EASTER BUSH SCIENCE OUTREACH CENTRE

Get hands-on with real-life science

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Easter Bush
Science Outreach Centre

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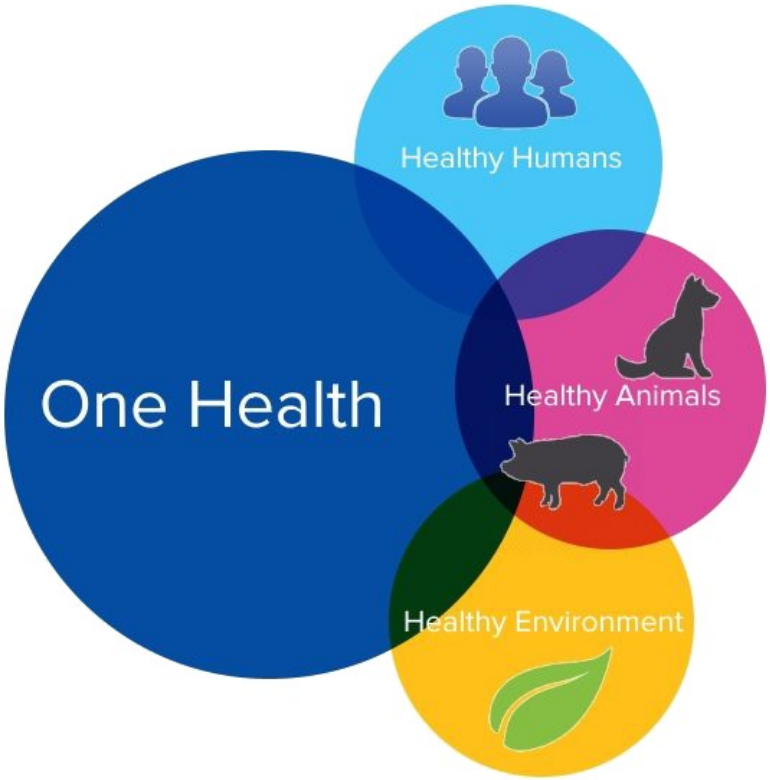
DNA Profiling Workshop

Science Outreach Centre

Get hands-on with real-life science

The Roslin Institute- Improving animal health and welfare



BBSRC
bioscience for the future

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Get hands-on with real-life science

The Great Escape

The Shetland Flock

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Easter Bu
Science C

Get hands-on with real-life science

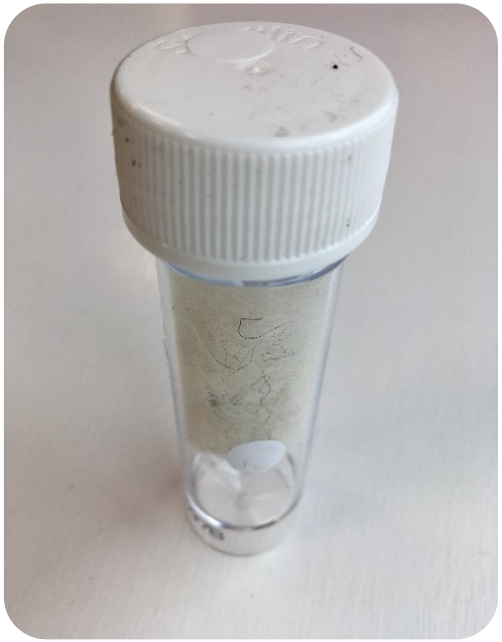
The Great Esc

The Problem

The Great Escape

The facts so far….

Farmer Jamie has collected some fleece from the gate.



Evidence item # CS1

There are five sheep in the pen, one is responsible for opening the gate.

Farmer Jamie has collected fleece from each of the five sheep that live in the pen.

Evidence item
S1

Evidence item
S2

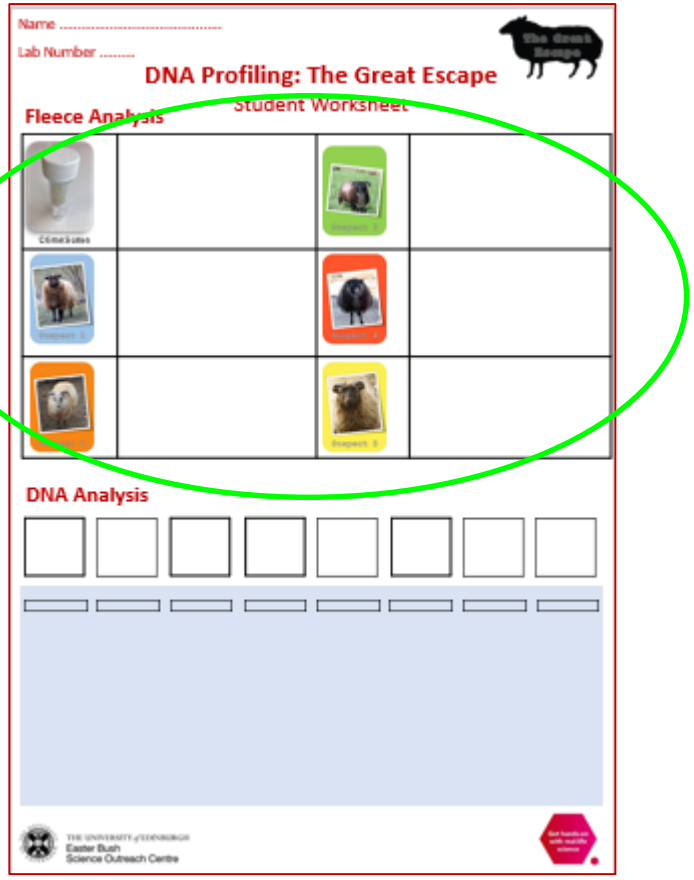
Evidence item
S3

Evidence item
S4

Evidence item
S5

Fleece Analysis

Analyse the sheep fleece of five sheep suspects and compare it with the fleece found on the gate.



Which sheep do you think it is?

What else could we analyse?

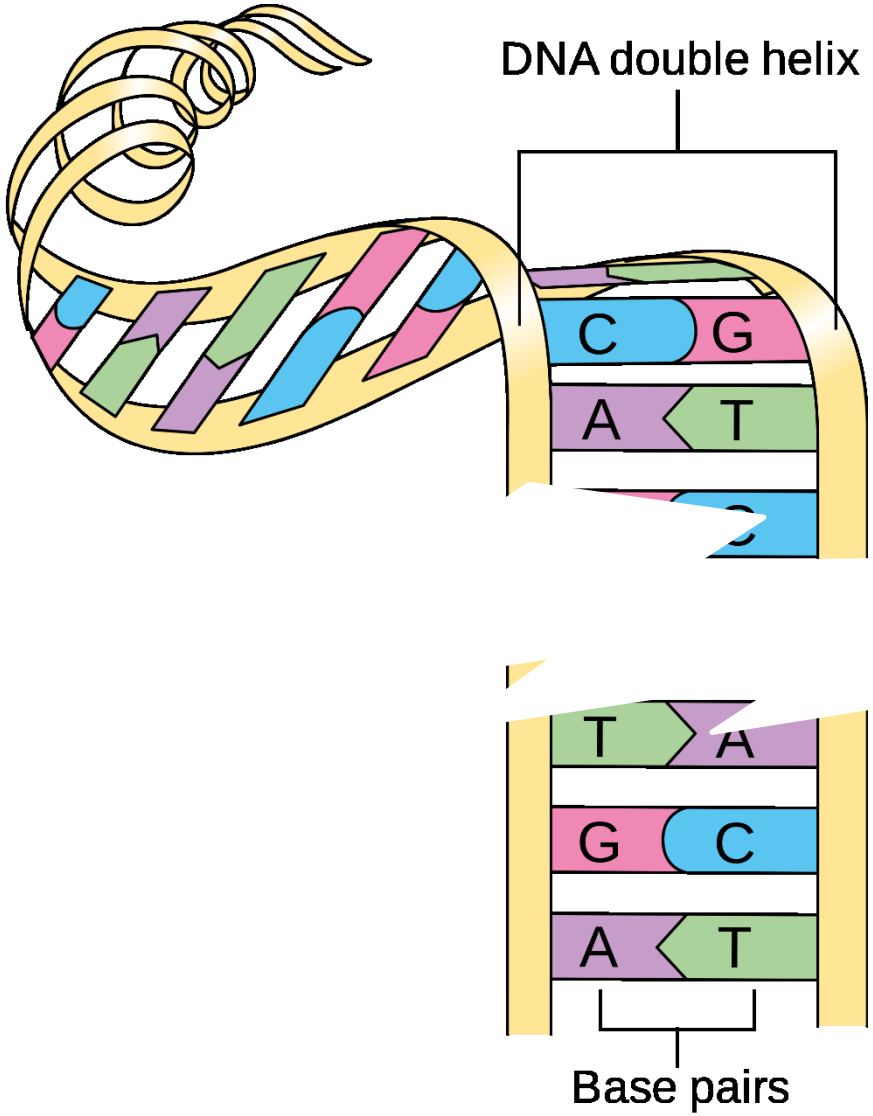
Why are we all different?

