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# Preserving and preventing waste

## AUSTRALIAN CURRICULUM CONTENT



Analyse and make judgements on how the sensory and functional properties of food influence the design and preparation of sustainable food solutions for healthy eating. (ACTDEK045, AC9TDE10K05)

Analyse needs or opportunities for designing; develop design briefs; and investigate, analyse and select materials, systems, components, tools and equipment to create designed solutions. (ACTDEP048, AC9TDE10P01)

## LESSON OBJECTIVE

Students will explore how red meat can be preserved and investigate how food spoilage can be addressed in the industry.



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## Lesson 5

### LESSON OVERVIEW

<b>Activity 5.1</b>	Historical meat preservation techniques	25 mins
<b>Activity 5.2</b>	Red meat preservation and its relationship to the production chain	25 mins
<b>Activity 5.3</b>	Storage life of chilled red meat	15 mins
<b>Activity 5.4</b>	<a href="#">Online learning task: Reducing waste – nose-to-tail eating</a>	10 mins

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## Lesson 5

### Resources and equipment

#### ACTIVITY 5.1 – Historical meat preservation techniques

1. Computer/digital device access or printed copy of pages 1–4 [Shelf life of Australian red meat](#).
2. Worksheet 5.1a – *Australian history of meat and its preservation*.
3. Pens, pencils, markers.
4. Scissors.
5. Masking tape or string and pegs.

#### ACTIVITY 5.2 – Red meat preservation and its relationship to the production chain

1. Worksheet 5.2a – *Red meat preservation and its relationship to the production chain*.
2. Pens, pencils, highlighter.
3. [High Pressure Processing and Australian Red Meat | Innovation](#) (4.19).

#### ACTIVITY 5.3 – Storage life of chilled red meat

1. Worksheet 5.3a – *Storage life of chilled red meat*.
2. Graph paper or computer access with spreadsheet capability.
3. Lead pencils.

#### ACTIVITY 5.4 – Online learning task: Reducing waste - nose-to-tail eating

1. Computer/digital device access of [Lesson 5 Online learning task](#).
2. [Naturally Falling For You](#) (5.42).

#### ADDITIONAL READING/RESOURCES

- [Red meat is all natural](#).
- [Better with Age](#) (2.36).
- [Spotlight On: Retired Dairy Beef](#) (2.11).



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## Lesson 5

### Lesson guide

#### ACTIVITY 5.1 – Historical meat preservation techniques

- a. Facilitate a discussion about the preservation of food and record ideas in a central area.
  - What type of foods do we preserve?
  - Why do we preserve food?
  - How long have people been preserving food?
- b. Allocate students into six groups and nominate each group a section from the History pages [Shelf life of Australian red meat](#) on pages 1-4 of the document.
  - 1.1.2 The first fleet
  - 1.1.3 Immediately after colonisation
  - 1.1.4 The first exports
  - 1.1.5 Meat canning
  - 1.1.6 Refrigeration – new export opportunities
  - 1.1.7 The chilled meat trade
- c. Groups access and read the allocated section of [Shelf life of Australian red meat](#) on pages 1–4, discussing in collaboration what the most important points are in the source.
- d. Students complete Worksheet 5.1a – *Australian history of meat and its preservation* by summarising the date range they have been allocated and providing a summary of the main points. (Answers page 13)
- e. Prepare the timeline, place a piece of masking tape approximately 3-5 metres in length on the floor to create a timeline. Alternatively, use string to create an above ground timeline with pegs to attach students' work. Work with students to create an approximated scale for the timeline.
- f. Students place their completed worksheet on the timeline in date order and roughly to scale in terms of dates from 1788 to present.
- g. Students stand at their group's historical time on the timeline in date order and present their dates and main points to the class.
- h. At the conclusion of the presentation, allow time for students to create a copy/take a photo of the timeline.

*Lesson guide continued next page*



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## Lesson 5

### Lesson guide *continued*

#### **ACTIVITY 5.2** – Red meat preservation and its relationship to the production chain

- a. Revise the preserving methods from the timeline activity (salting, canning, refrigeration and modified atmosphere transportation). Facilitate a discussion about some other methods of flavouring and preserving meat, including: smoking, drying, the role of packaging (vacuum packing, modified atmosphere packaging) and some more recent innovations, including high pressure processing.

