



HURLSTONE AGRICULTURAL HIGH SCHOOL

BOVINE REPRODUCTION

AGRICULTURE

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1 Gestation periods

Bovine refers to the cattle family. The gestation period is the time from the fertilisation of the egg to the birth of the offspring. Basically, it is the length of pregnancy (conception to birth). In humans, the gestation period is 9 months.

Species	Gestation period (days)
Cattle (cow)	279-285 (approx 9 months)
Horse (mare)	330-345
Sheep (ewe)	144-151
Goats (doe)	146-155
Pigs (sow)	112-144

2 Heat

'Heat' is the term used to describe when a cow is ready to be mated or is 'oestrus'. The duration of heat is the period when the egg first bursts out of the follicle in the ovary

Signs indicating heat

- Stands to be ridden
- Bellows frequently
- Frequent tail twitching and urination
- Nervousness, restlessness and excitability
- Clear mucous discharge from vulva
- Ruffled hair on pin bones and rump

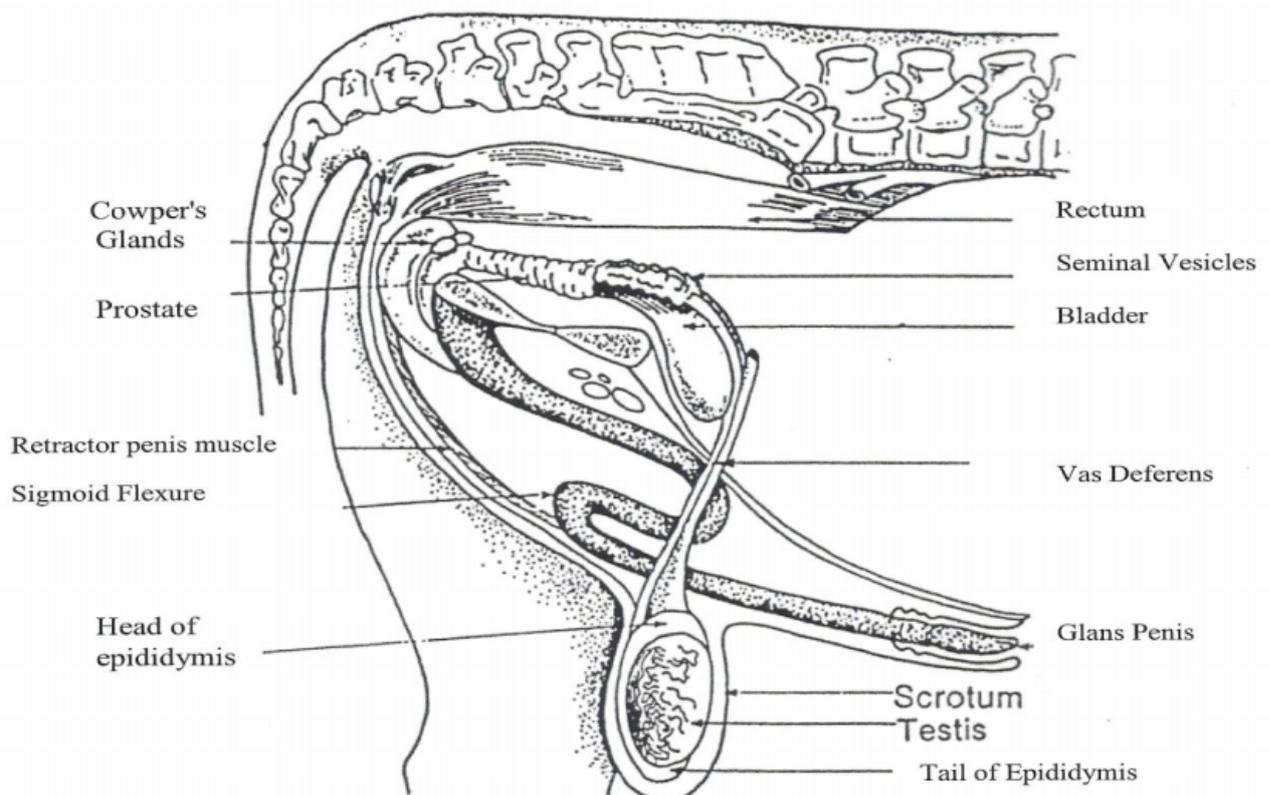
Techniques for heat detection

- **Tail Paint:** Paint is applied in a wide strip that rubs off when mounted by other animals. Colours are normally blue or green.