Different DNA

Different characteristics

Every living thing has unique DNA

DNA contains four bases



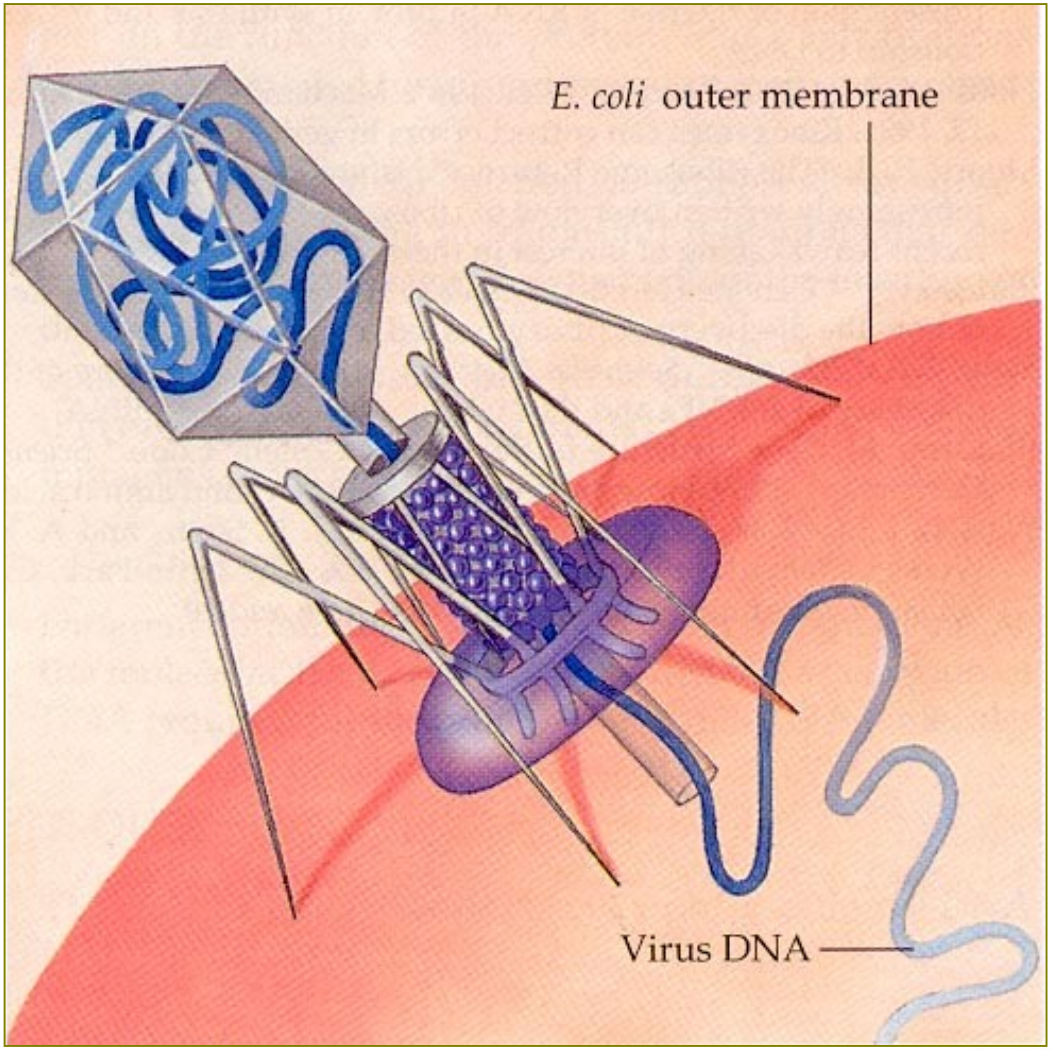
Restriction enzymes cut the DNA at specific sequences

DNA Restriction Enzymes

Evolved by bacteria to protect against viral DNA infection

Endonucleases = cleave within DNA strands

Over 3,000 known enzymes



Different restriction enzymes cut different sequences

EcoRI

G A A T T C
C T T A A G

PstI

C T G C A G
G A C G T C

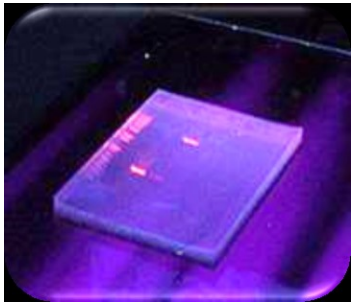
G A A T T C A C G T C T G C A G C C A A A T G G C G A A T T C C A
C T T A A G T G C A G A C G T C G G T T T A C C G C T T A A G G T

