

Infertility in cattle

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Fertility problems in dairy cattle

1. Introduction

In modern high-yielding dairy herds, fertility is of major economic importance. Many efforts are being made to try to maintain good fertility levels. This is a review of the most important problems that lead to infertility in dairy herds: main causes and some suggestions on how to control and prevent diseases that affect fertility.



TYPES OF INFERTILITY

- Infectious infertility :
- Non-infectious infertility :

NON- INFECTIOUS INFERTILITY

- Managemental causes :
 - 1- Anestrous :
 - * inadequate estrous detection .
 - * chronic diseases .
 - * AI at late or early estrous sign .
- **** anestrous due to nutritional problems .

- Nutritional causes :
 - Vit. D deficiency – leading to suppresses signs of estrous and delays ovulation .
 - Vit. A deficiency – leading to irregular cycles .
 - Vit. E deficiency – leading to reproductive problems .
- ***** Blood urea nitrogen , if is greater than 20 mg/dl cow may have low conception rate .
- **** Deficiency of protein , iron , copper , manganese , cobalt or selenium , phosphorus and energy may impaired reproduction .
- **** Carotene is needed by CLif it is low ,the cow may have low progesterone and irregular cycles .

HORMONAL CAUSES

- Silent heat .
- Delayed ovulation .If cows ovulate more than 18 hrs after end of heat ,then ovulation said to be delayed .
- Cystic ovarian diseases .

INFECTIOUS INFERTILITY

- Bacterial : Specific ; brucellosis , leptospirosis , campylobacteriosis (vibriosis) , listeriosis , haemophilus , somnas and ureaplasmosis .

Non – specific; like : salmonella , actinomyces , E.coli , streptococcus , staphylococcus , bacillus , pseudomonas , proteus , pasteurilla , nocardia and chlamydia spp.

- Fungal , mycotic
- Viral : IBR (RED NOSE) ; AND BVD
- Parasite , protozoal : Trichomoniasis

Reproductive disorder disease

In simple language this can be defined as a disease affecting that leads to infertility or sterility

fertility : ability of an animal to reproduce

Infertility : temporary inability of the animal to reproduce

Sterility : permanent inability of the animal to reproduce

Causes :

1-anatomical (hereditary disease) or structural defect

2-functional defect(hormonal disease)

3-infection causes

4-management causes

CLASSIFICATION

- ✦ **PRIMARY INFERTILITY:** The couple is never being able to conceive.
- ✦ **SECONDARY INFERTILITY:** The couple is being able to conceive but the pregnancy is not taken to full terms or had miscarriage.

Factors Affecting Fertility

- **Environment and management**
 - Season, region, herd, age, milk yield
 - Calving difficulty, twins, mastitis, health
 - Estrus detection and / or synchronization
 - Voluntary waiting period
- **Genes of cow (Daughter Pregnancy Rate)**
- **Fertility of bull (ERCR)**
- **Interaction of bull's and cow's genes**

Causes

- ▶ Hereditary
- ▶ Congenital
- ▶ Genetic
- ▶ Infectious
- ▶ Nutritional
- ▶ Hormonal
- ▶ Miscellaneous

- Anestrus, subestrus or silent heat, ovulatory dysfunction, delayed ovulation, ovulatory failure on ovulation, cystic ovarian conditions, failure of fertilization and dysfunction of the fallopian tube and death or loss of the conceptus fall under this category.

Hereditary Causes Of Infertility-

- 1.Freemartin
- 2.Hermaphrodites
- 3.White Heifer Disease
- 4.Ovarian aplasia
- 5.Ovarian Hypoplasia
- 6.Paraovarian Cyst
- 7.Developmental
Abnormalities

❑ CAUSES OF INFERTILITY

o ACQUIRED /ENVIRONMENT OR CONGENITAL/HEREDITARY CAUSES

(LAGERLOF, 1954)

o PHYSIOLOGICAL, ANATOMICAL, INFECTIOUS CAUSES

(KODAGALI, 1968)

❑ OTHER CAUSES

NUTRITIONAL

HORMONAL

MANAGEMENTAL

3- Hormonal causes:

A- Increased secretion of prolactin and growth hormone necessary for high lactation: prolactin causes direct inhibition to granulosa cells to secrete progesterone with a consequent increase in estrogen secretion and development of follicular atresia that followed by development of follicle lutein cyst or development of cystic CL (with a consequent development of anestrus).

B- An endocrine imbalance:

1-Excessive amounts of FSH that over stimulating follicular growth.