- **Heat Mount Detectors:** Patches containing a coloured dye are attached to the tail and held by glue. When the cow is ridden (standing heat) the tube is broken, which stains the whole pad. Heat detection is improved by 50% with these detectors, but are expensive.
- **Management Practices:** accurate cow identification, accurate records for calving dates, accurate records of cow oestrus dates, observation of cow heard at least three times a day.
- **Teaser Animals:** Teasers are fitted with a chin ball harness to mark the cows they mount. The chin ball harness, worn under the skin, has a stainless ball with an ink reservoir. The in season female has ink on her from the male resting his chin before and after trying to mate. Animals used for this include vasectomised bulls, pelvis diverted bulls and hormone treated steers.

3 Male reproductive system

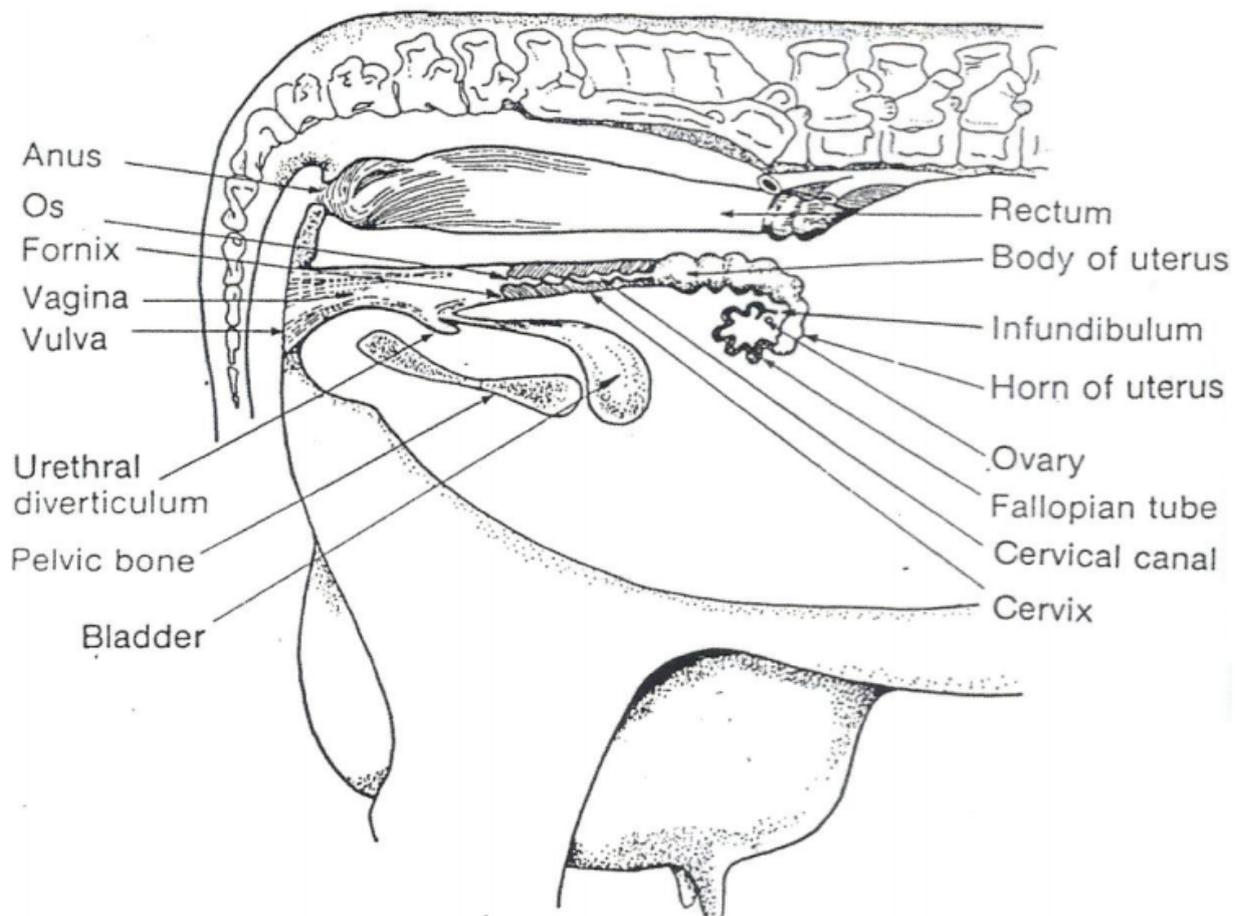
You will be required to both label a diagram, as well as describe the function of various parts of the male and female reproductive system.