Different DNA is cut in different places

So far…

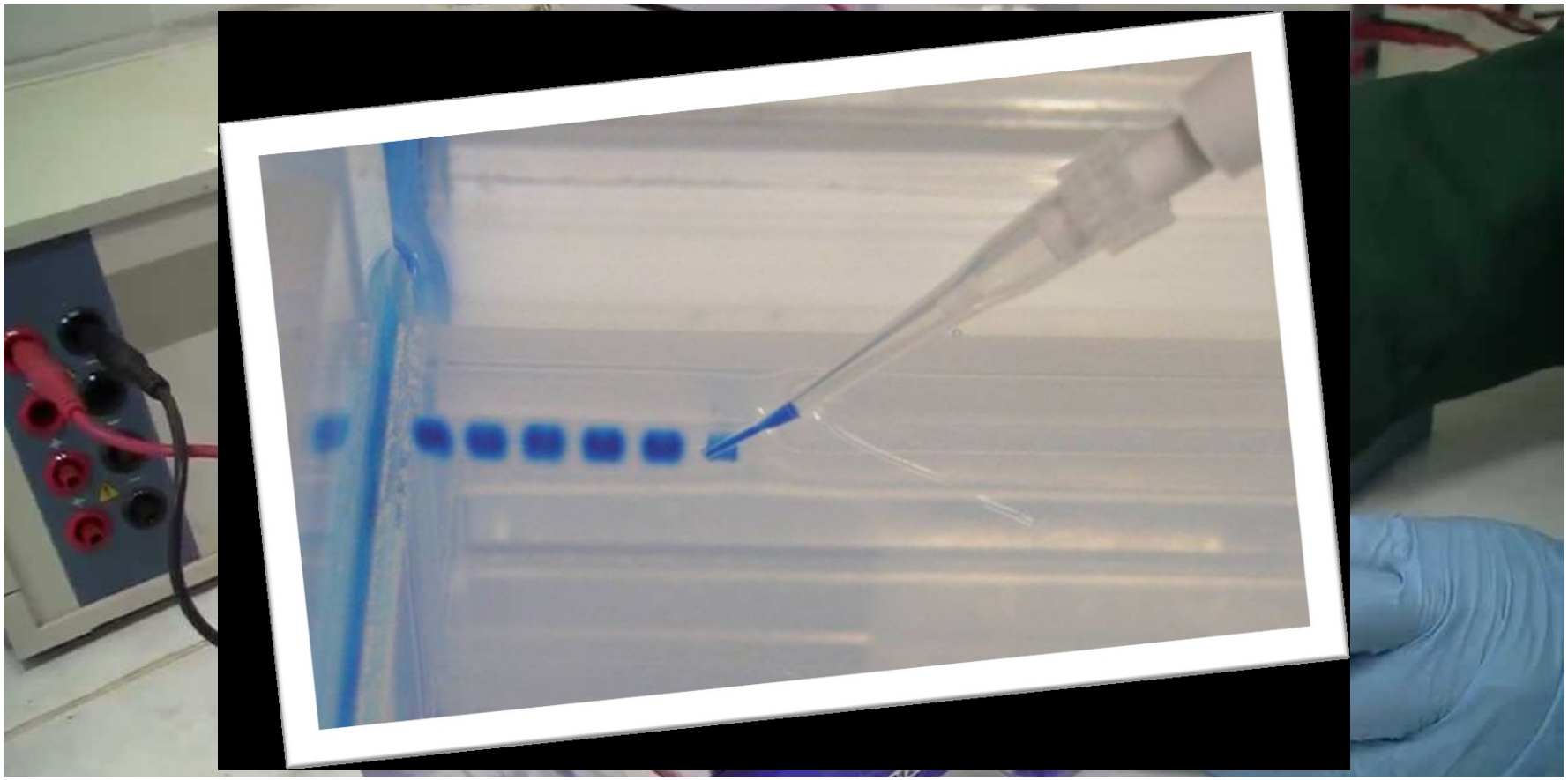
Analysed the fleece from five sheep suspects

Next…



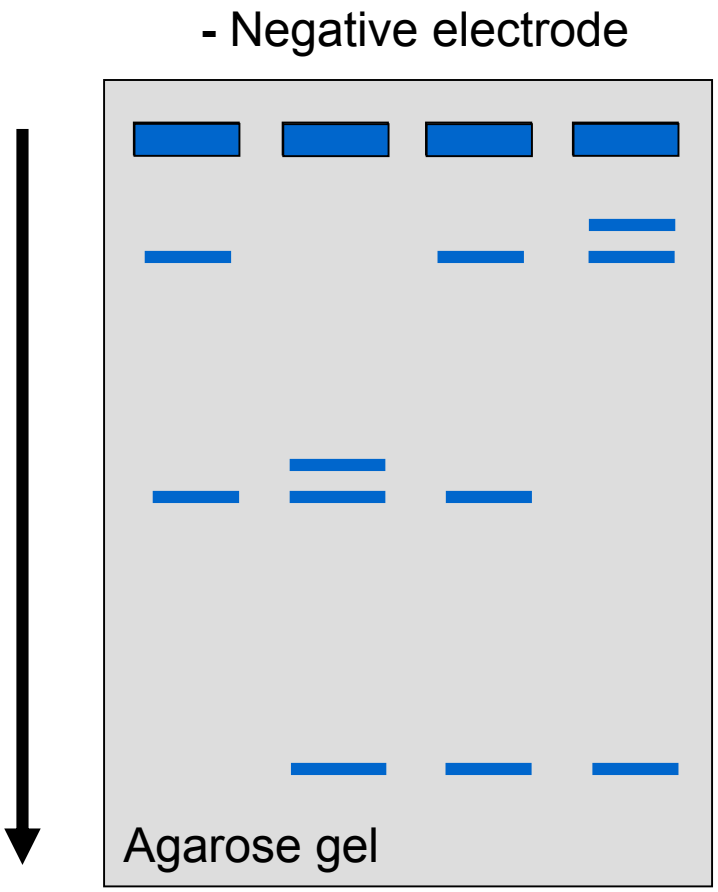
Use the DNA of our five sheep suspects to find out how whose fleece was on the gate

How can we see their DNA?



Gel Electrophoresis

Gel electrophoresis



Larger DNA fragments move slower

Molecules of the same size travel the same distance and form a band

Smaller DNA fragments move faster

Holding Micropipettes

Setting the volume

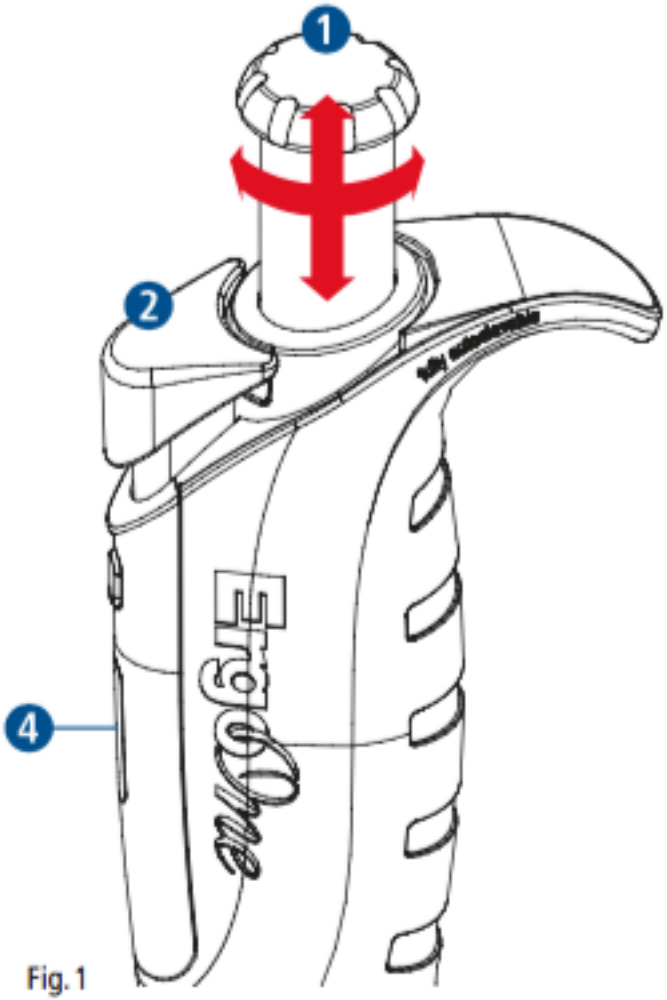


Fig. 1

Can you set the pipette for 10 µl?

Pipette set for 10 µl

Taking up liquid

- Put tip on pipette
- Press plunger d
- Place tip in liquid
- Release plunger

Dispensing li

- Place tip where you
- Press plunger right
- Move tip away from
- Release plunger

Playing with pipettes

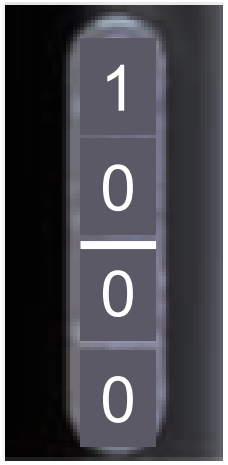
What does 10µl look like?	
What does 5µl look like?	
What does 2.5µl look like?	

Safety first!

DNA from suspects 1 to 5

1. **Write your lab number** on the lid of each tube containing DNA collected from each sheep suspect.

