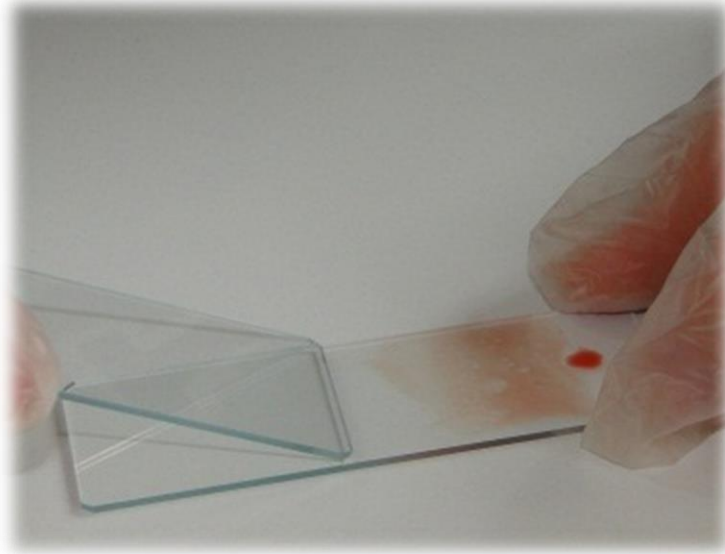


# Flipped Classroom

## Blood Smear



### Disclaimer

A series of booklets (instructions for skills and flipped classroom materials) has been developed by the Clinical Skills Lab team (staff, recent graduates and students) from Bristol Veterinary School, University of Bristol, UK.

Please note:

- Each flipped classroom booklet includes ways to prepare for learning a skill in class; it is acknowledged that there are often other approaches. Before using the booklets, students should check with their university or college to determine whether the approaches illustrated are acceptable in their context or whether an alternative resources should be used.
- The booklets are made available in good faith and may be subject to changes.
- In using these booklets, you must adopt safe working procedures and take your own risk assessments (as and when appropriate), checked by your university, college etc. The University of Bristol will not be liable for any loss or damage resulting from failure to adhere to such practices.

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## Introduction

This flipped classroom is designed to be used as preparation for practical classes that involve learning to make a blood smear. The smear would then be stained and examined under a microscope.

This booklet has the following sections:

1. Learning outcomes
2. Content (a selection of learning resources)
3. MCQs (a self-assessment quiz)
4. Notes and other useful learning resources

## 1. Learning Outcomes

- Identify and prepare all equipment ready to make a blood smear
- Describe how to draw up a small amount of blood into a capillary tube
- Perform the steps to make a blood smear

*N.B. The focus of the flipped classroom is on underpinning knowledge and 'knowing how' to do the skills, which will ensure you can get the most out of the time spent in the practical class. You can also practise the technique for making a blood smear at home with two pieces of plastic and a drop of water.*

### 2A: Preparing for the practical

#### Important note:

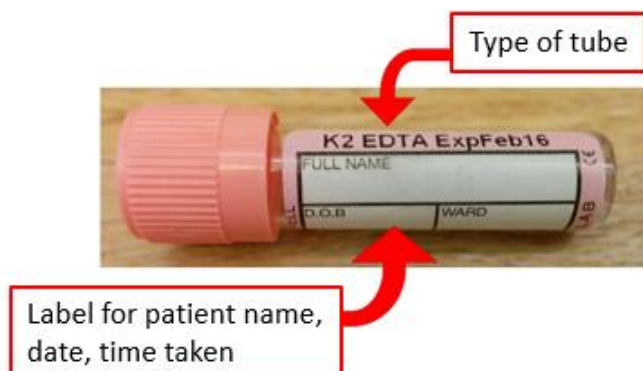
Ensure that you read and follow your institution's guidelines on preparing for laboratory-based practicals.

### 2B: Preparing a blood smear for microscopy

#### Equipment needed:

- Whole blood in EDTA (or heparin) blood collection tube (*see labelled image below*)
- Capillary (haematocrit) tubes
- Microscope slides
- China marker pencil (or equivalent)
- Tissue or paper towel
- Gloves

The **label** on the tube includes information about e.g. the type of tube and boxes to write on the tube (patient & owner name, date etc.)



### 2B: Preparing a blood smear for microscopy

#### STEPS

##### 1. Labelling the slide



Label the microscope slide with the patient's details and the date.