Organ	Function
Scrotum	Skin covered pouch that contains, supports and protects the testes. Its main function is to
Testes	Where the bull produces spermatozoa and the male sex hormone, testosterone
Epididymis	Stores and provides nutrition to the sperm until mating
Vas deferens	Transports the sperm from the epididymis to the urethra.
Seminal Vesicles	Secrete a clear fluid into the urethra.
Prostate Gland	Like the seminal vesicles, the prostate gland also secretes a clear fluid called plasma. This plasma activates the semen and nourishes it and provides volume to the sperm.
Sigmoid Flexure	It is a muscle controlling the movement of the penis.
Penis	Deposits semen into the reproductive tract and used to empty the bladder
Urethra	Carries both urine and genital products of the penis

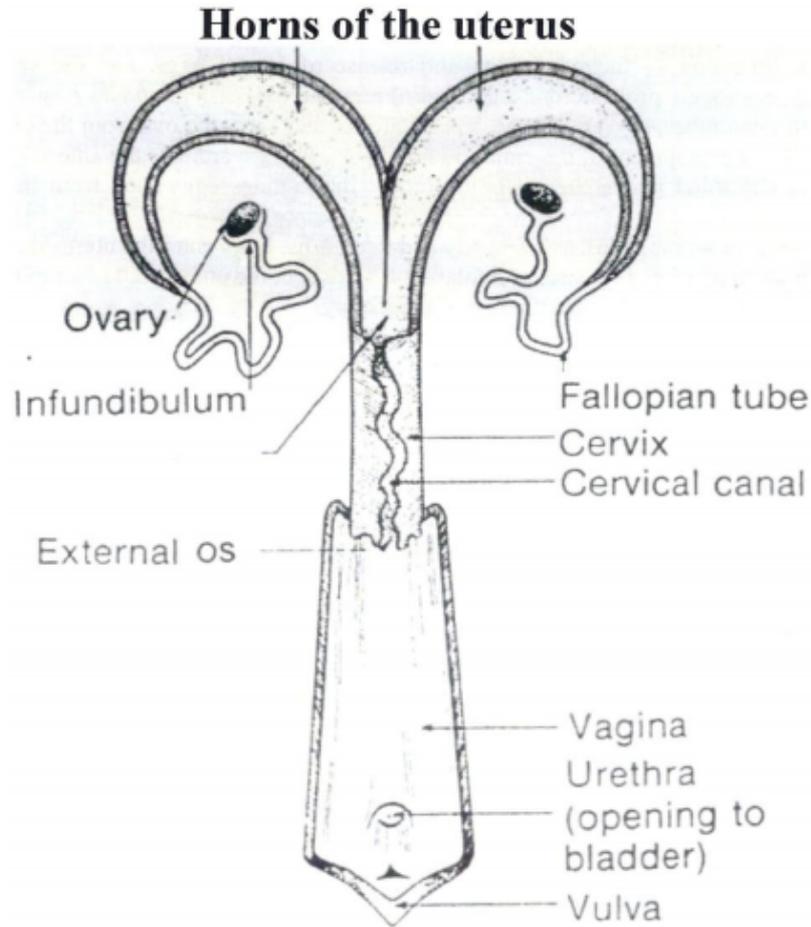


4 Female reproductive system

Organ	Function
Ovaries	There are two ovaries, one each side of the cow's abdomen. The ovaries have three main functions. These are: <ol style="list-style-type: none"> 1. Production of ova (eggs) 2. Production of female sex hormone (Oestrogen) 3. Production of the pregnancy hormone (Progesterone)
Fallopian Tubes	Also known as the <i>oviduct</i> - carries the ova from the ovaries to the uterus