2. Set **micropipette** to 10µl.



3. Place a **tip** on pipette.

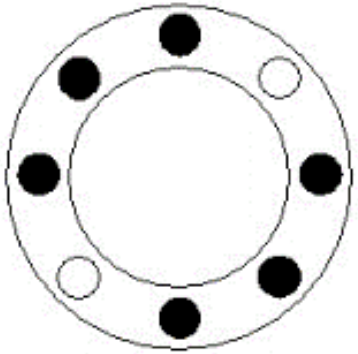
Digest DNA samples

1. Add **10µl enzyme mix** (tube marked E) to every tube. (This time you push down to the 2nd stop to dispense all the liquid!)

Change the pipette tip between each tube

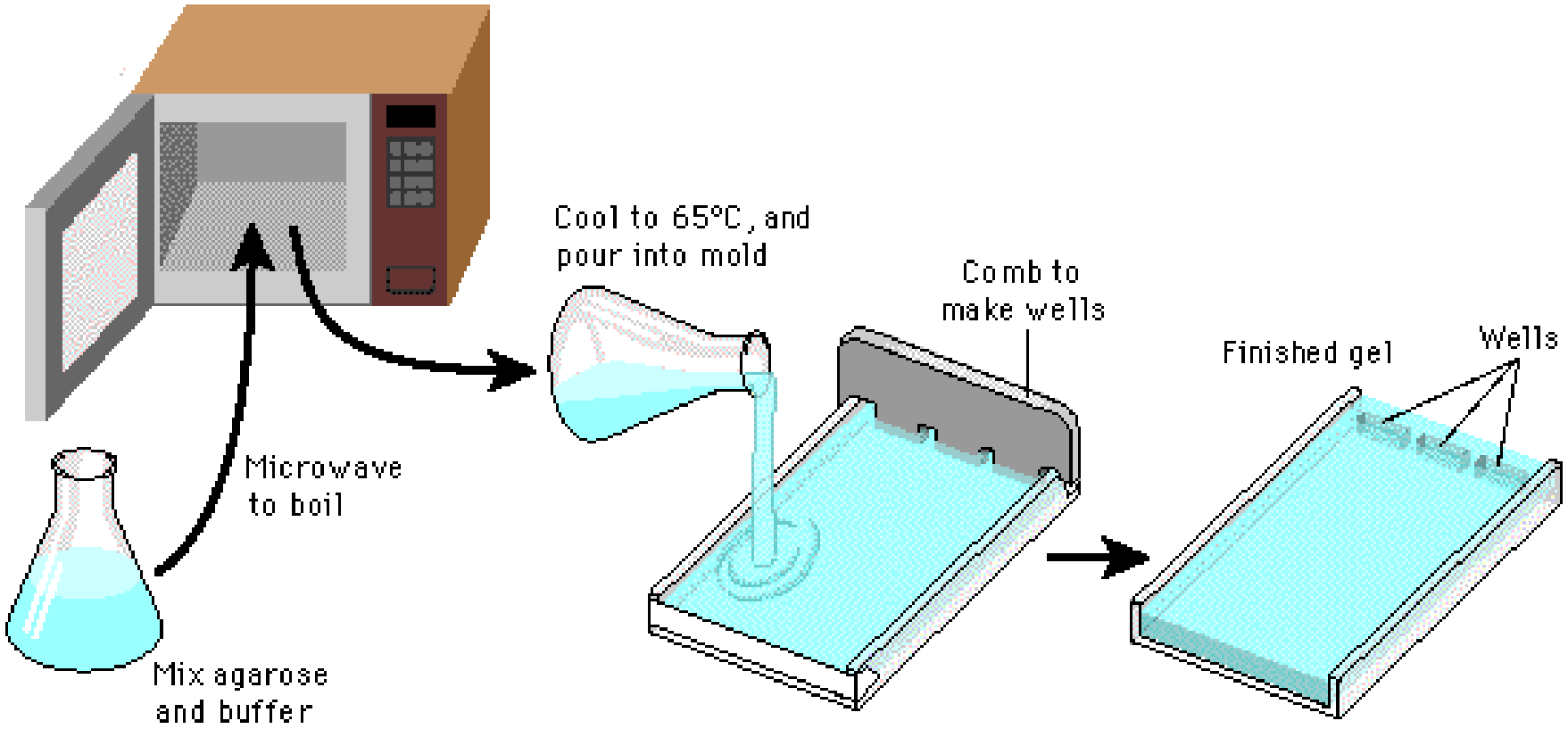
Digest DNA samples

3. **Flick** the tubes and then **centrifuge** samples (make sure they are balanced)



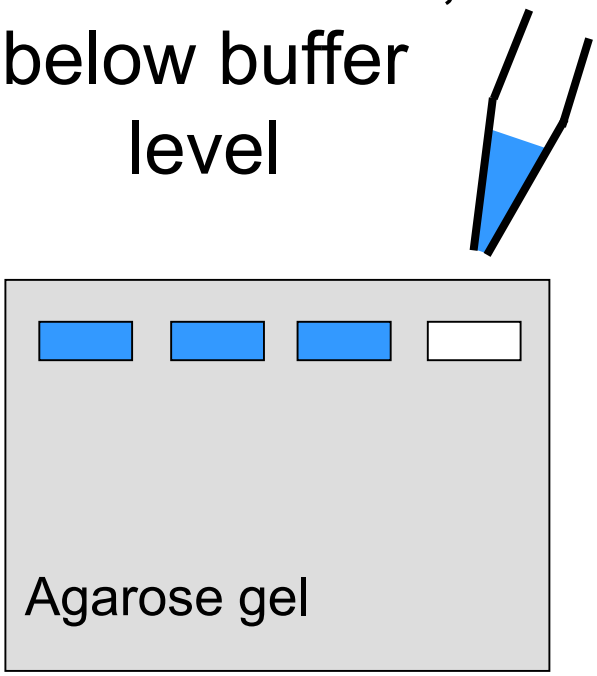
4. Place the tubes in the **foam rack** and put them in a 37°C water bath for 20 minutes.

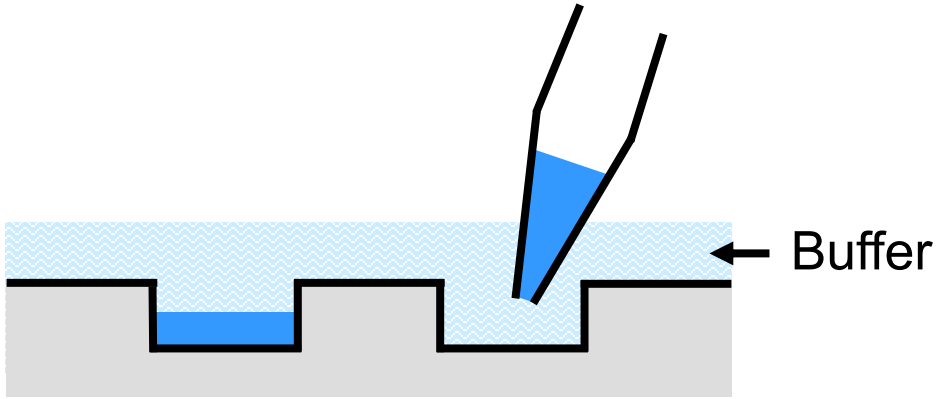
Pour an agarose gel



Loading sample on to gel

Hold pipette tip just above well, below buffer level



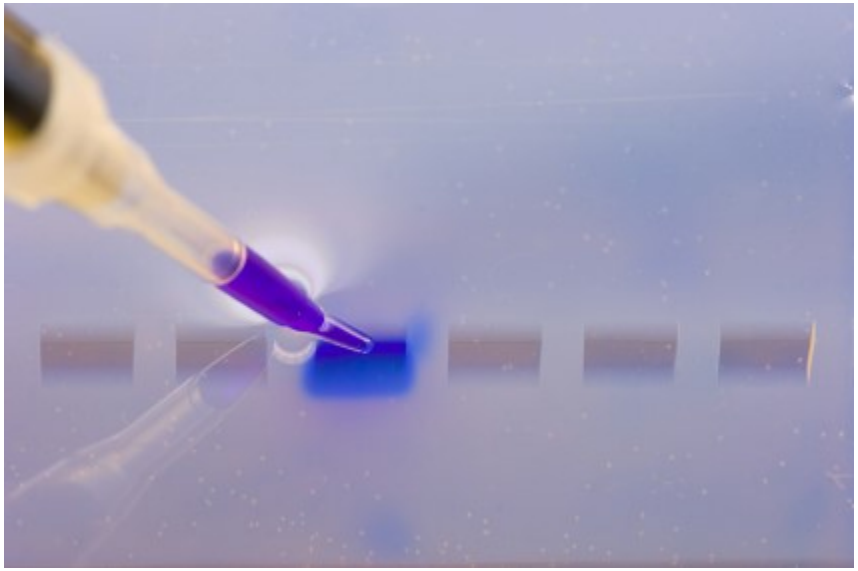


Be careful not to pierce bottom of well with pipette tip!