*NB: more recent technological innovations in packaging are investigated in Lesson 6 – Emerging production technologies.*

- b. As a class, view the video clip [High Pressure Processing and Australian Red Meat Innovation](#) (4.19).
- c. Using content from the clip, students complete Worksheet 5.2a – *Red meat preservation and its relationship to the production chain*. (Answers page 14)

#### **ACTIVITY 5.3** – Storage life of chilled red meat

- a. Observe the data on Worksheet 5.3a – *Storage life of chilled red meat*. Using this data, students create a graph to show how the storage life of beef, lamb & mutton and offal is related to the different methods of preservation (in air, vacuum packaged and CO<sub>2</sub> gas flushed). Graph paper or a computer program may be used to graph the data. (Answers page 15)

#### **ACTIVITY 5.4** – Online learning task: Reducing waste – nose-to-tail eating

- a. Students access Online learning task 5 and complete the provided activities focused on reducing waste and nose-to-tail eating. (Answers page 16)



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## Lesson 5

### Student resources

#### ACTIVITY 5.1 – Historical meat preservation techniques

Worksheet 5.1a

[Australian history of meat and its preservation](#)

#### ACTIVITY 5.2 – Red meat preservation and its relationship to the production chain

Worksheet 5.2a

[Red meat preservation and its relationship to the production chain](#)

#### ACTIVITY 5.3 – Storage life of chilled red meat

Worksheet 5.3a

[Storage life of chilled red meat](#)

#### ACTIVITY 5.4 – Online learning task: Reducing waste – nose-to-tail eating

Lesson 5

Online learning task

[Reducing waste – nose-to-tail eating](#)



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9-10 | WORKSHEETS

## Worksheet 5.1a

# Australian history of meat and its preservation



**Date or date range:**

**Main points:**



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## Worksheet 5.2a

# Red meat preservation and its relationship to the production chain

Preserving food is extending its shelf life by reducing or eliminating the growth of certain microorganisms, which would make food spoil or 'go off' and render it unfit for human consumption.

Preserving red meat is achieved by creating unfavourable environments for microorganisms to grow and depends on the processes applied and temperature control along the meat supply chain.

a. Define the term 'shelf life'?

b. Identify 3 safety risks to consumers if meat isn't preserved correctly?

In Australia, red meat is preserved by a combination of processing, packaging, labelling and correct storage to obtain the maximum shelf life - without creating a food safety risk to consumers.

Observe the red meat production chain and complete the following:

c. Highlight where in the production chain you think **preserving** meat is an important consideration.

*Worksheet 5.2a continued next page*





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# Worksheet 5.2a

Worksheet 5.2a continued

- d. Identify the method or methods of preservation at each highlighted step along the chain. You can choose these from the definitions provided.

Red meat production chain	Preserving method(s)
farm	
transport	
saleyards	
transport	
abattoir	
processing	
grading of carcase	
cutting (primal and sub-primal)	
packaging	
end supply	

Worksheet 5.2a continued next page



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## Definitions of red meat preservation methods

<b>Canning</b>	Involves sealing meat in a metal can and heating it to destroy all microorganisms. This gives the meat a very long shelf life without refrigeration.
<b>Drying/dehydration</b>	Removing water from meat by drying or dehydrating removes the water soluble nutrients that microorganisms need to survive. Without these nutrients, they can not survive.
<b>Smoking</b>	Smoking adds flavour, and the chemicals in smoke can preserve meat to give it a longer shelf life. Refrigeration is still required.
<b>Curing or salting</b>	Salt removes water from meat so that it is resistant to the growth of microorganisms.
<b>Chilling/refrigeration</b>	Is the most widely used method of preservation for short term storage of meat, as chilling/refrigeration slows the growth of microorganisms as they can't grow and reproduce optimally at 2-4°C.
<b>Freezing</b>	Is an ideal method of keeping the original nutrient content of fresh meat. Freezing converts most water contained in the meat into ice meaning that the microorganisms are prevented from growing and reproducing.
<b>Thermal processing</b>	Is using heat to kill microorganisms.
<b>Irradiation</b>	Electromagnetic radiation such as gamma rays and UV rays can destroy microorganisms by destroying their DNA molecules. The benefit of this is they have no effect on the food after the process and the meat is not heated during the process.
<b>Vacuum packaging (cryovac)</b>	Is sucking the air out of food packaging. By greatly reducing the amount of air and oxygen around the meat, pathogenic and food spoilage microorganisms are not able to grow and reproduce, so that meat can be kept fresher for longer. Cryovac is the brand name of a type of vacuum packaging technology that allows fresh goods to be kept fresher for longer.
<b>High pressure processing</b>	High pressure compresses the microorganisms and damages them so that they can not grow and reproduce. This process can also be used to make meat more tender.
<b>Modified atmosphere packaging</b>	Involves the injection of a specific mix of gases such as CO <sub>2</sub> into a package which has been selected to help maintain the desired atmosphere to prevent the growth and reproduction of microorganisms.