Hormonal Causes of Infertility

1-Ovarian Atrophy

- ❑ The condition was manifested clinically by a history of prolonged period of anestrus in the affected females.
- ❑ It is usually diagnosed in association with chronic debilitating diseases or in aged cows over 15 -20 years of age.
- ❑ The condition was found affecting both ovaries (small, smooth, and firm in consistency), and the genital tract was found reduced in size.
- ❑ The prognosis is poor and the affected female should be discarded from breeding or replaced.

2- Follicular Atresia

- ❑ The condition means regression of the growing follicles caused by insufficiency of proper gonadotropin stimulation or due to hormonal imbalance.
- ❑ The atretic follicles fail to grow beyond its size, loses its turgidity, and never ovulate.
- ❑ The condition was manifested clinically by a history of anestrus in the affected females.
- ❑ Histopathological examination of atretic follicles revealed that the granulosa cell layer was found reduced in thickness and appeared degenerated or detached. The antrum appeared collapsed and the oocyte with the surrounded cumulus oophorus appeared degenerated and loosely detached in the antrum . Degenerated tissues are further replaced by fibrous formation with complete antrum obliteration in advanced follicular atresia.
- ❑ The condition could be controlled by feeding (concentrate ration supplemented with vitamins and minerals) together with GnRH administration.

3- Silent heat

4- Subestrus

5- weak estrus

6- Short Unobserved heat

- ❑ These conditions are characterized clinically by that the affected females fail to express the behavioral signs of estrus or exhibited a marked reduction in the heat period despite the presence of cyclic estral changes in their genital organs.
- ❑ Signs of short unobserved heat could not be clinically differentiated from those of silent heat, subestrus, or weak estrus.
- ❑ Silent heat can be classified as functional anestrus and constitute 90% of all anestrus cases especially in hot climate.
- ❑ Functional anestrus increases open days and causes severe economic losses that could be calculated as 100 pound per open day.

4- The physiologic bases of these condition is not clearly defined, but the central nervous system may be less sensitive in those cases or requires a higher concentrations of estrogen to produce the behavioral signs of heat and consequent acceptance of the male.

5- Hereditary predisposition: High incidence of silent heat was observed in a certain sire line in a herd of Holstein breed, where daughters of silent dams may developed silent heat.

6- Cows in advanced age, arthritic cows, cows with foot rot or untrimmed feet, or affected with painful diseases may fail to express signs of heat.

7- High lactating cows or fatty cows may also acquire silent heat or quite ovulation.

Diagnoses and treatment:

□ These conditions can be diagnosed by the following application:

- 1-Close observations to the herd to detect estrus cows.
- 2-Application of heat detecting device or aids.....
- 3-Careful clinical examination for prediction of heat.
- 4-Good keeping records.

□ Treatment of those condition can be practiced more easily by:

- 1-Improve managemental practices(feeding, housing, medical care, and education of laymen).
- 2-Application of estrus synchronization in the affected herd.
- 3-Regular watching of cows during feeding or milking.
- 4-Selection against those conditions and replacement of chronically recurred cases.

Delayed Ovulation- 7

- ❑ The condition means that the process of ovulation occurs in cows after the proper time (beyond 12 hour after the end of heat signs).
- ❑ Delayed ovulation is usually associated with aging of both gametes (sperm and ova) and results in reduction of their fertilizing capacity. Therefore, delayed ovulation is usually associated with failure of fertilization.
- ❑ The affected females exhibiting prolonged estrus phase and developed cyclic non-breeding syndrome (regular repeat breeder) despite mating in the proper time (middle of estrum).
- ❑ The condition can be diagnosed by the history and clinical examination (persistence of mature Graffian follicle on surface of the ovary for 1 or 2 days later).
- ❑ The condition can be controlled either by:
 - 1-Application of second insemination by the next day.
 - 2-Administration of GnRH or LH at the time of breeding.

8- Ovarian Cysts (Cystic Ovary)

- ❑ Ovarian cysts can be defined as follicular structures of 2.5 cm in diameter or more that persist on the ovary for at least 10 days up to several months.
- ❑ This syndrome affects all cows ages especially after their 2nd to 5th parturition, and develops most commonly during the second to the seventh week after calving.
- ❑ Four types of cysts can be detected on the ovary(ies) of the affected cases (follicle theca cyst, or follicle lutein cyst, or corpus luteum cyst, or small cystic ovarian degeneration).
- ❑ Behavioral signs of nymphomania (follicle theca cyst) or anestrus (other types of cyst) were found associating cystic ovarian degeneration in the affected cows.