This time you push down to the 1st stop to fill the well with the DNA

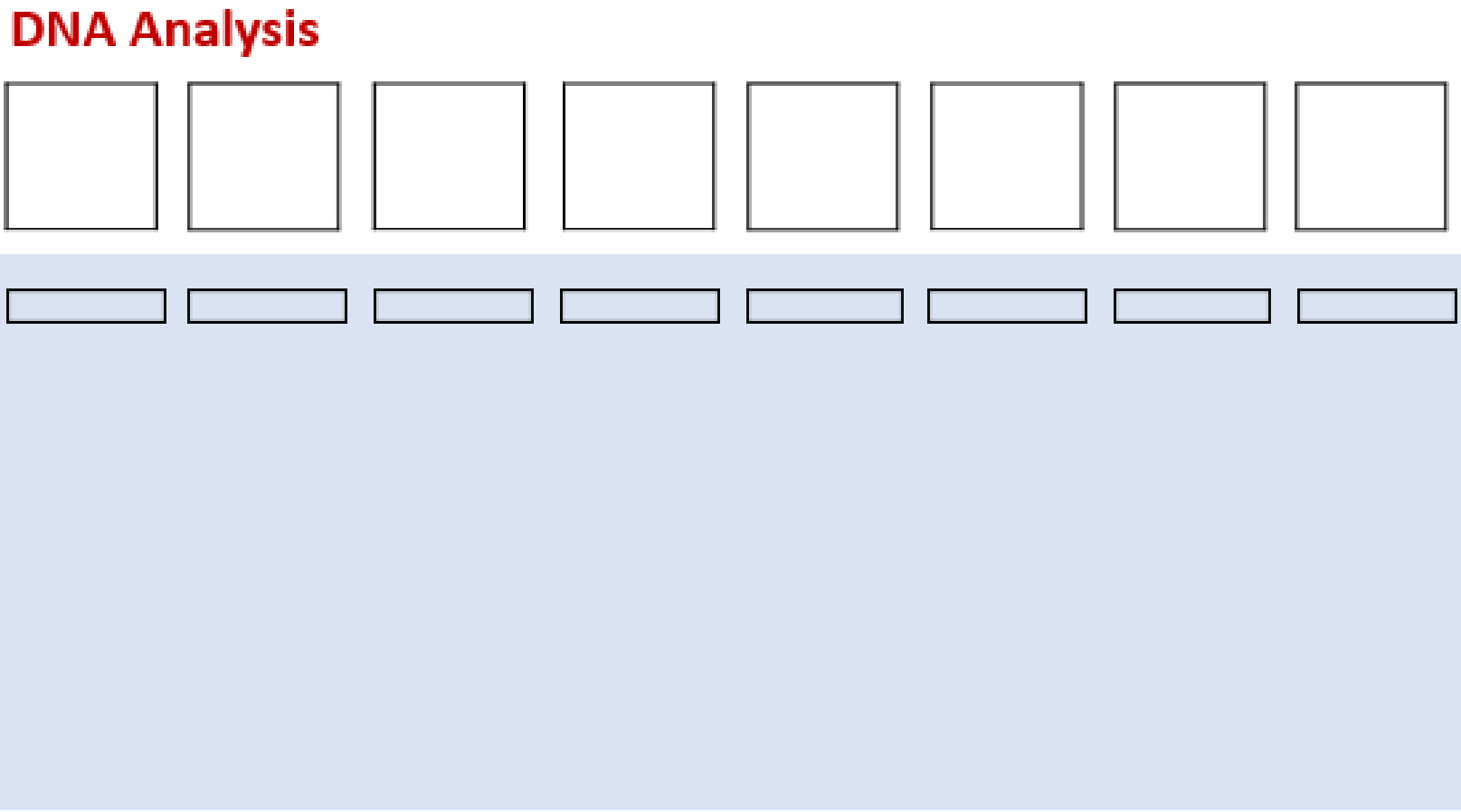
Have a go!

Load 10µl practice dye (tube marked P) to each well.

