**REPRODUCTION IN FARM ANIMALS**

Reproduction is the biological process which involves fusion of the male and female reproductive cells to give rise to an offspring.

**Definition of terms used in reproduction**

1. Sperm, this is a male gamete that fuses with the ovum to form a zygote
2. Ovum, female gamete that fuses with sperm to form a zygote
3. Zygote, a cell produced by the union or fusion of male and female gametes
4. Semen, a mixture of sperms and fluids produced by the prostate gland and seminal vesicles
5. Fertility, this is the ability of the animal to reproduce
6. Puberty, age when the animal attains sexual maturity and becomes sexually active

**Parts of the female reproductive system of a cow**

**Functions of the parts**

1. **Ovaries**

These are paired and oval shaped structures. They play the following functions

Production of female gametes known as ova

Production of sex hormones responsible for the sex cycle ego estrogen

1. **Funnels/infundibulum**

These are funnel shaped end of the fallopian tube which lies below and partially covers the ovary. Its function is to receive the ovum that is released during ovulation and deliver it to the oviduct.

1. **Oviduct (fallopian tube)**

It’s where the egg is fertilized and provides a connecting link between the infundibulum and the uterus.

1. **Uterus (womb)**

It has got muscular walls and it’s where the fertilized egg is implanted

It’s also were the fetus grows till time for calving.

1. **Cervix**

It’s a muscular ring/neck of the vagina, about 25mm in diameter. It tightly closes during pregnancy and prevents entry of any other material into the uterus once the animal is pregnant. It also relaxes during parturition to give way to the calf.

1. **Vagina**

It is a channel/tube like structure that connects the vulva to the uterus, it has a corrugated lining designed to receive the penis of the bull during copulation. Functions of the vagina

Receives and passes over semen during copulation

Receives the fetus from the uterus and passes it on to the outside during parturition (it’s a birth canal)

The vaginal wall secretes mucus which reduces friction during copulation

1. **Hymen**

It is a membrane that usually breaks the 1st time the penis of the bull enters. Failure of this hymen to break means the heifer will remain infertile (white heifer disease).

1. **Vulva**

It is the external opening of the vagina which aids expulsion of the calf at birth. It also guides the penis during mating

**Parts of the male reproductive system.**

**Functions of the parts**

1. **Testis** These are made up of convulated tubules known as seminiferous tubules that are responsible for production of spermatozoa.

Testes also produce male hormone testosterone which stimulates the development of the male secondary characteristic.

1. **Scrotal sac**

It hangs below the body cavity and its where the testis are contained.

1. **Sperm ducts (vas deferens)**

These convey sperms from the epididymis to the urethra.

1. **Epididymis**

It is a coiled tube where spermatozoa are stored and allows them to mature further before ejaculation.

1. **Accessory glands (Prostate, Cowper’s and seminal vesicles):-** These produce fluids (semen) which contain nutrients and also act as a medium for mobility of sperms.

**Seminal vesicles,** these produce the largest part of the seminal fluids, they produce sugars which provide energy to the sperms to ensure that they remain viable.

**Prostate gland,** this secretes seminal fluids in which sperms mix to form semen

**Cowpers gland,** produces a liquid which neutralizes the urine in the urethra. This protects the sperms from damage

1. **Ampulla:-** It’s a structure that aids in ejaculation of the sperms.
2. **Sheath:-** Protect the penis from pathogens and injury.
3. **Urethra:-** It delivers semen and urine out of the penis at the required time.
4. **Penis,** its an organ for copulation, it also passes out urine

**PUBERTY IN FARM ANIMALS**

This is the age when the animal attains sexual maturity and becomes sexually active.

**Factors that influence puberty in farm animals**

1. Weight of the animal, animals tend to reach puberty at a certain critical weight
2. Feeding of the animal, well fed animals reach maturity earlier than poorly fed animals
3. Breed, some breeds grow faster than others hence reach puberty earlier.
4. Heterosity. Hybrid animals reach puberty earlier than purebreds
5. Presence of mature male animals, female animals exposed to males tend to reach puberty earlier than those isolated from males
6. Age of the animal, animals tend to reach maturity at a certain average age that is typical for a particular breed.
7. Housing/stock density, animals in congested quarters take longer to reach puberty because of the stress imposed on them by the environment.
8. Level of hormones produced, animals that produce higher amounts of gonadotrophic hormones reach puberty faster than other animals of the same species that produce lower amounts of gonadotrophic hormones

**REPRODUCTIVE HORMONES**

There are two groups of hormones namely:

