

Fertility and Infertility

Fertility: Is the ability of a cow to give birth of a live calf at approximately 12 months intervals?

Infertility: Or subfertility is reduced the fertility. The cow may be capable to becoming pregnant and giving birth of a live calf but the interval may be much longer than 12 months.

Sterility: Is the total inability of a cow to become pregnant and to give birth of a live calf.

There are many factors causing infertility:

1. Anatomical causes.
2. Infectious causes.
3. Functional causes.

Anatomical causes of infertility:

1- Congenital anomalies:

Congenital causes of infertility are often inherited. They include developmental abnormalities of the ovaries, oviducts, uterus, cervix, vagina and vulva.

Ovarian Agenesis:

One or both ovaries may be absence.

Ovarian Hypoplasia:

In this condition one or both ovaries are small, narrow and functionless.

Intersexuality - Freemartin:

- This case occur when the female calve born as a twin with a male calve.
- This case occur due to the anastomosis of blood vessels of the allantoic sacs from the earlier differentiating fetal testicle to retard the development of the female gonads.
- The result is an intersex with outward appearance of female and internal sex organs of a mixed type.
- The ovaries remain hypo plastic.
- The vulva shows a tuft of hair.
- The clitoris is markedly enlarged.
- The cervix is absent and the uterus is represented by two solid cords.



Segmental Aplasia of Mullerian ducts (White heifer disease):

- Developmental defects of the Mullerian ducts lead to various anomalies of the vagina, cervix and uterus.
- The ovaries develop normally and animal show normal cyclic behaviour.
- The cow may be sub-fertile or sterile.

There are many forms of muelarian development defect which are:

Uterus unicornis:

only one uterine horn has a lumen, the other appearing as a narrow, flat band.

Uterus didelphys:

Where there is duplication of the lumen of the cervix, each uterine horn connects with the vagina by a separate cervical canal.

2- Acquired anomalies:

Ovarobursal adhesions:

- There is an adhesion between the ovary and bursa.
- The adhesion is occurred due to formation of fibrous strand of varying thickness which connects the fimbriae (bursa) to the ovary.
- The adhesion is occurring partially or completely.

Causes:

- Rough manipulation of ovary through rectal palpation.
- Expression of corpus luteum (manually).
- Diffuse peritonitis (Tuberculosis, traumatic reticular penetration).
- It occurs as a complication of caesarean section or due to uterine rupture.
- The adhesion occurs between the uterus and omentum, intestines or abdominal wall.

Fibrosis:

- It occurs in the uterus, cervix, vagina and vulva.
- It occurs mainly after dystocia and complication of birth.
- It occurs as a result of severe pyogenic infection.

Tumours of the genital organs:

- Granulosa cell tumours are the common type of tumours of bovine ovaries.
- Uterine tumours are rare in cattle but a few cases were reported such as adenocarcinoma and lymphosarcoma.

2. Infectious causes of infertility:1- Bacterial and protozoan infections2 -Viral infections3 -Mycoplasmas4 -Endometritis, metritis and pyometra,5 -Retained afterbirth*Infectious causes of infertility*

Infectious agents include several bacterial, protozoan, viral and mycoplasmal infections. Details of the most common and economically important ones are given below. Several are important zoonoses.

Brucellosis:

Brucellosis affects humans, domestic animals and wildlife. It is caused by *Brucella spp.* The disease is most severe in cows infected during pregnancy and usually results in abortion at about 6 to 8 months of gestation. In some cases the dead fetus is not aborted, but is retained in a mummified or macerated form. Calves born alive are usually very weak, contract calf scours easily and most die soon after delivery. Brucellosis is a professional hazard for cattle keepers and veterinarians.

Trichomoniasis:

Trichomoniasis is caused by a protozoan *Trichomonas fetus*. Cows and heifers become infected by an infected bull or artificial inseminations with contaminated semen. The disease causes infertility, repeat breeding, delayed return to estrus after mating, early embryonic death and, sometimes, abortion.