ANESTRUS



- FAILURE OF ESTRUS
 - MOST COMMON CAUSE OF INFERTILITY
- TWO CATEGORIES
 - CLASS I - FUNCTIONAL CL (False anestrus)
 - CLASS II - NO CL (True anestrus)



1. Anestrus:

❖ is a condition when an animal doesn't come to heat and is the most common condition affecting fertility in cattle.

A. True Anestrus:

❖ is when ovary is non-functional and will be devoid of any palpable structures. Anestrus is most commonly observed after parturition and post service when conception does not occur.

Causes:

- ❑ Inadequate or lack of pituitary hormone.
- ❑ Malnutrition. This is the most common cause of anestrus. Inadequate level of carbohydrate, proteins, minerals like P, Cu, Co, Fe etc., and vitamins like vitamin A.

2-Subnormal availability of LH to induce ovulation (anti-LH).

3-Failure in the mechanism controlling LH secretion (GnRH administration).

4-Deficiency in synthesis or release of GnRH was also suggested (GnRH administration).

5-Reduced pituitary-hypothalamus responsiveness to estrogen during the immediate postpartum period (progesterone dominance during pregnancy, supraphysiological concentration of estrogen shortly before calving, most cases develops cystic ovary within 45 days after calving, spontaneous recovery of the cyst, and responsiveness of pituitary and hypothalamus was found to be returned by 4-6 week postpartum).

2- Follicle lutein cysts (22%):

- ❑ It comprises about 23% of the cows affected with cystic ovarian degeneration, but the percentage would be higher than this value because the condition is not associated with abnormal sexual behavior as in follicle theca cyst (nymphomania).
- ❑ Affected cases are anestrus, but spontaneous recovery may occurs.
- ❑ The cyst is firm, less fluctuating than follicle theca cyst, and persists on the ovary without any cyclic changes.

:Nutritional and Managemental causes- 2

A- Feeding high concentrates ration necessary for milk production (urea concentration was found increased in the follicular fluid of cystic follicle).

B- Reduced amount of green feeds in the ration (vitamin A was found reduced in the follicular fluid of cystic follicle).

C- Incidence of cystic ovary was high in stabled cows (lack of exercise, lameness, stress of lactation, reduced exposure to sun light, reduced aeration, crowdedness and heat stress together with postpartum uterine infection).

Symptoms and clinical findings:

1- Follicle theca cyst (75 %):

A-Behavioral and phenotypic changes:

a-Frequent, irregular or continuous heat and bellow frequently

b-Nervous, restless, sexually aggressive, acquires masculine behavior, and mount other cows (Nymphomania).

c-Lose weight and the voice changed to masculine pitch.

d-Relaxation of the pelvic ligaments with the consequent development of sterility hump (elevation of the tail rosette).

e-Edema in the vulva and tail folds together with signs of pneumovagina and presence of grayish white secretion.

f-Sharp decrease in milk production rate due to elevated concentration of estrogen together with reduced appetite.

B- Rectal and vaginal examination:

a-Presence of 1 - 4 thin walled cyst on one or both ovaries(2.5 - 10 cm in diameter).

b-Fallopian tubes are enlarged an relaxed or flaccid.

c-The uterus is enlarged, edematous and flaccid.

d-In longstanding cases, the uterine wall became thin and the lumen became distended with mucoid fluid (hydrometra or mucometra).

e- Endometrial glands exhibite cystic degeneration.

f-Bartholin glands and Gartner ducts became cystic too.

g-Portio vaginal is enlarged, dilated and relaxed together with presence of grayish white mucous.

C-Histopathological changes and fate:

a-Degenerative changes together with partial luteinization occurs in the granulosa cell layer of follicle theca cyst.

b-Progesterone production is increased and estrogen production is reduced.

c-The affected cow went anestrus and the condition might spontaneously recovered.

INFECTIOUS CAUSES OF INFERTILITY IN DOMESTIC ANIMALS

Common Infectious Diseases Affecting Reproduction Are:

- ✦ Endometritis
- ✦ Metritis
- ✦ Pyometra
- ✦ Cervicitis
- ✦ Vaginitis
- ✦ Granular- vulvovaginitis
- ✦ Oophoritis
- ✦ Puerperal Metritis
- ✦ Brucellosis
- ✦ Vibriosis
- ✦ IBR-IPV
- ✦ Leptospirosis
- ✦ Listeriosis

Cervicitis

definition Inflammation of cervix is associated with metritis following abnormal parturition through vaginal contamination.