* Gonadotrophic hormones, these are secreted by the anterior pituitary gland and act on gonads. (Ovaries and testes).
* Gonadal or sex hormones, these are secreted by the gonads

**The gonadotrophic hormones**

|  |  |  |
| --- | --- | --- |
| HORMONE  | ORIGIN/SOURCE | FUNCTION  |
| Follicle stimulating hormone (F.S.H) | Anterior pituitary  | * It stimulates development and growth of the graafian follicles
* Responsible for secretion of oestrogen
* In males, it stimulates production of sperms
 |
| Luteinizing hormone (L.H) | Anterior pituitary  | * Responsible for ovulation. It causes rapture of the graafian follicles so as to release the ovum
* Causes formation of the corpus luteum in the cavity left after ovulation
* Responsible for secretion of progesterone by the corpus luteum
 |
| Prolactin  | Pituitary gland | * Promotes development of the mammary glands
* Initiates milk secretion by the mammary glands after parturition
 |

**Gonadal (sex) hormones**

|  |  |  |
| --- | --- | --- |
| HORMONE | SOURCE | FUNCTIONS |
| Oestrogen  | * Graafian follicles in the ovary
* Placenta in pregnant animals
 | * Responsible for development of secondary sex characteristics e.g mammary glands
* Responsible for the healing and repair of the uterine wall
* Responsible for the onset of heat
* Stimulates thickening of vaginal walls
* Increases secretion of mucus in the oviduct
 |
| Progesterone  | Corpus luteum  | * Prepare the uterus for implantation of the zygote
* Maintains pregnancy
* Responsible for the development of glandular tissue in the mammary glands and uterus
 |
| Testosterone  | Testes  | * Initiates development of sex characteristics in bulls
* Stimulates spermatogenesis
 |
| Relaxin  | Ovary and placenta | * Causes the opening of the pubic bones and the relaxation of the pelvic ligaments to facilitate parturition
 |

Other hormones include

**Oxytocin hormone**. This is produced by the hypothalamus and stored in the posterior pituitary.

**Functions**

Responsible for parturition by causing contraction of uterine muscles

It stimulates milk let down

Promotes transportation of sperms in the female animal

Helps in the breakdown of corpus luteum at the end of the luteal phase

**Lactogen,** this is produced by the anterior pituitary

**Functions**

Initiates production of milk

Influences growth of bones and tissues

Stimulates functioning of corpus luteum and development of maternal behaviour

**OESTRUS CYCLE**

It refers to the physiological events which take place from the onset of one heat period to another.

**Or.** It’s a period between two successive heat periods. In cattle it is 21 days.

**Hormonal control of the reproductive (oestrus) cycle in animals**

The cycle starts with secretion of follicle stimulating hormone (F.S.H) by the anterior pituitary gland into the blood stream.

When follicle stimulating hormone reaches the ovaries, it stimulates development of follicles into ova. This is termed as the ***proestrus stage***

As follicles mature, they start producing oestrogen hormone which in turn hinders production of more F.S.H.

At maturity, the follicles burst under the influence of another hormone known as luteinizing (L.H) hormone

After ovulation, the ova begins to move within the fallopian tube (oviduct) with the help of the muscular contraction of the oviduct and the to and fro movement of cilia in the oviduct. This stage is known as oestrus

The ruptured follicles start producing progesterone hormone which maintains the uterine wall. The uterine wall gets prepared for implantation. The amount of progesterone only declines when no fertilization has occurred. The corpus luteum degenerates. Therefore progesterone maintains the state of pregnancy. This is known as the metooestrus

If the ova meets a sperm within the fallopian tube, fertilization occurs and there after implantation. This marks the beginning of the gestation period which varies from species to species.

In case no fertilization, the uterine wall and corpus luteum degenerate and the oestrus cycle resumes.

**NB**. Ovulation occurs shortly after the end of heat. In cattle heat usually lasts 18-24 hours and in sows and goats it takes 48-72 hours.

**Signs of heat in cattle**

* 1. The vulva becomes swollen and its colour turns reddish.
	2. There’s mucus discharge from the vulva.
	3. In lactating animals, there will be a drop in milk yield.
	4. The cow loses appetite for food and spends most of the time bellowing (mowing).
	5. It urinates frequently.
	6. It tends to mount other animals and stands still to be mounted also.
	7. The animal is always restless, excited and nervous.
	8. It twitches and carries the tail on one side, exposing the vulva.
	9. There’s a slight rise in body temperature.
	10. There is continuous bellowing/ mooing
	11. The eyes of the cow become glossy.
	12. The cow licks other cows

NB. The most reliable sign of heat in cows is when a cow on heat stands still and allows others to mount it. This is refered to as standing heat. (lordosis)

**Methods of heat detection**

Use of detector animals, e.g. males with deviated penis or androgenized females to identify females on heat

Measuring the levels of progesterone in milk, low levels could indicate heat

Observation of the animal for the outward signs of heat

Using heat expectancy charts, these are organized on a 21 day cycle. This allows heat to be recorded and time for the next heat to be predicted so that the cow can be viewed closely at the time of the next expected heat.

