GYMPIE SHOW

Celebrating our community

14th,15th & 16th May 2026

AGRICULTURAL EDUCATION

Secondary School Information Pack.

'Theme – From Paddock to Pavilion – Journey of the sheep'

SHEEP IN STEM

DOLLY THE SHEEP - WHO WAS DOLLY THE SHEEP?

Dolly the sheep (1996–2003) was the first mammal ever cloned from an adult somatic cell—a fully differentiated body cell. She was created at the Roslin Institute in Scotland and her birth proved something scientists were not sure was possible: that a specialised adult cell can be "reprogrammed" back into an embryonic state to create a whole new organism.

Dolly proved that adult cells can be reprogrammed to create new life, sparking major advances in cloning, stem cell research, regenerative medicine, and genetic engineering that continue shaping science today.

HOW SHE WAS CREATED

The technique used was Somatic Cell Nuclear Transfer (SCNT):

1. Scientists took the nucleus from an adult udder cell of a Finn Dorset sheep.
2. They inserted this nucleus into an egg cell from a Scottish Blackface sheep that had its own nucleus removed.
3. This reconstructed egg began dividing and was implanted into a surrogate ewe.
4. Dolly was born on 5 July 1996 and was genetically identical to the Finn Dorset sheep that donated the adult cell.

WHY DOLLY WAS GROUNDBREAKING

1. Proved that adult cells can be reprogrammed

Before Dolly, scientists believed only embryonic cells were flexible enough to create a whole animal. Dolly showed that an adult cell could be reset, which reshaped thinking in developmental biology.

2. Opened the door to modern stem cell science

The concept of "reprogramming" adult cells eventually contributed to the development of induced pluripotent stem cells (iPSCs)—adult cells turned back into embryonic-like cells without creating an embryo. This discovery (by Shinya Yamanaka in 2006) earned a Nobel Prize and has driven much of modern regenerative medicine.

3. Advanced animal breeding and conservation

Cloning became a tool for:

- Preserving endangered species
- Replicating elite livestock with desirable traits
- Creating genetically uniform animals for research

4. Improved understanding of ageing and genetics

Because Dolly was cloned from a six-year-old sheep, researchers observed:

- She had shorter telomeres (the "age markers" on chromosomes)
- She developed arthritis and a progressive lung disease

This sparked debates and research into whether clones age faster or differently. (Later studies on other cloned sheep showed they do not age abnormally.)

5. Laid the foundation for genetic modification in livestock

Cloning made it easier to produce animals with targeted gene edits for:

- Biomedical research
- Pharmaceutical protein production ("pharming")
- Disease-resistant livestock

HOW SHEEP CLONING INFLUENCED SCIENCE TODAY

Medicine and Regenerative Biology

- Enabled research into cell development, tissue repair, and organ regeneration
- Laid groundwork for stem-cell therapies now being trialled for diabetes, spinal injuries, and blindness

Genetic Engineering

- SCNT is still used to create animals with specific genetic changes
- Supports the production of human-compatible organs in animals (xenotransplantation research)

Agriculture

- Allows creation of disease-resistant and high-performance livestock lines
- Helps preserve rare or heritage breeds through cloning of valuable individuals

Conservation Biology

- Assists efforts to revive endangered species (e.g., black-footed ferret, Przewalski's horse)

Why are sheep used in medical & scientific research (2mins)

https://why are sheep used in medical & scientific research you tube link

SHEEP IN MEDICINE

(Following are only some examples of Sheep in medicine and not an exhaustive list).

Box Jelly Fish Antivenom

Link to Box Jelly Fish Antivenom product information

https:/Product information box jellyfish antivenom

http://www.toxinology.com/generic_static_files/cslavh_antivenom_boxjelly.html

Classroom Conversation

How does the sheep contribute to the production of the Box Jellyfish Antivenom?

LANOLIN IN MEDICINE

Lanolin is a natural emollient derived from sheep's wool, commonly used in medications and skin care products to so othe and protect the skin.

Link to Lanolin information

https://www.medicinenet.com/lanolin/article.htm

https://www.webmd.com/drugs/2/drug-8944/lanolin-topical/details

https://www.webmd.com/drugs/2/drug-8944/lanolin-topical/details

Classroom Conversation

What is the benefit of using lanolin? Why?

