

# INVESTIGATING MEAT

## Investigation 1

### Aim

Finding out whether a tough cut of meat can be made more tender when mechanical forces are applied.

### Equipment

- Digital scales
- Digital timer / stopwatch
- Red chopping board
- Chef's knife
- Measuring jug
- 4 small saucepans
- Temperature probe and wipes
- Slotted spoon
- Kitchen roll
- 4 sticky labels and marker pen

### Ingredients

- 200g tough cut of lean meat – either beef, pork or lamb. For example, beef brisket, pork collar steak, lamb scrag end.

## Method

Cut the meat into 4 pieces of equal weight. Try to ensure the meat has the same thickness. You will have 4 samples:

- Control – leave as it is.
- **Variation 1** – on a red chopping board, tenderise the meat by beating it well with a meat tenderiser (a rolling pin will also be suitable for this task).
- **Variation 2** – on a red chopping board, tenderise the meat by scoring the surface of the meat in a criss-cross pattern with a chef's knife.
- **Variation 3** – on a red chopping board, tenderise the meat by cutting the sample into smaller pieces – approximately 8 diced pieces.
- Place each sample of meat in a small saucepan and add approximately 100ml cold water. You may need more water if your saucepans are large
- Leave the meat to soak in the water for 5 minutes.
- After 5 minutes, apply heat and bring the water to 80°C. Then, simmer gently for 15 minutes. **Keep an eye on the water – if it evaporates, top it up using freshly boiled water.**
- Remove the meat and drain on kitchen paper and allow to cool.
- Photograph and examine each sample carefully. Note any visible changes to the fibrous structure of the meat when compared with the control.
- Then, gently pull the muscle fibres from each sample apart in order to determine how easy or difficult the fibres are to separate.
- Finally, taste the meat and compare how tender / chewy each sample is when compared to the control.

## Results

You are now going to compare the degree of tenderness between each of the 4 samples. Create a table to record your results.

Original meat before start of experiment	Image of sample before cooking	Image of sample after cooking	Samples ranked in order of tenderness (1 being least tender, 4 being most tender) BY HANDLING MEAT SAMPLES	Samples ranked in order of tenderness (1 being least tender, 4 being most tender) BY TASTING MEAT SAMPLES
Control			1	1
Variation 1			2	2
Variation 2			3	3
Variation 3			4	4

## Conclusions

Summarise your findings here. You should consider:

- **Control** – the sample that had no mechanical force applied to it was the toughest. This is because the meat fibres were the longest.
- **Variation 1** – the meat ‘bashed’ with a meat tenderiser was the second most tough. It was less tough than the control, as bashing the meat had opened up the meat fibres.
- **Variation 2** – the meat was scored in a criss-cross pattern with a sharp knife – this opened up the meat fibres, and the cutting action made them shorter. I was interested to see if this variation produced a less tough finished sample than Variation 1. I could develop this experiment and combine both these processes, Variation 1 and Variation 2, to see if I could achieve a more tender finished sample of cooked meat.
- **Variation 3** – the meat was cut into much smaller pieces. This meant that the meat fibres had been opened up and made shorter due to the cutting action.
- All meat samples were still quite tough. This is because beef braising steak was used, which comes from a well exercised part of the animal. To make the meat more tender, the meat samples would need to be cooked in water for longer (approximately 1 hour) and you could experiment with additional ingredients to see if this would also affect the degree of toughness / tenderness, for example acid such as lemon juice, tomatoes, vinegar.
- You could see why chefs add other ingredients to both tenderise and flavour casseroles which use the tougher cuts of meat. Examples of popular ingredients used for meat tenderising include wine and beer, and acidic fruits such as tomatoes, apples, pears, apricots.

## Extension task

Investigate the Maillard reaction. Create an experiment that demonstrates how the colour of meat changes due to cooking.

Develop this experiment using different cuts of meat, in order to determine how tender / tough the cuts of meat are.