Uterus (Womb)	Where the ova, if fertilised, attach itself to the wall and stays for the duration of the pregnancy. The walls have a rich blood supply to feed the calf all the nourishment need for its development.
Cervix	Muscular tube connecting the uterus to the vagina. When the cow is pregnant, the cervix is sealed to protect the foetus. It also helps to push the calf during birth.
Vagina	It is the connection between the cervix and vulva.
Vulva	The entrance to the female reproductive systems. There are two muscular folds that the cow holds closed for protection but often swell when the cow is in heat.



You may also be taken to the farm classroom where you play around with Breeding Betsy.



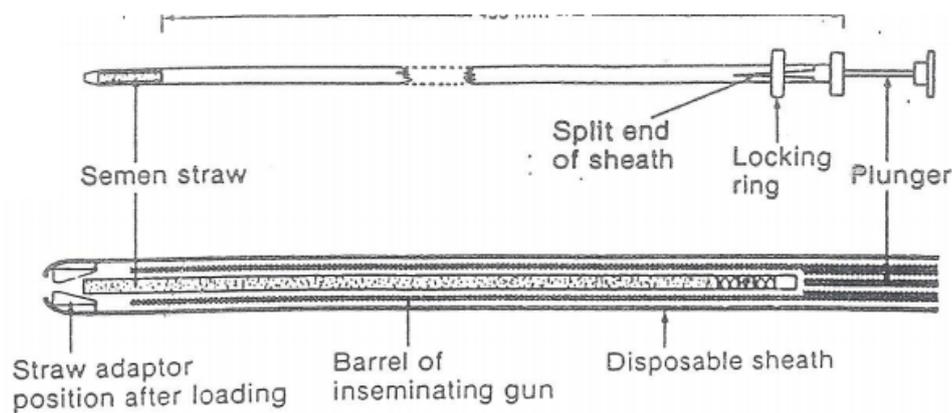
5 Artificial Insemination

Artificial Insemination is the act of using instruments to deposit semen in the female reproductive tract with the aim of achieving pregnancy.

Advantages over natural mating

- Rapid genetic improvement
- Widespread availability of genetically superior sires
- Eradication or prevention of venereal diseases
- Introduction of new bloodlines from other countries through the use of overseas bulls
- Ease of crossbreeding without expense of purchasing many bulls