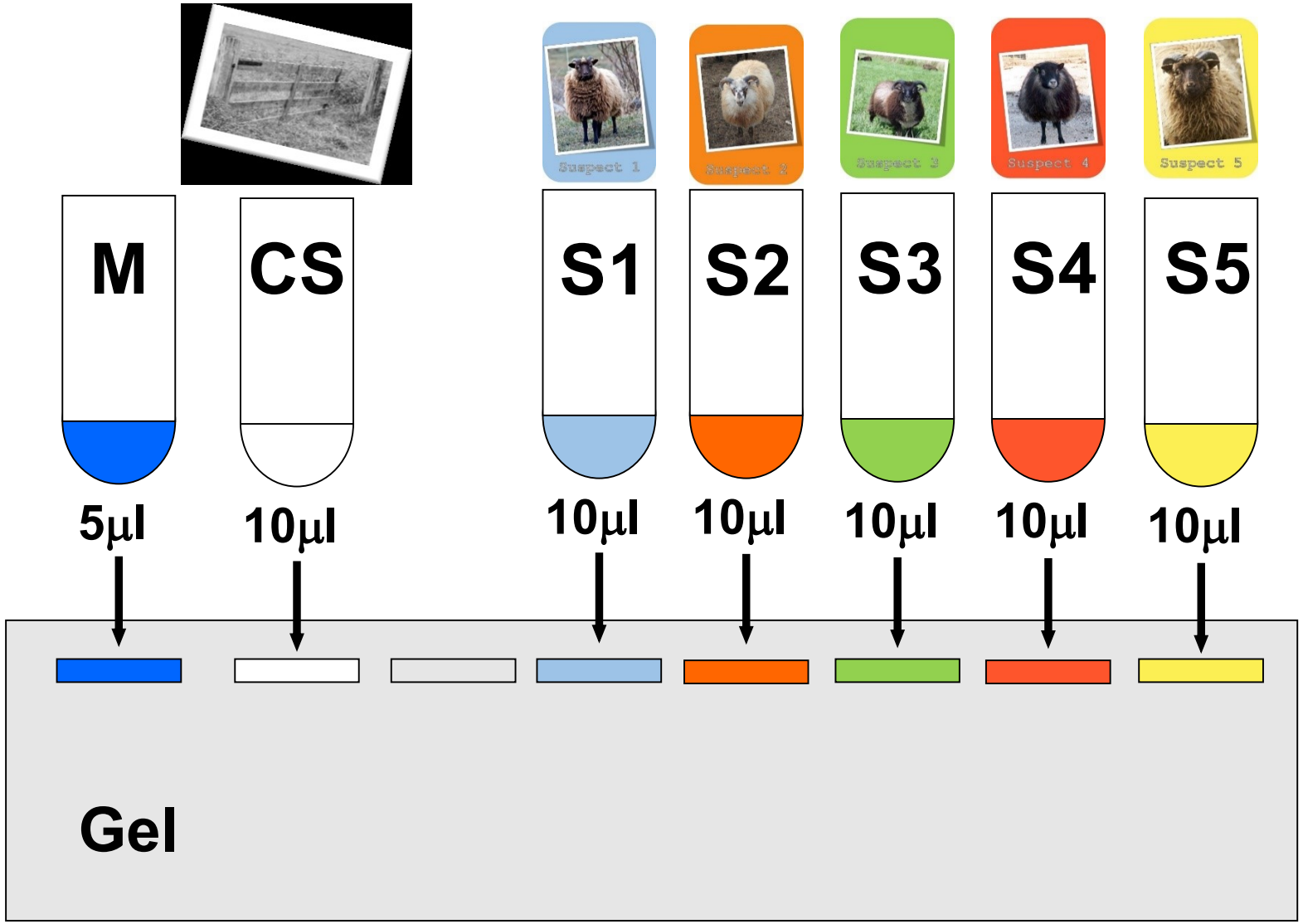


Push down to the 1st stop to fill the well with the DNA

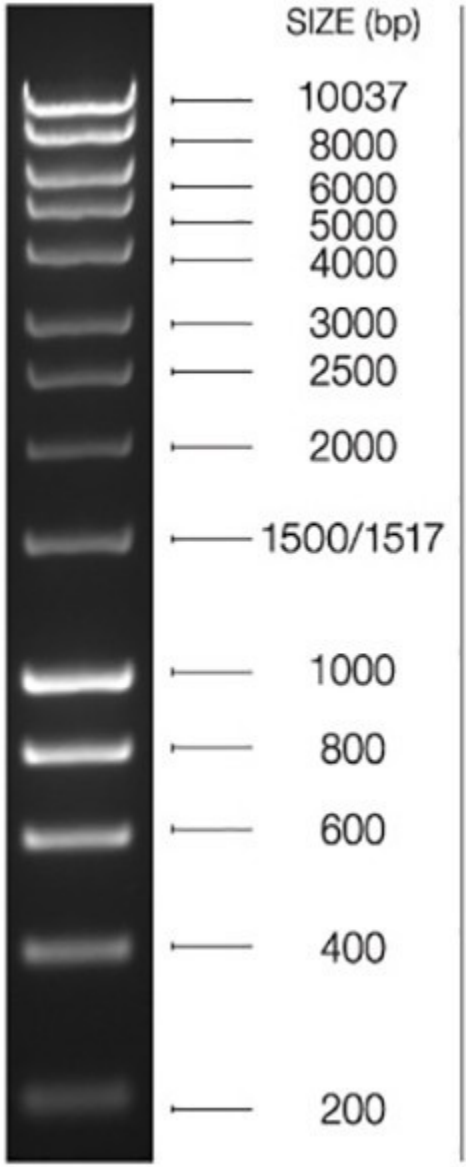
Create a gel loading plan



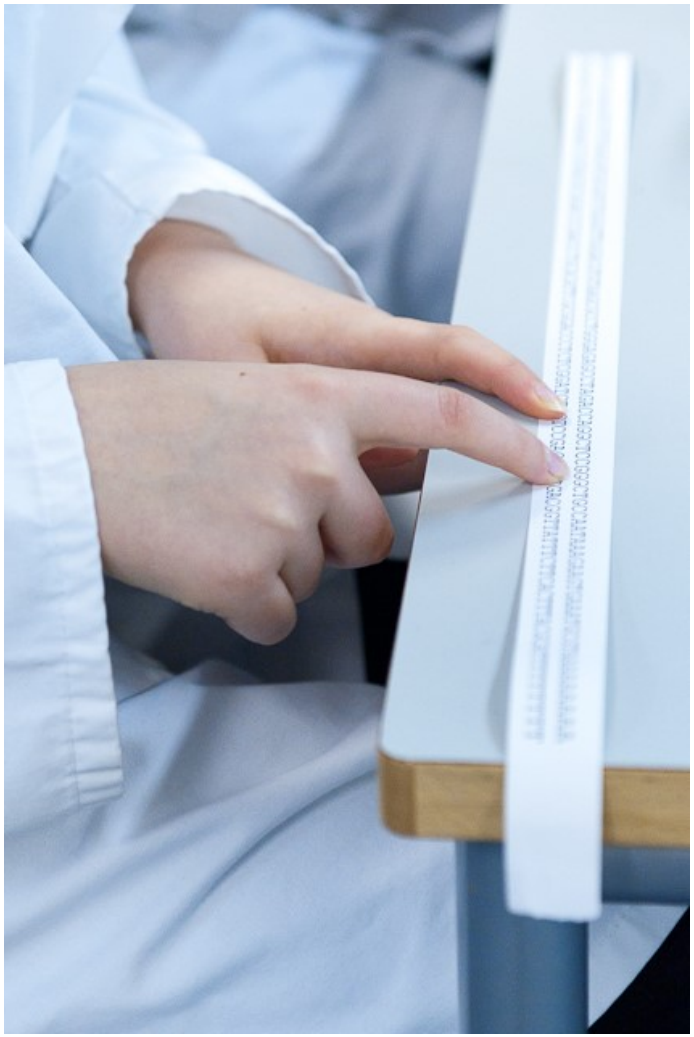
Gel loading plan



The marker is a ruler made of DNA



Group activity



GGCC
CCGG

HaeIII

Short break

Remove your gloves and lab coat if leaving the lab.

Safety check!

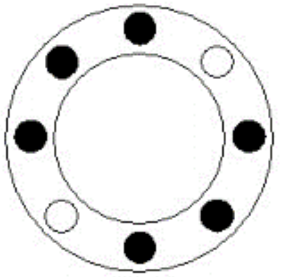
Preparing DNA samples

1. Add 5µl purple loading dye (tube marked LD) to every tube.

Change the pipette tip between each tube

2. Mix by gently flicking the tube with your finger.

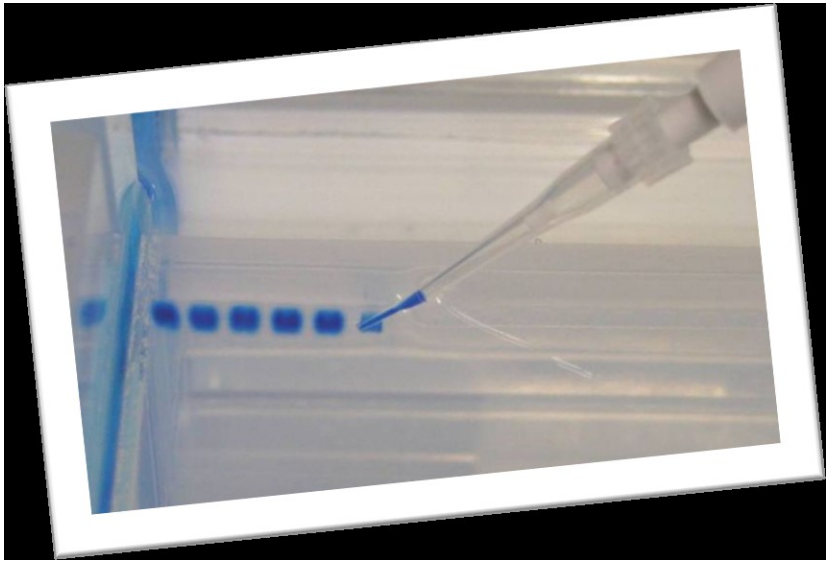
3. Centrifuge samples (make sure the tubes are balanced)