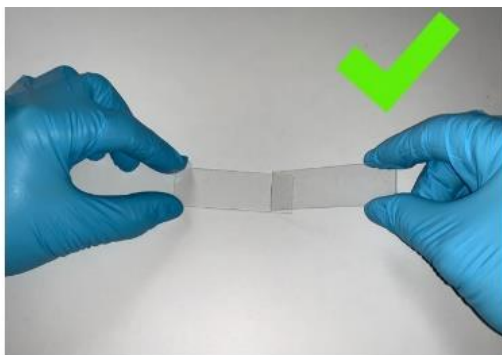
##### 2. Preparing the blood smear

There are **2 different ways to make a blood smear**:

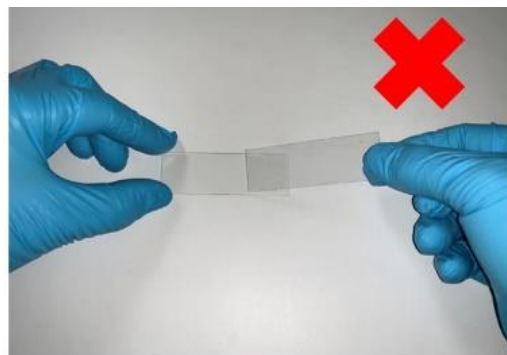
- 'Push' technique
- 'Pull' technique

Either technique is acceptable - it's just personal preference

When making the blood smear, the two slides are held as illustrated below:



Correct technique. **Hold the slide edges** with the index finger & thumb of your dominant hand when creating the blood smear (push or pull technique).



Incorrect technique. Holding the slide surface between the index finger and thumb will make the smear (using push or pull technique) uneven.

You can **practise the techniques at home** with two plastic 'slides'. To prepare, you will need e.g. an old library card or store card and a drop of water. You can see which technique (push or pull) you find easiest before the practical.

### 2B: Preparing a blood smear for microscopy

#### STEPS

#### 2. Preparing the blood smear (*continued*)

Follow steps A-C for both techniques and then D & E (on the following pages) for each different technique (push or pull).

A



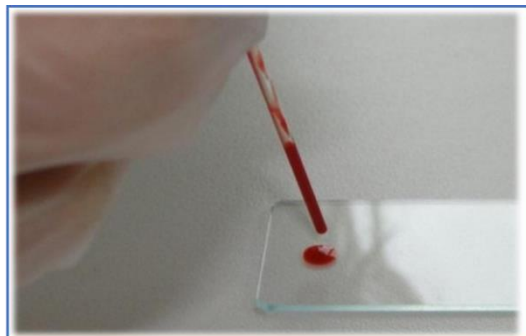
Gently invert the tube to mix the sample. Hold the tube at an angle and introduce the capillary tube. Allow blood to move up the capillary tube.

B



Put your index finger over the top of the capillary tube before removing it or blood will leak (run back down into the sample).

C



Place a drop of blood onto one end of a clean slide.  
Discard the capillary tube into a sharps bin.

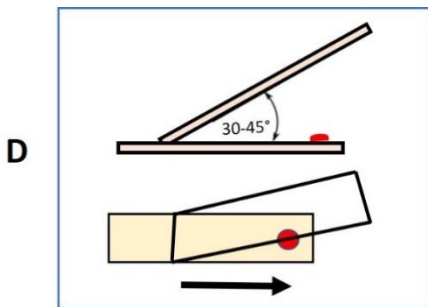
### 2B: Preparing a blood smear for microscopy

#### STEPS

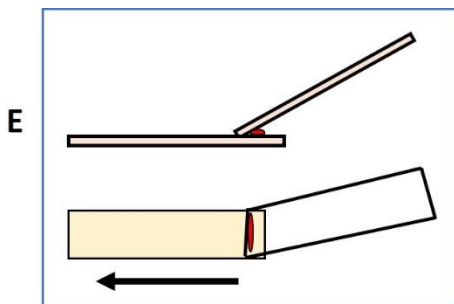
#### 2. Preparing the blood smear (*continued*)

Now perform steps D & E to make a blood smear using either the 'push' technique or the 'pull' technique. Try both techniques to decide which one you prefer. These look easy but it takes quite a lot of practise to make a blood smear well and it is important as the quality of the smear affects how easy it is to recognise the cells and make a diagnosis.

#### 'Push' technique:

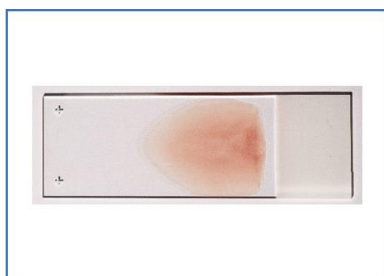


**The PUSH technique:** Take a second slide and lie the edge flat on the smear slide at approximately 30-45 degree angle. Pull the second slide back until it contacts the drop of blood. Allow the blood to spread along the edge of the slide.