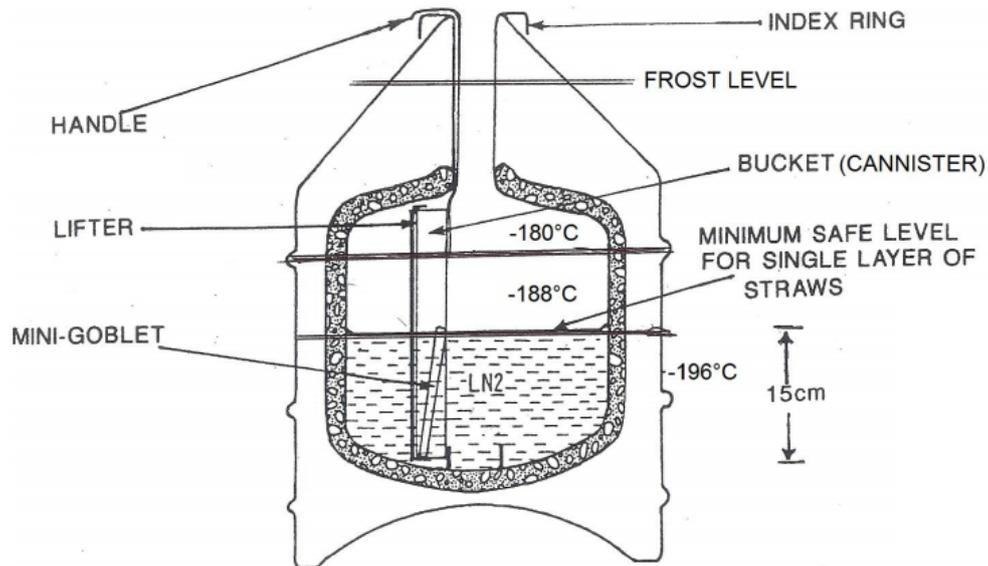
Figure 1: Insemination gun



AI equipment

- **Liquid Nitrogen Unit:** a hollow-walled pressurised vacuum flask, generally made of aluminium, used to hold semen in liquid nitrogen at -196 degrees Celsius.
- **Canister:** removable metal holder with a long, hooked handle, in which semen straws are held. Canister can be lifted by the handle into the neck of the liquid nitrogen unit, to allow access to the semen straws.
- **Sheath:** used mainly for hygienic purposes.
- **Plunger:** pushes the semen from the straw into the vagina.
- **Goblet:** plastic containers, slightly shorter in length than the semen straw, which can be used to store semen straws from different bulls separately in each canister.
- **Insemination Gun:** both medium and mini straws have the same principle of operation and loading. Mini guns are only suitable for mini straws while medium guns are only suitable for medium straws. Accidental use of the wrong size can cause the gun to jam, and the straw to be spoiled and lost.
- **Semen Straw:** contains one cow dose, either 0.5 mL (medium straw) or 0.35 mL (mini straw) in volume. Manufacturing end of the straw consists of double wad and powder, fitted at the time of manufacture. This seals one end of the straw when the powder is moistened. This acts as a piston to expel the semen in the inseminator depresses the plunger of the inseminating gun.
- **Laboratory End:** After it is filled with semen in the laboratory the straw is either crimp-sealed or a power plug is inserted. This end of the straw is sometimes coloured to assist identification. The inseminator cuts off the laboratory ends of the straw through the air bubble, before inseminating.

Figure 2: Liquid nitrogen unit



Preparing AI gun for insemination

1. Select the semen straw that you wish to use.
2. Remove semen straw from AI tank (using forceps) and thaw out straw.
3. Wipe the straw with paper towel (or anything that is water absorbent) and confirm that you have selected the correct straw by looking at the identification code.
4. Place the manufacturing end of the straw into the gun (the crimped end of the straw will be showing at the top of the gun).
5. Using scissors, cut squarely through the air bubble just below the crimped section.
6. Slide sheath over AI gun making sure that cut end of the straw fits neatly into the end of the sheath. Lock sheath on with plastic locking ring.

AI procedure

1. Cow to be AI'd is restrained in crush. A.I inseminating gun has already been loaded/prepared.
2. Wipe the vulva clean of faeces, dirt.
3. Put an AI glove on your arm.
4. Lubricate the glove and the anus of the cow.
5. Inset arm into anus, find cervix by feeling through the rectum wall and hold cervix with fingers
6. Insert AI gun in an upward motion into the vagina through the vulva till it reaches the opening of the cervix.
7. With hand hold cervix manipulate the conix with your hand until the end of the AI gun enters the cervical passage.
8. Push AI gun through the cervix till it reaches the cervix-uterus junction. Feel for tip of gun with finger of the hand, which is holding the cervix.
9. Push the plunger on AI gun 2/3 of total distance, in uterus.
10. Withdraw AI gun back into the cervix and deposit the remaining 1/3 of semen in the middle of the cervix.
11. Remove AI gun from female reproduction system and check end of gun for any missing blood spot.

Maintaining hygiene

We take precautions to maintain hygiene and semen viability. These are important because they maximise the chances for successful artificial insemination. Considerations include:

1. Always keep fingernails short.
2. Use a new sheath for each insemination
3. Wash hands thoroughly.
4. Avoid all dirty surfaces.
5. Avoid inseminating too deeply and using excessive jabbing. This will cause either irritation or injury which could allow infection to occur.
6. Dismantle soiled gun and wash in soapy water dip in methylated spirits and sterilise before use.
7. Edges of vulva should be clean to ensure clean entry.