Using chin ball devices, the device is placed under the chin of the bull, causes paint to be smeared on the back of the cow if mounting takes place

Using the kaMar heat mount detector, a detector filled with a red dye is glued on the skin of the cow covering the tail bone. When a cow wearing the detector is mounted, the pressure from the brisket of the mounting animal makes the dye to come onto the skin and can be detected from a distance.

**GESTATION PERIOD**

This is when the animal is pregnant. It starts with fertilization and ends with parturition

Duration of gestation period in different species of farm animals

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Farm animal | cow | goat | sheep | sow | rabbit |
| Gestation period (days) | 270-280 | 150 | 147 | 110-118 | 28-31 |

**Signs of pregnancy in cattle**

* Failure to return on heat after service
* Increase in body weight
* Enlargement of the belly
* As pregnancy progresses, udder increases in size
* The skin of the animal becomes smooth and shiny
* Abdominal movements (signs of life in fetus) are visible especially in late pregnancy
* Increase in pulse rate
* Body temperature goes slightly higher than normal
* Increased progesterone levels in blood and urine
* Flank regions become hollow as the spine and tail root become prominent
* Sticky and thick mucus seals the cervix

**Care of the cow during pregnancy**

Carry out pregnancy diagnosis two months after service

The animal should be given adequate and nutritious feeds to cater for both mother and fetus

The animal should not be made to walk long distances particularly on uneven surfaces.

The animal should be isolated from other animals especially the sick ones

The animal should be housed in stalls with rough surfaces to avoid sliding

Give the animal enough clean water

Lactating animals must be dried off in time (cattle 7months of pregnancy).

Steaming up is recommended for cattle at drying off stage

Regular deworming of the animal

Regular parasite control

During calving, assist animals with calving difficulties

Call a veterinary doctor for help in case of dystocia

**DRYING OFF**

This is the practice of inducing a lactating cow to cease/stop producing milk in preparation for the next parturition and lactation.

When the animal has been lactating it becomes pregnant, the farmer should stop milking at 5- 6 months of pregnancy.

**Aims of drying off.**

1. To restore/repair the udder tissue by next lactation.
2. To replenish the mineral such as calcium and phosphor that was depleted.
3. To enable the cow herself it gain weight and energy for the next calving.
4. To cater for the extra nutrient demands of the growing fetus.
5. To allow the udder produce colostrum for the newly born calf

In case the animal is not dried off, the following is likely to happen

A lower milk yield of about 25%

Nutritional disorders like milk fever

Continued loss of weight

The cow may fail to deliver which might lead to its death and fetus

**Methods of drying off/procedure for drying off**

**Complete stoppage/cessation**

In this method, milking the cow is completely stopped

**Intermittent milking**

In this method, the cow is milked once a day either in the morning or evening for about 5 days after which milking is stopped. Another option is to milk on alternate days for about 5 days and therefore milking is stopped.

**Incomplete milking**

In this method the cow is milked half way in the morning and evening to reduce the amount of milk in the udder. Milking is then stopped completely after about 4 days. This method is best to apply on heavy milkers. Also the animal should be given fewer amounts of concentrates so as to decrease the amount of milk produced by the udder.

**Using dry cow therapy,** milk depressants like obrenin (an antibiotic) are added to the feeds.

**STEAMING UP**.

This is the practice of feeding a pregnant animal on a higly nutritious ration prior (3-4months) to calving

**Importance of steaming up.**

1. It provides nutrients for the growing fetus.
2. Stimulates growth and repair of the udder tissue.
3. It provides extra nutrients for the pregnant animals for its body building before calving.
4. It provides nutrients for milk synthesis.
5. Prevents nutritional disorders such as milk fever before calving.
6. Provide big room for exercise.
7. Provide mineral supplements such as leaks to deficiency diseases.
8. Heifers should always be brought to the milk paddocks to get them used to it.
9. Provide enough facility for resting.
10. To build up body reserves so that it can have sufficient energy at calving

**What shouldn’t be done to pregnant cattle**

1. Don’t allow them to walk very long distances.
2. Don’t mix bulls with pregnant cows because they can knock or mount them, leading to abortion.
3. Don’t scare or beat up pregnant animals.
4. Pregnant cows shouldn’t be dipped, they should only be sprayed.