Once blood has spread along the edge of the second slide then **push** it away from the drop of blood firmly and swiftly. This can take some practice! Air dry the slide by wafting it.

The resulting blood smear should look like:



The smear should be fully contained on the slide (i.e. not off the edge). It should not be too thick or so thin that there are scratch marks. If held up to the light, the tail (feathered edge) of the smear should contain a rainbow effect.



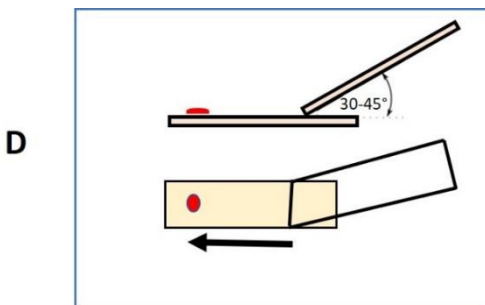
### 2B: Preparing a blood smear for microscopy

#### STEPS

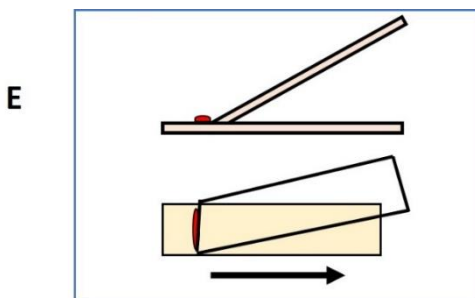
#### 2. Preparing the blood smear (*continued*)

Now try using the 'pull' technique

#### 'Pull' technique:

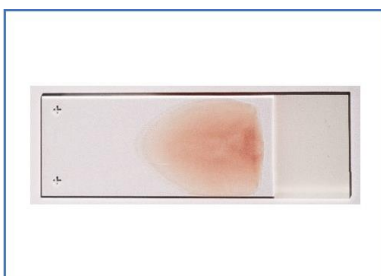


**The PULL technique:** Take a second slide and lie the edge flat on the smear slide, Hold the slide at approximately 30-45 degree angle. Push the second slide back until it contacts the drop of blood. Allow the blood to spread along the edge of the slide



Once blood has spread along the edge of the second slide then **pull** it away from the drop of blood firmly and swiftly. This can take some practice!  
Air dry the slide by wafting it.

The resulting blood smear should look like:



The smear should be fully contained on the slide (i.e. not off the edge). It should not be too thick or so thin that there are scratch marks. If held up to the light, the tail (feathered edge) of the smear should contain a rainbow effect.

You can use the 'push' or 'pull' technique. Practise both and then use the one you find easiest. You can **practise the techniques at home** with two plastic 'slides' e.g. an old library card or store card and a drop of water.

### 2B: Preparing a blood smear for microscopy

#### STEPS

#### 2. Preparing the blood smear (*continued*)

##### **Drying** the slide

Air dry the slide by gently wafting it from side to side.

##### **Staining** the slide

When the slide is dry, the blood smear is stained with Diff-Quik before being viewed under the microscope - refer to booklet **CSL\_L06 Diff-Quik Staining** on the Clinical Skills website

[www.bristol.ac.uk/vet-school/research/comparative-clinical/veterinary-education/clinical-skills-booklets/laboratory-techniques/](http://www.bristol.ac.uk/vet-school/research/comparative-clinical/veterinary-education/clinical-skills-booklets/laboratory-techniques/)

#### **Video: How to make a blood smear**

A video showing how to make a blood smear. To view please click on the image below or the following link:

<https://youtu.be/6E2omJNzNUE>







### 3. MCQs

Test yourself using the MCQs in this quiz:



[https://xerte.bris.ac.uk/play.php?template\\_id=5245](https://xerte.bris.ac.uk/play.php?template_id=5245)



### 4. Notes and other useful resources

There are **clinical skills instruction booklets** relevant to laboratory skills practicals on the website:

[www.bristol.ac.uk/vet-school/research/comparative-clinical/veterinary-education/clinical-skills-booklets/laboratory-techniques/](http://www.bristol.ac.uk/vet-school/research/comparative-clinical/veterinary-education/clinical-skills-booklets/laboratory-techniques/)

Relevant and related booklets include:

- CSL\_L02 Blood Smear
- CSL\_L06 Diff-Quik Staining
- CSL\_L07 Using a Microscope