Campylobacteriosis:

Also referred to as Vibriosis, Campylobacteriosis is a venereal disease that may cause abortion at any time of pregnancy, usually 5 to 6 months. Cows in a herd get infected from infected bulls or improperly prepared semen. Cows have irregular estrous cycles and manifest repeat breeder syndrome i.e. return to heat after repeated service. Vaccinations can prevent infections.

Leptospirosis:

The disease is caused by *Leptospira* bacteria. Animals infected with *Leptospira* excrete the bacteria in their urine. Direct or indirect contact with the urine of infected animals is the major route of infection in both animals and man. In the pregnant cow this may result in abortion during the last trimester or the birth of a weak or dead calf. Vaccination can help prevent infections.

Salmonellosis:

Salmonellosis is a zoonotic disease that causes abortion in cattle. Following abortion, the uterus may become severely inflamed, resulting in the death of the cow. Cows that recover may continue to excrete the bacteria for years.

Infectious Bovine Rhinotracheitis (IBR):

IBR is caused by a herpes virus. This is a respiratory disease that also causes pinkeye. IBR can cause failure to conceive, early embryonic death, and abortions later in pregnancy. Commercial vaccines can help control IBR.

Bovine Viral Diarrhea Virus (BVD):

This is a viral disease that can cause failure to conceive, early embryonic death, and abortions later in pregnancy. When the virus infects a pregnant cow it may also infect the fetus and kill it or cause fetal abnormalities. Calves born alive may be stunted.

Retained placenta (afterbirth):

The cow fails to expel the placenta (afterbirth) within 12 hours after calving down.

Causes :

This may be as a result of infections of the reproductive tract.

Twin births and abnormal deliveries, including prolonged or difficult deliveries or caesarian sections, are often followed by placental retention. Retained placenta can also be caused by deficiencies of selenium, vitamin A or vitamin E and over-conditioning of dry cows.

Treatment is by expelling the afterbirth and preventing infection of the uterus. Removing the afterbirth by hand may be harmful to the cow because it can damage the uterus reducing subsequent fertility.

ENDOMETRITIS:

Endometritis refers to inflammatory processes in which the endometrium is primarily involved (**actually, the reaction is limited to the endometrium only in very mild forms of infections**). Almost all uterine infections begin as an endometritis, but they may progress very rapidly to involve the entire wall. There is a tendency for *Vibrio fetus* and *Trichomonas fetus* to cause mild infections limited to the endometrium. In mild forms of endometritis, gross lesions are absent or insignificant. Microscopically, there is a mild infiltration of inflammatory cells (**the best indication of mild metritis is the presence of infiltrated plasma cells and lymphocytes in the stroma because a few neutrophils may be present in a normal uterus**). A more severe form of endometritis occurs following parturition. Grossly, the uterus is enlarged, flabby and collapsed (**rather than firm and contracted**). The uterine lumen contains chocolate-colored lochia, with or without a foul odor. The endometrium is reddened, swollen and edematous.

METRITIS:

Metritis is characterized by inflammation of the entire uterine wall (**including the endometrium**). The term septic metritis is oftentimes used when referring to severe and often fatal inflammation of the uterus. Metritis is usually due to infections introduced at or shortly after parturition. Organisms most likely to be responsible are streptococci, staphylococci and other pus-formers. Grossly, the uterine wall is flaccid, thickened, reddened, edematous and friable. There may be a scanty secretion of fetid uterine exudate via the vagina. Microscopically, inflammatory cells may be found throughout the uterine wall (**in acute cases, neutrophils dominate, whereas in chronic cases, lymphocytes are prominent**). Severe metritis may lead to a septicemia. However, cases may recover with proper treatment.

PYOMETRIA:

Pyometria is an acute or chronic suppurative infection of the uterus with an accumulation of pus in the lumen in the presence of a "**closed**" cervix. The condition occurs with frequency only in the cow, bitch and cat.