**PARTURITION (CALVING)**

This is the act of giving birth to young ones and marks the end of pregnancy.

**Signs to show that the cow is about to deliver**

1. The vulva gets enlarged
2. Slimy mucus discharge oozes out from the vulva.
3. The udder is excessively enlarged and gets filled with milk.
4. The animal becomes restless and nervous.
5. Pelvic muscles relax.
6. The cow usually isolates herself.
7. Frequent urination
8. The amnion bag appears and bursts eventually a few hours to giving birth.
9. Loss of appetite
10. Colostrum secretion from the udder

**Management of pregnant animals prior to calving**

Proper feeding

Provision of clean and adequate water

Parasite control

Provision of clean soft beddings

Animals are put in nurse paddocks for easy supervision

**Care during calving**

Take the animal to the calving paddock

The calving paddock should be clean and free from sharp objects

The animal should be left to deliver by its self

In case of failure, the veterinary officer should be called for help

Remove the after birth as soon as possible

**DYSTOCIA**

This is difficulty in giving birth.

The normal presentation of the calf should be front limbs first with the head extended and the nose between the front limbs

**Causes of dystocia**

Narrow birth canal in relation to the fetal size

Inadequate production of relaxin which help in the dilation of the muscle and ligament of cervix and pelvis

Improper presentation of the fetus in the birth canal

Pathological condition of the dam or fetus, weak or sick mothers experience dystocia

Twinning in cattle and fetal malformations i.e. calves with two heads or extra appendages

**Examples of calf malpresentations**

Head first with one or both legs bent backwards

Head and foot first with one leg crossed over the neck

Front feet first with the head twisted backwards

Backward presentation with the hind feet first

Front feet first with the head turned downwards between the front feet

**Care for the calf up to the time of weaning**

1. After parturition, assist in removing mucus from the nostrils and mouth.
2. Let the dam dry up the calf by leaking it.
3. Use some straw to rub the chest region in order to stimulate breathing if the calf is not breathing well.
4. Disinfect the naval cord with iodine tincture.
5. Take the calf’s weight to determine the birth weight
6. Give the calf colostrum for the first 4 days.
7. Take the calf to a well prepared calf pen
8. Ensure that the calf pen is clean.
9. Train the calf to drink from a bucket
10. Provide the calf with plenty of clean water
11. Feed the calf 3-4 times a day
12. Deworm the calf
13. Spray the calf to control external parasites
14. Give early weaner meal in form of pellets
15. After 5 weeks introduce dry feeds e.g concentrates to help in development of the rumen
16. Castrate the calf if its male.

**N.B:-** Colostrum is the thick, creamy, yellowish milk given out by the dam within the first 4 days after giving birth.

**Importance of colostrum to calves**

* It’s very easy to digest by the calves
* It contains anti-bodies that impart immunity to calves.
* It contains laxative and purgative substances that assist to remove the sticky feaces (meconium) from the gut.
* It’s very rich in vitamin A, proteins, fats and minerals (highly nutritious).

**METHODS USED IN CALF FEEDING**

Single suckling (natural feeding)

Multiple suckling (foster/nurse mother feeding)

Bucket feeding

Early weaner feeding

**SINGLE SUCKLING (NATURAL FEEDING)**

This is when the calf is allowed to suckle directly from its mother and the mother is never milked. This method is commonly practiced in beef cattle where the cow usually produces small quantities of milk.

**Advantages**

The calf suckles until it becomes satisfied

The method doesn’t require training the calf how to suckle.

The calf is safe from diseases that can be spread through unhygienic feeding containers

**Disadvantages**

It weakens the dam since the calf is allowed to suckle its mother.

It may get infected if the mother is diseased

The quantity suckled is not regulated and this can cause scours

MULTIPLE SUCKLING (NURSE/FOSTER MOTHER)

This is when a particular cow is given a number of calves it didn’t produce to suckle. The calf is first allowed to get colostrum from their mothers and thereafter they are taken care of by the nurse cow.

Advantages

Multiple suckling uses little labour. E.g. labour that would be used to clean and sterilize buckets is saved.

Little supervision is required

Digestive disturbances in calves are reduced to a minimum since there are fewer chances of over feeding the calves

Calves are able to take in milk that is clean and at body temperature directly from the nurse cow

Under good and proper management practices, it can reduce incidences of disease transmission thus giving healthy calves.

