lancets, sterile, 200/pkg	64217-00	1
7	Chemicals set for TESS advanced Microscopy	13290-10	1

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Set-up and procedure

Hazards

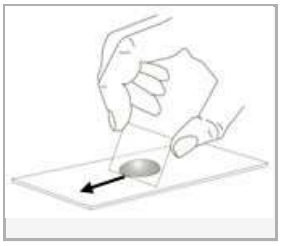
- Ethanol is extremely flammable. Extinguish all open flames!
- Giemsa solution contains methanol. Avoid contact with skin!
- Wear protective glasses and gloves!

1. The constituents of blood
Gather information on the composition of blood and the functions of each single blood constituent and answer Question 1 in the report.

2. Blood source
Variant A: The teacher will make a blood sample containing an anticoagulant agent available to you. Prepare a slide etc.
Variant B: You prefer to examine your own blood!
First thoroughly clean a slide and prepare all materials you need.
Massage the finger from which you intend to take your own blood sample. Disinfect your finger tip with ethanol. Take the hemostylet out of the original package (only to be used for this purpose!). Use the stylet to scratch or punch your finger until blood emerges. The first drop is discarded, the second is allowed to drip directly onto the slide.
3. Rapid blood examination
The drop of blood is diluted with water and swiftly viewed under the microscope (up to 400-fold).
Note: If you insert an extra (broken) cover slip as a spacer between your slide and the regular cover slip, you will be able to better identify the shape of the blood cells!
What are the blood cells called which you see in a great number?

4. Staining a blood smear

- The slide should be placed on a firm substrate for this staining procedure.
- Drip some blood on the slide as described under 2.
- Place one edge of a cover slip next to it so that it contacts the blood and then pull it away from the blood drop. This will cause the blood to smear across the slide in a thin layer and the cells will not be damaged.
- Allow to dry for 5 minutes.
- Apply several drops of the azure II eosin Methylene Blue solution and allow it to take effect for 2 minutes.
- Add several drops of distilled water and wait 2 to 3 minutes.
- Rinse with plenty of distilled water.
- Allow to air dry.



5. Microscopy of a blood smear

Examine the blood smear or a permanent slide.

Describe the appearance of the various constituents stained. What kind of blood cells are there?

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Report: Blood cells

Result - Observations 1

What are the blood cells called which you see in a great number in the rapid blood examination?

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Result - Observations 2

Draw your observations.

Result - Observations 3

Examine the blood smear or a permanent slide.

Describe the appearance of the various constituents stained. What kind of blood cells are there?

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Evaluation - Question 1

Complete the sentence:

Blood contains the following cells as solid constituents:

Which of these cell types do you expect to see in a very great number under the microscope

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