6 Tubes

Loading samples on to gel using your gel loading plan

Science specialists will load the marker

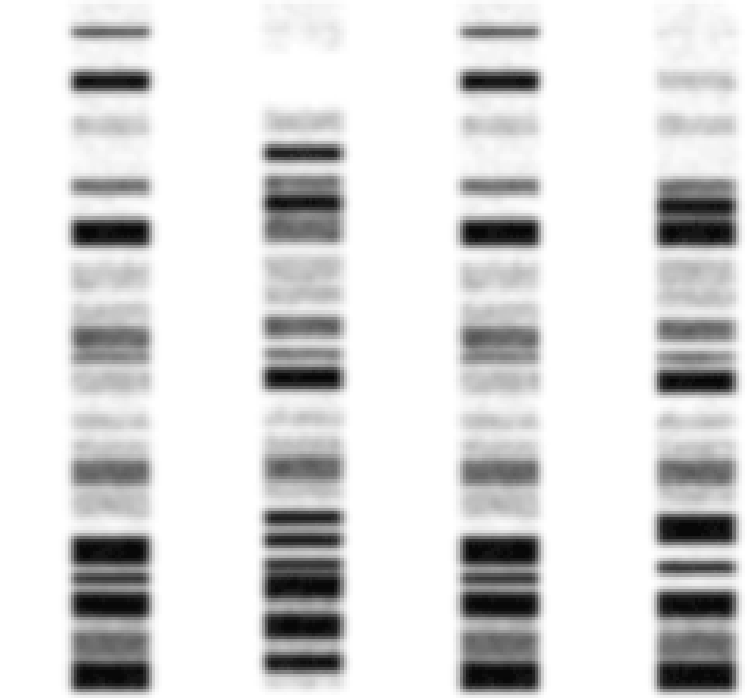


Meet the Scientists

Seeing the DNA

A DNA stain was added to the agarose when the gels were made

Which suspect was at the crime scene?

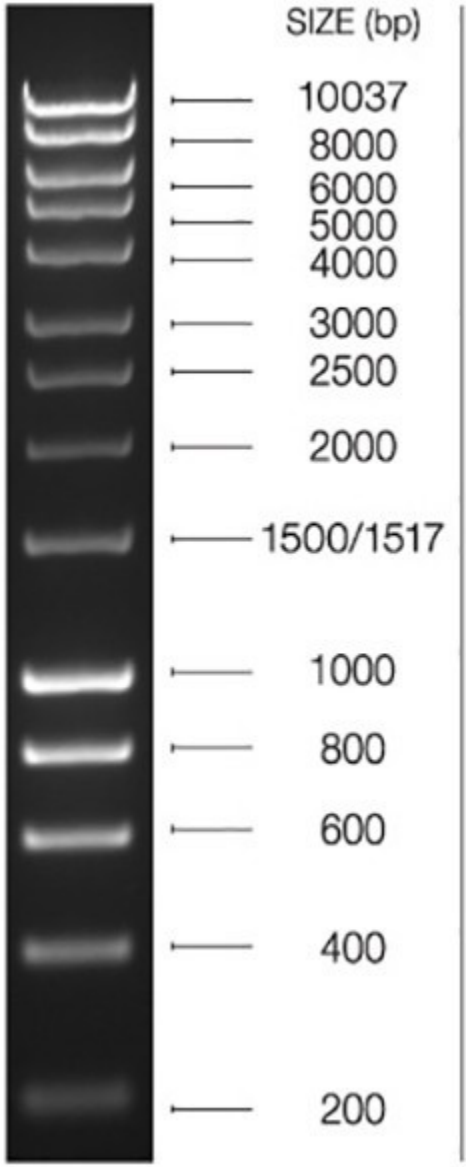


Safety check!

Viewing gels

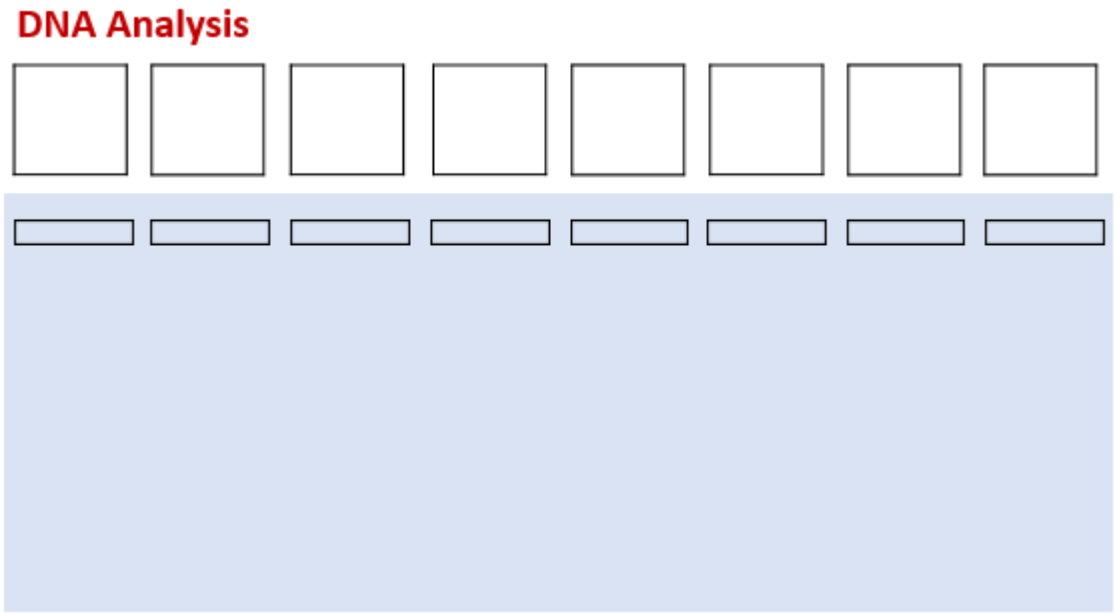
Look for DNA bands an interpret your results