DISCHARGE occurs most frequently in animals. An essential component of this pyometria is a retained corpus luteum which may be either cystic or solid

(the corpus luteum is retained beyond its normal cyclic span with prolonged production and secretion of progesterone). The secreted progesterone is important in the pathogenesis of pyometria by:

- (1) increasing the susceptibility of the uterus to infection,
- (2) maintaining functional closure of the cervix and
- (3) inhibiting myometrial contractions.

Grossly, the uterine horns are distended with purulent exudate (**pus**) and the cervix is completely or almost completely closed. Streptococcal and staphylococcal organisms produce a typical purulent exudate. However, if the uterus is infected with *E. coli* or *Proteus*, the pus is thick, viscid and reddish-brown with a characteristic fetid odor.

In cattle, pyometria is characterized by an accumulation of pus in the lumen of the uterus (a few ounces to more than a gallon) which is thick and cream or grayish-green in color. There is no cervical seal of mucus and a small amount of pus escapes into the vagina. The uterine wall is thick and doughy or it is thin and fibrosed. Pyometria in cattle is usually asymptomatic and there are no extragenital lesions recognized.

Abortions and embryonic death:

Termination of pregnancy may occur at various stages :

- 1- Before maternal recognition of pregnancy (before 14 days of gestation in cow), in which case the length of cycle is not affected (early embryonic death).

The early embryonic death considers the main causes of repeat breeder in cattle

- 2- After maternal recognition of pregnancy and is associated with a delay in the length of the cycle (late embryonic death).(this time between 14 days of gestation to 45 days)
- 3- During the fetal stage (after 45 days of gestation) is called fetal death.

Abortion in dairy cattle is commonly defined as a loss of the fetus between the age of 42 days and approximately 260 days.

Causes of abortion can be either infectious or non-infectious.

- i. Infectious causes which discussed above .
- ii. Noninfectious causes genetic defects, multiple fetuses, injuries, toxicities or drug induced.
 1. Drug-induced (prostaglandins & dexamethasone)
 2. Insemination/intra-uterine infusion

3. Hypothyroidism
4. Trauma/stress (transport, noise, veterinary treatment etc.)
5. High fever and endotoxins (toxic plants, nitrate/nitrite, fungal toxins, other disease)
6. Nutritional (malnutrition, vitamin A/selenium/vitamin E deficiency, goitre)
7. Twin pregnancy
8. Genetic (malformation)

3- Functional causes of infertility :

1- Cystic ovarian disease

2- Anoestrus

3- Repeat Breeders

1- Cystic ovarian disease :

Cystic ovaries is the clinical term used to refer to one or more cysts in the ovaries. The condition may occur in all species, but it is most common in cattle and swine.

Several kinds of cysts are recognized:

- 1- Follicular cyst
- 2- Luteal cyst
- 3- Cystic corpus luteum
- 4- Persistent corpus luteum

Ovaries are said to be cystic when they contain one or more fluid-filled structures larger than a mature follicle (i.e. > 2.5 cm diameter), which are persistent for longer than 10 days and which result in aberrant reproductive function.

Cysts arise as a result of anovulation of a Graafian follicle. Under normal circumstances, anovulation is followed by either atresia or luteinisation, after which the follicle undergoes regression. so that she becomes either acyclic or nymphomania.

Predisposing factors

Cystic ovarian disease arises as an interaction between a hereditary predisposition, stress, milk yield, age and plane of nutrition.

Aetiology:

1. Cystic ovarian disease are caused by mechanical interference with the process of ovulation.
2. Ovarobursal adhesions .
3. The prolactin– thyroid system may be involved in the development of ovarian cysts.???

Classification

Ovarian cysts have been classified as either follicular or luteal cysts.

1. Follicular cysts are thin-walled and have little or no luteal tissue in the cyst wall. It is common to find multiple follicular cysts.
2. Luteal, or luteinised, cysts are thick walled and more usually single and have a large quantity of luteal tissue in the cyst wall. However, the accurate classification of cysts is difficult by palpation per rectum

Clinical signs.

The main clinical signs of cystic ovarian disease in cattle are nymphomania, anoestrus or masculinisation.