6 Preg testing

At 5 – 6 weeks pregnancy can be diagnosed. Early diagnosis can be detected through fluid being present in the uterine horn which will feel like a water-filled balloon with a diameter of 10 – 16 centimetres. The uterine artery horn enlarges and develops a characteristic ‘buzzing pulse’ (*fremitus*). Cotyledons, which are an attachment point where placenta and uterus join to exchange oxygen, carbon dioxide and nutrients, can be felt. The veterinarian looks for all these things to diagnose pregnancy.

Reasons for Pregnancy Diagnosis

- Identification of non-pregnant cows for culling programs or to allow re-breeding to occur with minimal loss of production.
- To group animals according to gestational status for management sale.
- To identify calving time to be able to observe animals during critical times.

Figure 3: The preg testing procedure



7 Birth sequence in cows

1. Cow isolates herself and the cervix begins to dilate.
2. Forceful uterine contractions begin with rest periods. Cervix is fully dilated (open).
3. Amber fluid rushes out and lubricates the birth canal
4. Stronger uterine contractions with shorter rest periods emerge.
5. A brief rest occurs after the calf's forelegs, head and shoulders exit the reproductive tract.
6. Contractions force out calf body, rump and hind legs.
8. Cow licks, cleans, dries and nuzzles her calf.
9. The cow then suckles the calf.
10. Uterine contractions expel the afterbirth.

Stages of parturition

1. Preparatory (cervical dilation)
 - (a) Positioning of the foetus for birth
 - (b) Dilation of cervix
 - (c) Exposure of foetal membranes through the vulva with possible rupture
2. Foetal expulsion
 - (a) Uterine contractions intensify
 - (b) Abdominal pressing by the dam
 - (c) Leading to expulsion of the foetus
3. Cleaning (foetal membrane expulsion)
 - (a) Placenta membranes (afterbirth) are expelled
 - (b) Usually in 3-6 hours, although it can take 12 hours in some cases.

8 Dystocia

The term *dystocia* means calving problems. It is important to keep watch on any cow during birth in case dystocia occurs which may require intervention. Heifers and young cows tend to be more prone to dystocia than older cows.

Reasons for Dystocia

- Small Pelvis – usually in heifers due to their immaturity
- Incomplete Dilation of the Cervix – often a hormonal problem
- Lack of Uterine Contraction – often lack of calcium in the blood
- Uterus twisted during the initial stages of birth
- Oversized calf due to genetic make up
- Calf in a position other than the normal birth position.

Figure 4: Common causes for dystocia

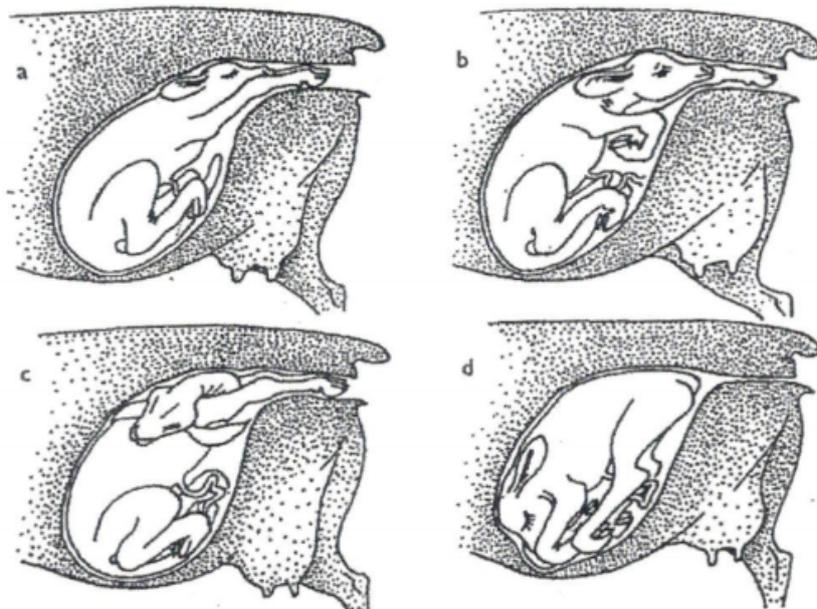


FIG. 8.9 Birth presentations (a) Normal. (b), (c), (d) Common dystochias.