The marker is a ruler made of DNA



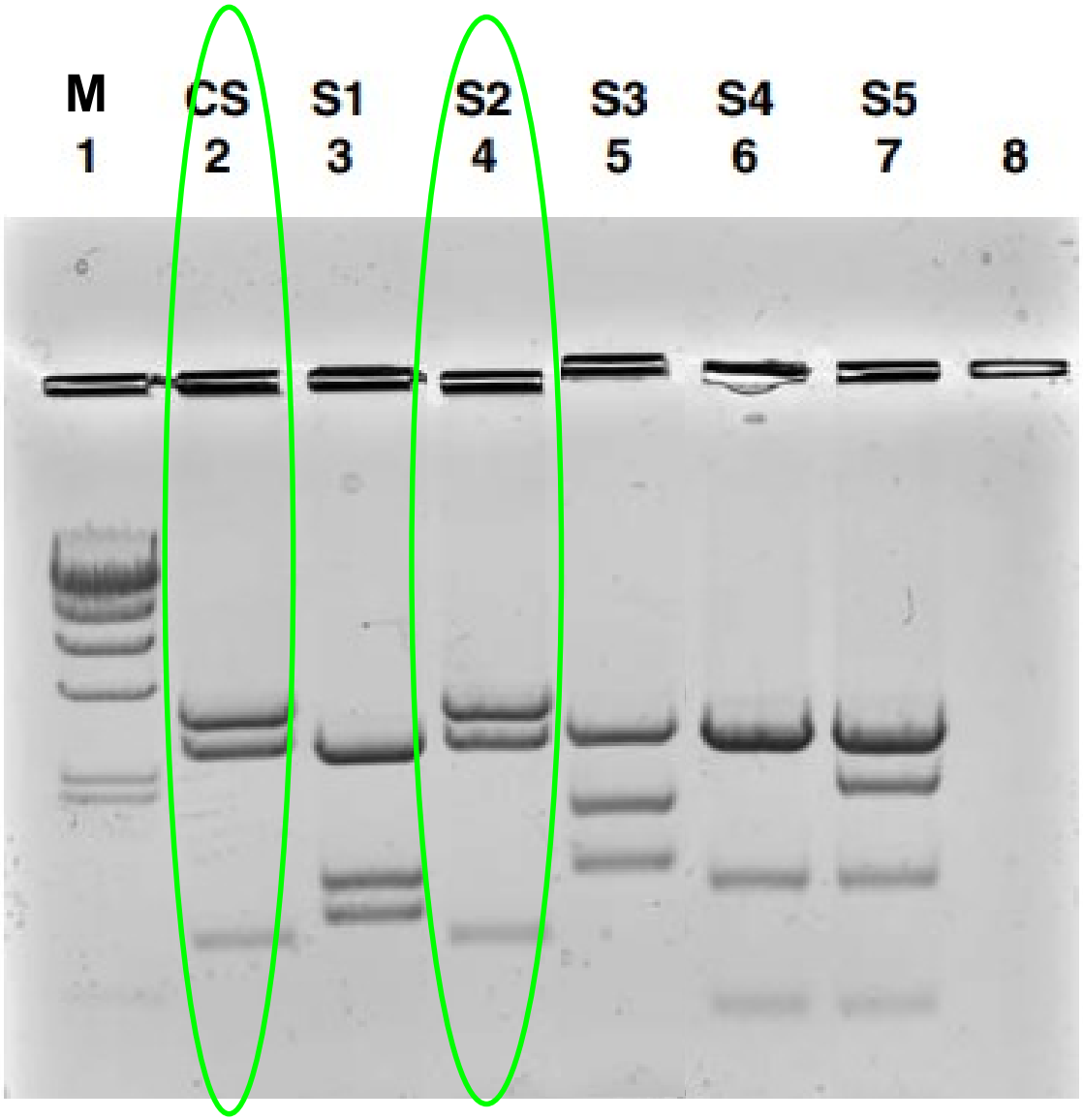
The Great Escape

DNA Analysis



Analyse the DNA profiling pattern. Which suspect matches?

Who is the mischievous sheep?



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So did suspect 2 definitely do it?


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Conclusions…

Being at a scene of a crime does not mean that you (or the sheep) committed it!

Learned behaviour

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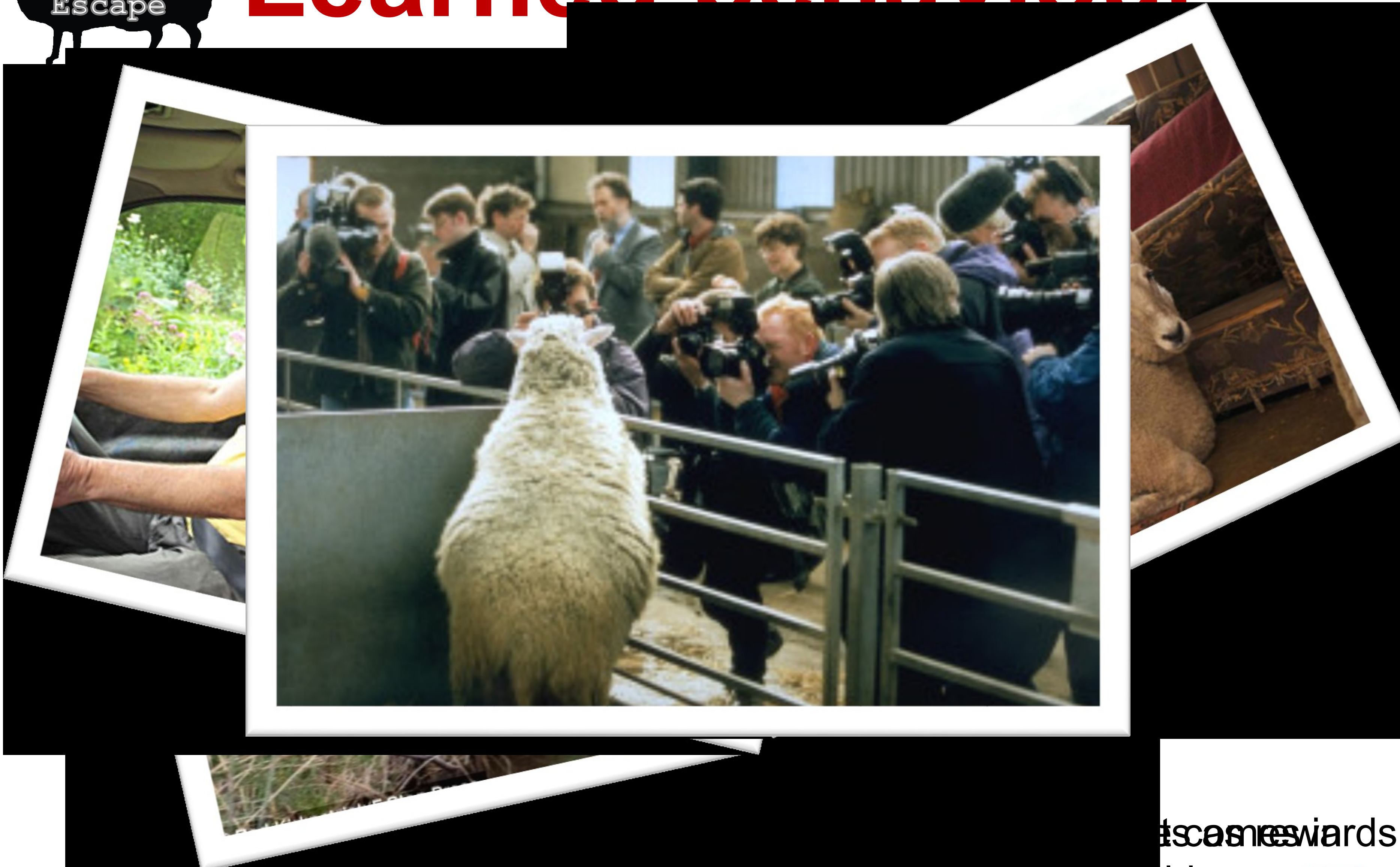
Learned behaviour



tscamesrewards

toegrympsening, head-butts the cushions

settee and watches TV.

The Great Escape

Innate behaviour

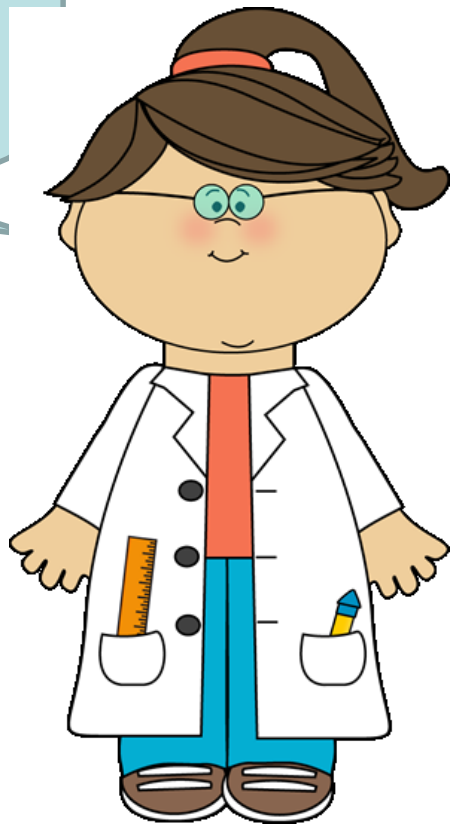
Sheep are able to recognise human faces from photographs

Innate behaviour

Roslin scientists are studying pig DNA to find out why some pigs are aggressive.

Get hands-on with real-life science

Please write down three words on our wall that describe your experience today!



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Fun

Boring

Informative

Inspiring

Rewarding

Uninteresting

Interesting

Confusing

Enjoyable

Difficult

Thought-provoking

Frustrating

Dull

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LUNCH

Remove your gloves and lab coat if leaving the lab.