Follicular cyst symptoms :

- 1- Cows with follicular cysts are often nymphomaniacal, i.e. displaying excessive, prolonged signs of oestrus and a shortened interval between successive heats.
2. There is oedematous swelling of the vulva, frequent and copious discharge of clear mucus.
3. Depressed milk yield and loss of bodily condition.
4. They will attempt to ride other cows and, as with cows in oestrus, will stand to be mounted by other cows.
5. sinking of the sacrosciatic **ligaments** .
6. displacement of the coccyx

luteinized cyst symptoms :

- 1- The luteal or luteinised cyst usually results in a cessation of cyclical activity; the structure functions as a persistent corpus luteum.
- 2- If cows with luteinised cysts are left untreated then a proportion of them will become virilised, These individuals will develop a masculine conformation and will attempt to mount other cows, but unlike the nymphomaniacal cow they will not stand to be mounted by other cows.

Treatment.

Spontaneous recovery from cystic ovarian disease occurs frequently in the early post-calving period.

1. The earliest method of treating cysts was by manual rupture per rectum. it should not be done intentionally as it can cause trauma or haemorrhage, which might result in ovarobursal adhesions.
2. Surgical removal of one chronically affected ovary, or paracentesis using a long hypodermic needle through the sacrosciatic ligament might be worth considering in a limited number of cases where other treatments have failed.
3. Most cysts are now treated using reproductive hormones.

follicular cysts are usually treated with:

- 1- Gonadotrophic hormones (i.e. hCG given by the intravenous route, at doses of between 3000–4500 i.u, also it can give small doses of hCG directly into the cyst.
- 2- GnRH: Doses of 100–250 µg of GnRH probably cause luteinisation of the cyst), whereas luteinised cysts are normally treated with luteolytic substances.
- 3- Progesterone may injected to decrease the intensive signs of estrus (nymphomania)

Luteal cysts :

- 1- Luteal cysts have been treated with prostaglandin (PGF2 α)
- 2- Treatment with hCG was fairly successful.

Persistent corpus luteum

Anything which interferes with the production or release of PGF2 α will result in a persistent corpus luteum. Pregnancy is the condition results in persistence of the corpus luteum and in the presence of uterine infection and inflammation of the tissues, there is interference with the production or the release of PGF2 α . it lead to prevents recurrent periods of oestrus if untreated and can persist for several months.

Treatment :

it can be readily treated with PGF2 α or a synthetic analogue, provided, of course, that the clinician is confident that the cow is not pregnant.

CYSTIC CORPUS LUTEUM

occurs following ovulation with the formation of a cystic cavity in the center mass of the developing luteal tissue. Grossly, an ovulation papilla is present and the cystic cavity is irregularly shaped. Pathologic corpus luteum cysts usually measure from 10 to 15 mm in diameter (small cystic cavities, less than 5 mm in diameter, are normal and common in cattle shortly after ovulation).

Anoestrus:

Estrus is not Exhibited or Estrus is not Observed.

Possible Causes

Anoestrus is failure to show [signs of heat or estrus](#) although in most cases it is a failure to [detect heat](#).

1. Undetected heat symptoms in normal cow.

Undetected estrous signs in cows with normal ovarian activity result from inadequate estrous detection because majority of estrous signs are shown between 6 p.m. and 6 a.m. Cows with short estrus (less than 12 hours in length) may be missed even with twice-a-day estrous detection.

- a. Failure to properly observe for estrus.
- b. Failure to keep adequate records.
- c. Failure to turn cows out of stanchion barns.
- d. Few open cows within a group that are available to detect heat in other open cows—pregnant cows and cows in midcycle are much less likely to mount cows in or near heat.
- e. Feet and leg problems, lameness.
- f. Slippery footing.
- g. Unfamiliarity with symptoms of estrous behavior.

2. **Quiet estrus or silent estrus** : is when there is normal ovarian activity with little or no signs of estrus. Most of the factors associated with true anestrus can also be associated with quiet oestrus.

3. True anestrus: estrus is not occurring.

a- True an estrus with present luteal cells:

This cases occur when the cattle no opserved estrus compined with present functional curpus luteum (Pyometra and severe uterine infection) or luteal cyst.