MEDICAL GRADE SHEEPSKINS

Sheepskins are widely used in medicine for their unique properties that enhance patient care.

Link to medical grade sheepskins information

https://wp.csiro.au/cef/files/2024/02/Medical-Sheepskins.pdf

https://medicalsheepskins.com.au/sheepskin-for-hospital-use-benefits-in-healthcare/

Classroom Conversation

What is the benefit of using sheepskin in patient care? Why?

FROM SHEEP TO WOOL: PRODUCTION PROCESS IN AUSTRALIA

Australia is one of the world's leading wool producers, known especially for high-quality Merino wool. The process of transforming raw wool from the farm into finished textile products involves biological, chemical, and mechanical steps.

This process—from flock management to textile manufacture—shows how biology, technology, and market forces shape Australia's wool industry.

1. Sheep Production and Flock Management

Farmers select sheep breeds suited to their environment and production goals, with Merinos being the dominant wool breed. Management practices include nutrition planning, pasture rotation, parasite control, breeding programs, and regular health checks. Good management directly affects fibre diameter, staple strength, and overall fleece quality.

Meet a Woolgrower

https://www.youtube.com/watch?v=hKmf_HbOxUs

Classroom Conversation

Where is wool production mainly located in Queensland? Why?

2. Wool Growth and Fibre Characteristics

Wool grows continuously from follicles in the sheep's skin. Fibre characteristics such as diameter (microns), crimp, staple length, colour, and strength determine the wool's value and end use. Environmental conditions, genetics, and nutrition all influence fibre development.

Classroom Conversation

How does nutrition influence wool growth and quality?

3. Shearing

Shearing occurs once a year, typically in late spring or early summer to protect sheep from cold stress. Professional shearers remove the fleece in one piece using mechanical handpieces. Animal welfare, stress minimisation, and safe shed operations are priorities throughout the shearing process.

Shearing (9 mins)

https://www.youtube.com/watch?v=AOJViElDUSk

4. Shed Preparation: Skirting, Classing, and Baling

After shearing, the fleece is thrown onto a wool table for skirting—removing stained, short, or coarse sections. A trained wool classer assesses and separates wool into lines based on fibre diameter, yield, colour, strength, length, and style. The wool is then pressed into bales, labelled with bale specifications, and prepared for sale.

5. Marketing and Sale

Wool is sold through auctions, private contracts, or electronic trading platforms. Buyers examine samples to assess quality. Prices depend on global demand, fibre characteristics, and market conditions.

6. Scouring and Early-Stage Processing

Before wool can be processed into yarn, raw wool must be washed (scoured) to remove the bulk of contaminants from the raw fibre including:

- Dirt
- Wool wax
- Salts from suint (sweat)
- Non-wool protein material
- Skin pieces

It is washed in a series of alkaline baths (scouring), then dried. Scouring involves:

- Washing wool in a detergent solution
- Rinsing the fibres
- Drying the clean wool.

After scouring, wool may undergo:

- **Carding: fibres are aligned and cleaned further.** The carding action in woollen carding is similar to worsted carding where the wool is fed into the carding machine where wire-covered rollers separate the fibres, except: mixing of the wool (blending) is encouraged by cross-lapping the sliver formed and re-carding the cross-lapped layer in the second part of the card and at the end of the card, instead of being wound into a can as a single sliver ready for gilling the web is split into narrow strips called 'slubbings', ready for spinning.
- **Combing:** longer fibres are separated from shorter ones to produce top for worsted spinning.
- **Blending**: fibres from different batches are mixed for consistent quality.

7. Spinning, Dyeing, and Fabric Construction

Wool top or carded wool is drawn out and twisted into yarn. Yarn can be dyed at various stages (fibre, yarn, or fabric dyeing). It is then knitted or woven into textiles depending on the required product—light garments, suiting fabrics, carpets, or industrial materials.

Woollen yarns are spun using almost the same principles as the process undertaken for worsted spinning.

The differences are:

- the slubbing's from the woollen card are given only a little stretch before twisting — just enough to maintain cohesion. This contrasts to the 20–30 times stretch used in worsted spinning
- a false twister is often used to give the slubbing strength, so it survives the spinning process.