Managing dystochia

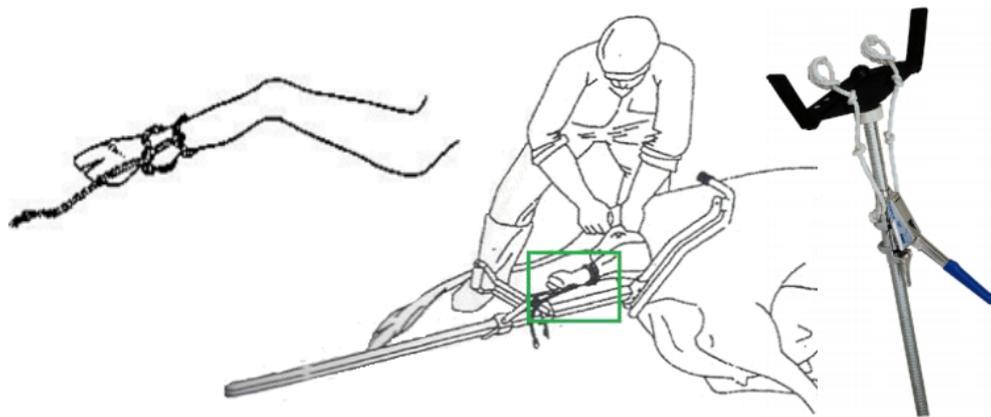
Chains or ropes, when clean are very useful for assisting the parturition process (calving). They are tied around the leg with a loop above the first joint as shown below. This ensures the limb does not easily break. The farmer or vet will pull on this in time with the contractions of the mother.

Calf pullers are mechanical devices which have ropes attached to the leg and a brace to push back against the cow. Mechanical advantage from the lever allows more force to be delivered with less effort.

Manual repositioning of the calf may be used for cases of dystochia, where the calf is not in a favourable position, such as when the feet or head are not facing first.

A **caesarean section** is when a surgical incision is made in the abdominal cavity and uterus, and the calf is pulled out through that instead. This is useful for larger calves, when the calf is not in a favourable position and it is expected that a natural birth would not be possible, or when there are twins. This should only be done by trained veterinarians.

Figure 5: Various tools to aid in dystochia



9 Embryo transfer

This technique enables embryos (which can be frozen, stored and used later) to be transferred from one female to another. It will enable greater use of superior females in breeding programs. Normally, a cow will produce six to seven calves in her lifetime. It usually produces a single egg, and thus a single calf, each time she ovulates. By the use of hormones she can be super-ovulated, or made to produce several eggs. These can be collected and implanted into several foster mothers, or recipient cows. Using this method a single cow may produce fifty calves in its lifetime.

10 Oestrus synchronisation

Oestrus Synchronisation involves bringing all the animals in a herd or flock into oestrus together. In Australia, heat detection is difficult. To overcome this problem, synchronising the oestrus cycle of the cows on a farm is a good solution. Without using oestrus synchronisation it would be necessary to inseminate, every day for about thirty days in cattle to make sure each animal was inseminated. It involves treating the females to be inseminated with hormones so that they will all come into oestrus and ovulate at about the same time. There are two common methods. One involves *progesterone* treatment while the other is an injection of *prostaglandin*.

The advantages of this technique include:

- More pregnancies
- More compact calving season.
- More 'even' line of calves.
- Better use of time and labour during breeding, pregnancy testing and calving.
- Tighter calving intervals, with more calves born during a cow's lifetime.
- Faster and more accurate heat detection
- Enhanced use of artificial insemination (AI) or specialist programs such as ET.
- Greater genetic gain and higher valued calves.
- Ability to schedule heifers to calve before older cows, so heifers get better attention and extra nutrition.
- Easier customised mating - including the use of calving ease sires because AI is more feasible
- Confirmed breeding and calving dates, not always possible with natural service.
- A more profitable herd
- All cows can be yarded and artificially inseminated together on the same day.
- Lambing and calving is condensed into a shorter period.
- Lambs and calves can be sold as an even pen or lot.