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## Worksheet 5.3a

# Storage life of chilled red meat

Observe the table below.

### Practical storage life of chilled meat

Product	Storage life
<b>Carcases/quarters etc. in air (0°C to 2°C)</b>	
• Beef (stockinette)	3-4 weeks
• Beef (overwrapped)	12 days
• Lamb & mutton	10-13 days
• Offals	7 days
<b>Primal cuts – vacuum packed (0°C)</b>	
• Beef	20 weeks
• Lamb & mutton	12 weeks
• Beef & lamb offal	3-4 weeks
<b>CO<sub>2</sub> (100%) gas flushed (0°C)</b>	
• Lamb & mutton carcasses and cuts	Up to 16 weeks



(Shelf life of Australian red meat, 2nd edition, Meat & Livestock Australia).

- a. Using graph paper or a computer, plot a bar graph/histogram using the data from the table: Practical storage life of chilled meat. Graphs should show how the storage life of beef, lamb & mutton and offal is related to the different methods of preservation (in air, vacuum packed and CO<sub>2</sub> gas flushed).

Include the following for your graph

- title
- label both axes, including units
- use a key

*Worksheet 5.3a continued next page*



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## Worksheet 5.3a

Worksheet 5.3a continued

**b.** Identify the type of meat that has the longest storage time.

--

**c.** Identify the type of packaging that is the best at preserving:

<ul style="list-style-type: none"><li>• Beef</li></ul>	
<ul style="list-style-type: none"><li>• Lamb and mutton</li></ul>	
<ul style="list-style-type: none"><li>• Offal</li></ul>	

**d.** Describe one interesting fact about packaging that your graph shows:

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## Activity 5.1

# Historical meat preservation techniques

### Worksheet 5.1a – Australian history of meat and its preservation

Group/section of text	Dates	Main points
The First Fleet	1788	<ul style="list-style-type: none"><li>7 cattle, 44 sheep, 19 goats, 32 pigs &amp; poultry introduced to Australia.</li></ul>
Immediately after colonisation	1788–1812	<ul style="list-style-type: none"><li>Cattle numbers are low.</li><li>Freshly killed game was the main meat consumed.</li><li><b>Salted</b> pork is also consumed.</li></ul>
The first exports	1813–1830	<ul style="list-style-type: none"><li>Oversupply of meat.</li><li>Export trade established with Britain and Mauritius.</li><li>Meat <b>salted/brined</b>.</li><li>Sheep boiling to produce tallow.</li></ul>
Meat canning	1810 onwards	<ul style="list-style-type: none"><li><b>Canning</b> developed. Main method of preserving meat for two decades.</li></ul>
Refrigeration – new export opportunities	1860s 1873–now	<ul style="list-style-type: none"><li>Mechanical <b>refrigeration</b> revolutionised preserving meat.</li><li>Exporting frozen meat dominated until the middle of the 20th century.</li></ul>
The chilled meat trade	Early 1900s	<ul style="list-style-type: none"><li>Australia’s distance to overseas markets was problematic.</li><li>Chilled meat transported in a <b>carbon dioxide (CO<sub>2</sub>) environment</b> greatly improved shelf life.</li></ul>



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## Activity 5.2

# Red meat preservation and its relationship to the production chain

### Worksheet 5.2a – Red meat preservation and its relationship to the production chain

- a. The term ‘shelf life’ is the period during which the food product is still fit for human consumption/ able to be safely eaten.
- b. Some of the food safety risks to consumers if meat isn’t preserved correctly could be that the meat might contain harmful bacteria, including salmonella, listeria, campylobacter and *E. coli*, which can cause food poisoning.

d.

Red meat production chain	Preserving method(s)
farm	
↓	
transport	
↓	
saleyards	
↓	
transport	
↓	
abattoir	Refrigeration
↓	
processing	Refrigeration, drying, smoking, canning, freezing
↓	
grading of carcase	Refrigeration
↓	
cutting (primal and sub-primal)	Refrigeration
↓	
packaging	Refrigeration, canning, vacuum packaging (cryovac), freezing, packing in CO <sub>2</sub> atmosphere
↓	
end supply	Refrigeration, freezing