The farmer is able to produce more milk for sales since the milk from other cows whose calves are suckled by the foster mother cow is for sale.

Disadvantages

The calves may suffer from starvation when the foster mother cow is sick or produces little milk than required.

Easy transmission of infectious diseases like T.B if the foster mother is sick.

The foster mother cow needs to be fed well and this may increase the cost of production.

**BUCKET FEEDING (ARTIFICIAL FEEDING)**

This is where the calves are allowed to get colostrum from their mother in the first 3-5 days after which they are trained to take or drink milk from the bucket.

**Advantages**

Calves are fed according to their individual needs. No under feeding

A calf can depend on bucket feeding if the dam dies

It allows early weaning of the calf

Reduces the incidents of disease transmission

The farmer gets more milk for sale

The calf doesn’t disturb its mother

It reduces/controls injuries caused by the calf to the teats of the mother.

Disadvantages

If the buckets are not properly cleaned, they may lead to diseases.

Buying feeding buckets is an added cost of production

Requires a lot of labour especially with large farms

Milk may not be at body temperature by the time it reaches the calf

Its time consuming since it requires training the calf

**How to train a calf to drink from a bucket**

Procedure

Starve the calf for two to four hours to step up its appetite.

Obtain warm milk from the mother and dilute 25% of its volume by water

Put the milk in a clean bucket

Wash your hands with soap

Dip your fingers into the milk

Lower the calf’s head into the bucket to suck the fingers

Gently lower the calf’s head as it sucks the fingers to drink the milk

Carefully and slowly withdraw the fingers as the calf continues to drink the milk

Repeat the procedure every other day till the calf automatically comes and drinks on its own.

Feed calves two times in a day at regular intervals

**Precautions to take when using bucket feeding**

 Use fresh milk daily

The bucket should be clean at all times to avoid spread of diseases

Milk should be at body temperature. Cold milk may encourages stomach disorders

Calf must not drink in gulps as it leads to chocking

The bucket must be held at knee height for milk to bypass the rumen when swallowed.

The trainer’s hands must be clean.

The procedure is repeated for a few days for the calf to grasp

**EARLY WEANER FEEDING**

In this method, feeding on milk is reduced and replaced with early weaner concentrates (calf pellets). Roughage in form of young elephant grass is given to enhance rumen development. At 8 weeks feeding on milk is completely stopped.

**CALF HOUSING**

The calf should be kept in the calf pen until it is two month old. But it should be released when cleaning the pen so that it can around the exercise

**Qualities of a good calf pen**

Rough floor to avoid sliding

Have individual pens for each calf to prevent suckling the navel

Should have a leak proof roof

Should have adequate space

Should have water and feed troughs

The floor should be slanting for easy flow of urine and water during cleaning

Should be well ventilated

Should have a drainage channel to lead away urine and water

Should be easy to clean.

**CALF MORTALITY**

This refers to the death of the calf.

Causes of calf mortalities

1. Calf scours, these are due to bacteria and can spread from one calf to another from 2 to 5 days of age and some may die quickly. They are characterized by the following

Blood stained faeces

Diarrhea

They can be prevented by

Feeding the calf on colostrum

Use of antibiotics added to feeds

Proper hygiene

1. Common scours, these result from poor management especially feeding errors like feeding the calf too much milk, cold milk, using dirty milk buckets.

Control

Ensure that calves are given clean adequate milk

Calf pens should be kept clean

Regularly disinfect calf pens

1. Pneumonia, this is characterized by difficulty in breathing and it can be controlled by

Isolating the affected calves

Keeping calf pens clean

Pens should have adequate ventilation

Avoid overcrowding in calf pens

1. East coast fever
2. Naval infection
3. Calf coccidiosis
4. Worm infestation

**WEANING**

This is the practice where a farmer stops giving milk to the bucket fed cows, or stops the calf from suckling. Weaning should be due at the age of about 8 weeks. Its achieved by giving the calf weaner pellets, good quality hay and freshly cut grass.

LACTATIONAL ANOESTRUS

This is the phase of sexual inactivity that usually follows parturition in farm animals.

Reducing lactational anoestrus

Giving animals adequate and well balanced feeds to enable them return to heat earlier.

Early weaning to reduce production of prolactin that suppresses normal oestrus

Treating animals with oestrogen to induce heat

Introduction of mature males to the females. The males produce hormones that induce heat in the females.

Introduction of creep feeds to the young to reduce the suckling sitimuli responsible for the release of prolactin.