Treatment:

- this condition of anestrus can be treated by injection of luteolytic hormone (PGF 2α).
- Anoestrus is normal in pregnant. Pregnancy is a common cause of anoestrus, but this is often overlooked where service records are poor. Since many treatments for anoestrus terminate pregnancy, the possibility that cows presented as anoestrous are pregnant should be eliminated before treatment begins.

b- True anestrus is due to lack of ovarian activity (in active ovary):

this condition occur due to anemia, energy deficiency, low hormone levels.

- a. Energy deficiency, cows losing large amounts of flesh due to high milk production and/or underfeeding and low dry matter intake.
- b. Anemia, often from inadequate protein, iron, selenium or vitamin E.
- c. Phosphorus deficiency, especially in heifers or excess phosphorus.
- d. Poor endocrine tone from stored forage only, no fresh forage; lack of fat-soluble vitamins, plant hormones and antihormones.

Treatment: this condition of anestrus can be treated by many ways:

- 1- Used GnRH
- 2- Used eCG
- 3- Give minerals and vitamins
- 4- Bring the animal into positive nutritive balance

Repeat Breeders:

A cow is called as repeat breeder when it has failed to conceive even after three or more number of services, has normal estrus cycle length, no abnormality in the vaginal discharge, no palpable abnormality in the reproductive tract, has calved at least once before and less than ten year of age. Repeat breeding is one the most import infertility problem faced by field veterinarians. The cows look apparently normal and it is difficult to diagnose the cause.

Causes

Fertilization failure and **early embryonic mortality** are two major causes for repeat breeding problem

1. **Fertilization failure** : Fertilization failure accounts for about 40 per cent of the repeat breeder cows.

It may be due to:

- **failure of ovulation,**
- **delayed ovulation,**
- **defects in the ovum,**
- **poor quality of the semen used,**
- **low sperm concentration,**
- **poor motility,**
- **improper handling of semen and AI,**
- **inflammatory conditions and**
- **anatomical defects of the genital tract of cow.**

2. **Early embryonic death** : Most of the embryonic death occurs between 8 and 16 days after breeding before the critical stage of maternal recognition of pregnancy.

Embryonic death may be due to **cytogenetic abnormalities of the early embryo, unfavourable uterine environment by hormonal imbalances, uterine infections, nutrition, environmental stress and immunological factors.**

- Cytogenic abnormalities Critical requirement for the embryo survival is the presence of a normal complement of chromosomes. Chromosomal aberrations play some un-quantified role in early embryonic loss.
- Unfavourable uterine environment: Uterine environment enables the spermatozoa to ascend, provides adequate nutrients for different stages of embryonic development, maintains an appropriate milieu and fulfils immunologic requirements. Uterine environment can be affected by hormonal imbalance, infections, nutrition and environmental stress.

The presence of non-specific uterine infection around the time of insemination may interfere with fertility

The bacteria may interfere with fertility by killing the gametes or conceptus, changing the uterine milk, toxic products and producing chronic histologic lesions.

Specific uterine infections Organisms which cause early embryonic death are Trichomonas fetus, Campylobacter fetus, Brucella abortus, IBR-IPV and others.

- **Nutritional causes:** Deficiency of selenium and vitamin E were reported to cause early embryonic death.

Extended period of feeding estrogenic forages affects the embryonic survival.

Management of repeat breeder cow:

Specific treatments for conditions like endometritis, delayed ovulation may be carried out whenever suspected them as the cause.

If specific cause was not identified the following guidelines may be followed:

1. Bring the animal into positive nutritive balance
2. Use good quality semen having more than 50 per cent progressive forward motility.
3. Inseminate the cow at right time of the estrum.
4. Do AI twice at 12 to 24 hour interval.
5. Follow proper AI technique.
6. After AI, Clitoral massage or 100 micro grams of GnRH or 1500 IU of luteinizing hormone may be administered to stimulate ovulation.
7. Sexual rest for two consecutive cycles and breeding.