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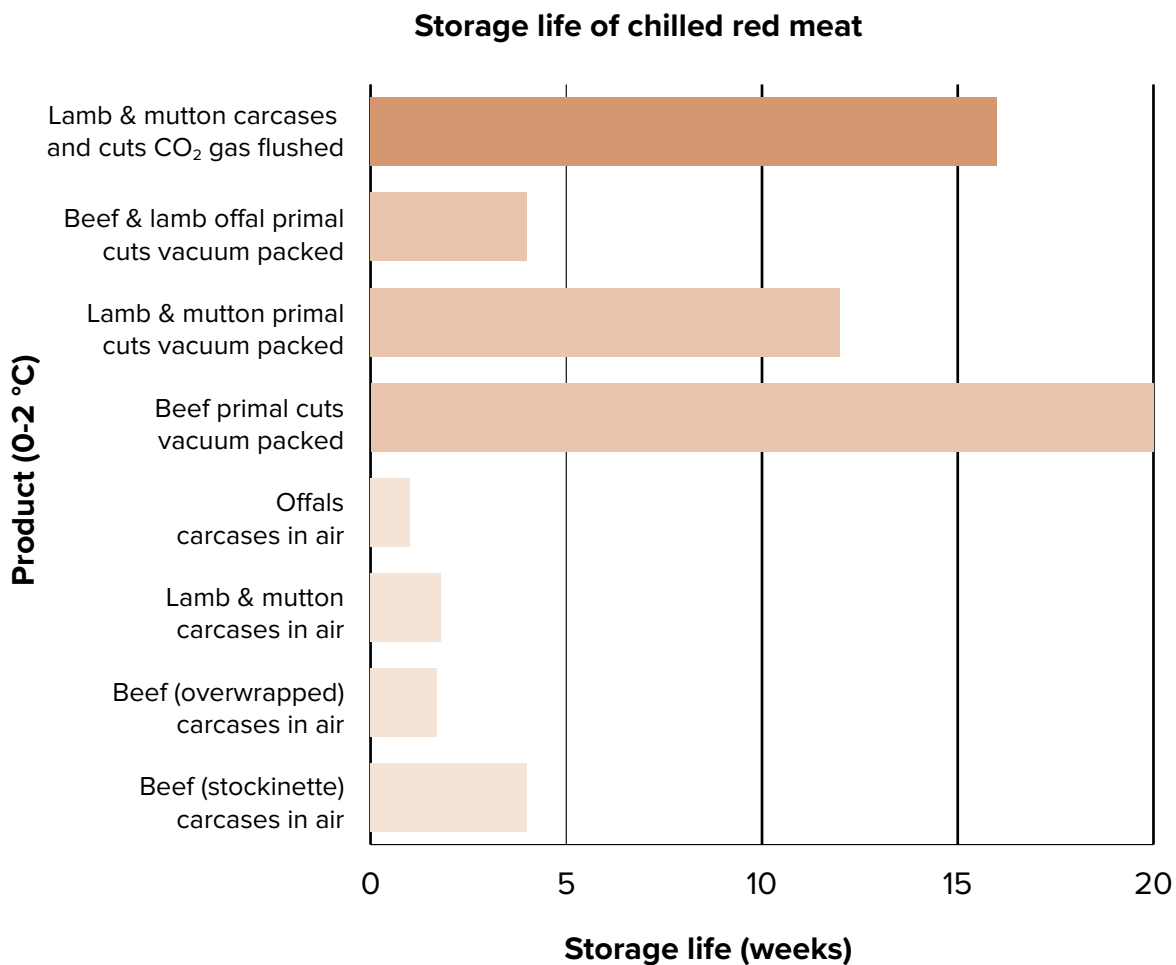


## Activity 5.3

# Storage life of chilled red meat

### Worksheet 5.3a – Storage life of chilled red meat

a. Various ways of representing data.



b. Beef primal cuts vacuum packed has the longest storage time of chilled meat.

c. The type of packaging that is the best at preserving:

- Beef : primal cuts vacuum packed.
- Lamb & mutton : CO<sub>2</sub> gas flushed.
- Offal - vacuum packed.

d. Various answers.



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9-10 | ANSWERS

## Activity 5.4

# Online learning task: Reducing waste – nose-to-tail eating

1. Answers may include: composting; considered purchasing; meal planning; not ordering too much food in a restaurant; growing your own vegetables; using leftovers; correct storage of food; understanding best before dates; nose-to-tail eating, etc.
3. Bones for stock: offal (liver) for beef pate; salami; pastrami; more sinewy cuts used in Malaysian curries and stews.
4. Buying the whole animal at price per kilogram means that they are able to save on purchasing costs; can pass savings onto the customer in restaurant; more red meat is able to be offered on the menu; difficult cuts to source can be used, e.g. beef neck; new chefs/employees desire to work at the hotel as they are keen to learn new methods of cooking and gain butchery skills, etc. Also it is more sustainable and customers are drawn in by the benefits to the environment to the hotel and restaurants to try new meals.
5. Producers benefit by getting a good price for their animals, processors have to deal with less waste as the whole carcass is sold.