8. Finishing and Product Manufacture

Finished fabrics undergo treatments such as fulling, shrinking, softening, or anti-pilling processes. The textiles are cut and sewn into garments or manufactured into other wool products. Wool's thermal insulation, elasticity, moisturewicking properties, and biodegradability make it valuable in global markets.

WOOL PRODUCTION IN QUEENSLAND

Wool production is historically and currently located in western Queensland due to a combination of its vast open rangelands suitable for large-scale grazing, a climate well-suited for merino sheep, and the historical development of infrastructure like the Great Artesian Basin water sources and wool processing facilities.

Key factors include:

- Native pastures: The region is characterised by extensive semi-arid rangelands, specifically the Mitchell grass downs, which support large-scale, low-density sheep grazing. This land was historically available for the establishment of massive sheep stations, some running hundreds of thousands of sheep.
- Suitable climate: While frequently dry and prone to drought, the climate in western Queensland is favourable for raising high-quality Merino sheep, which thrive in these conditions. The environment contributes to the specific characteristics of the wool produced in this region, which is typically in the finer 18-20 micron categories.
- Water resources: The discovery and tapping of the Great Artesian Basin provided crucial, reliable water sources to manage the unpredictable climate and frequent droughts, which was a historical turning point for the industry's sustainability. The naturally warm water from the basin also offers significant cost advantages for wool scouring (washing) in local processing facilities, such as the one in Blackall.
- Historical development and infrastructure: Towns like Longreach and Blackall were essentially built on the wool industry, developing infrastructure like shearing sheds, railways for transport, and processing facilities (wool scours). This historical legacy created a skilled workforce and supply chain that supports the industry's continued presence and recent resurgence.
- Modern management: More recently, the construction of predator-proof exclusion fencing has been a major factor in the industry's rebound by significantly reducing stock losses from wild dogs, thereby increasing lambing rates and the economic viability of sheep farming.

HAIR BREEDS VS WOOL BREEDS

	Hair Sheep	Wool Sheep
Fibre Type	• Grow hair, not wool. • Their coat is more like goat hair or coarse animal hair. • They naturally shed their coat each year (no shearing needed).	• Grow wool - a crimped, soft fibre. • Wool keeps growing and must be shorn annually.
Purpose / Production	• Primarily used for meat production. • Wool is usually not valuable or collected.	• Bred for wool production, though most also produce meat. • Breeds like Merino produce high-quality fibre for textiles
Management Needs	• Low maintenance — no shearing, crutching, or mulesing. • Less prone to flystrike because they shed and have cleaner skin. • Suited to hot, humid climates (eg Queensland)	• Require more care: shearing, crutching, and parasite management. • More prone to flystrike due to wool around breech area. • Suited to cooler, temperate climates.
Temperament & Hardiness	• Generally hardy, parasite-resistant. • Good for low-input or extensive grazing systems.	• Often more selective and less hardy, though varies by breed. • Some are highly adapted to harsh climates (eg Merino)
Breeds	• Dorper • Damara • Katahdin • Wiltshire Horn (shedding wool)	• Merino • Corriedale • Border Leicester • Romney

Meat sheep production in Queensland (13 mins)

https://www.youtube.com/watch?v=K5U6gkQlFIk

Online Resources

Good Meat Australia – Free curriculum-aligned school and teaching resources
https://www.goodmeat.com.au/educational-resources/

Meat production – Paddock to Plate card game (MLA)

https://www.goodmeat.com.au/globalassets/good-meat-v2/education-resources/new-resources/primary-school/mla-gme-card-game-5-6-25pp.pdf

Australian Lamb Paddock to Plate Story | 360º video | Use with VR headsets

https://www.youtube.com/watch?v=g_UBlxbA8Ls

A producer's guide to sheep husbandry practices (MLA): https://www.mla.com.au/globalassets/mla-corporate/research-and-development/program-areas/animal-health-welfare-and-biosecurity/mla---a-producers-guide-to-sheep-husbandry-practices_v04.pdf

Australian Wool Innovation - Wool Harvesting Resources Hub - https://www.wool.com/training-extension/wool-harvesting-resources-hub/

An Inside Look at the Australian Wool Supply Chain - https://iwto.org/an-inside-look-at-the-australian-wool-supply-chain/

Trust in Australian Wool - https://trustinaustralianwool.com.au/