Symptoms :

external os is edematous , swollen , prolapsed external fold .
Reddish mucopurulent cervical mucosa

Treatment :

- 1- Painting with lugal's iodine
- 3- Uterine douche

Symptoms:

External os is edematous, swollen, prolapsed external folds. Reddish mucopurulent cervical mucosa.

Treatment:

- ✓ Painting with Lugol's iodine.
- ✓ Uterine douche.

Vaginitis:

- ✓ Often secondary to metritis or cervicitis. Also as a result of trauma and laceration.

Causes:

Non-specific infection like Strep.cocci, Staph.cocci, Corynebacterium.

Specific causes like IBR-IPV, Trichomoniasis, and Vibriosis.



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2. Retained foetal membranes

Foetal membranes are normally expelled in 3-6 hours. However, retained foetal membranes (RFM), are retained for more than 24 hours.

Ninety four percent of cows that cleared within 24 h did so in 12 h.

In 50 studies, the median incidence of RFM is 8.6%, (1.3-39.2%).

Why does it occur?

Maternal immunological recognition of foetal antigens class I proteins - which are expressed by trophoblast cells - triggers an immunological inhibitory response that contributes to placental separation at parturition. When calving cows cannot attachment fails to separate at the right time after delivering the calf, retained placenta occurs.

The incidence of retained placenta can be increased by some of factors related to management, health and nutrition.





Pyometra usually develops following,

1. As a sequel to chronic endometritis.
2. Death of the fetus, invasion of the uterus by *A. Pyogenes* and retention of the *corpus Luteum of pregnancy*.
3. Venereal infection with organisms such as *Trichomonas fetus*, which causes embryonic death (infected bull)

Pyometra

1. Open Pyometra. (Discharge from Vagina)
2. Closed Pyometra. (no discharge from Vagina)



Dystocia : consequences and cost of dystocia

- Increased stillbirth rate mortality
- Increased neonatal morbidity
- Increased mortality rate for the dam
- Reduced productivity of the dam
- Reduced subsequent fertility and increased chance of sterility
- Increased likelihood of puerperal disease in the dam
- Increased likelihood of culling

endometritis

"Inflammation of endometrium extending not deeper than the stratum spongiosum is called endometritis".

Clinical signs :

- 1- White or whitish-yellow mucopurulent vaginal discharge comes out when a diseased cow sit down.
- 2- mucopurulent discharge at the time of estrous.
- 3- No signs of systemic illness like septic puerperal metritis.
- 4- Repeat breeding and failure of conception are the most common symptoms of endometritis

Classification :

- 1- **Clinical endometritis**: When the uterine discharge is thrown by the animal, is mucopurulent, it is called clinical endometritis.
- 2 - **Subclinical endometritis**: When the uterine discharge is thrown by the animal is almost clear, but give positive reaction to white side test, this condition is called subclinical endometritis

1. Endometritis

Inflammation of endometrium results:

- ❖ like abortion,
- ❖ retained placenta,
- ❖ premature birth,
- ❖ dystocia

Etiology:

- ✓ Wound on uterine mucosa.
- ✓ Dystocia.
- ✓ Abnormal parturition.
- ✓ Prolapse of uterus or vagina
- ✓ Abortions.
- ✓ Retained placenta,



- ✓ Pre-mature birth,
- ✓ Uterine inertia,
- ✓ Lack of exercise.
- ✓ Delayed uterine involution.
- ✓ Injury during AI.
- ✓ Unhygienic conditions at the time of calving.





- Leptospirosis: Mostly a mild disease that causes high fever, poor appetite, abortion, bloody urine, anemia and off milk.
- Vibriosis: infectious disease that causes infertility and abortion.
- Bovine Trichomoniasis: Spread by infected older bulls and causes early abortions.
- Metritis: Inflammation of the uterus after birth.

Brucellosis

(Contagious abortion, Bang's disease)

- Brucellosis of cattle is an infectious, contagious disease caused by *Brucella abortus* and is characterized by abortion in late pregnancy and a high rate of infertility.
- *B. melitensis* affects goats,
- *B. ovis* sheep and
- *B. suis* swine.
- *B. abortus* may occur in horses.

Treatment:

- ✓ Streptomycin @12mg/kg bid×3d
- ✓ Dihydrostreptomycin @ 25mg/kg i/m.

Listeriosis:

- ✓ Primarily parasite of Central Nervous System causing encephalitis.

Clinical Signs:

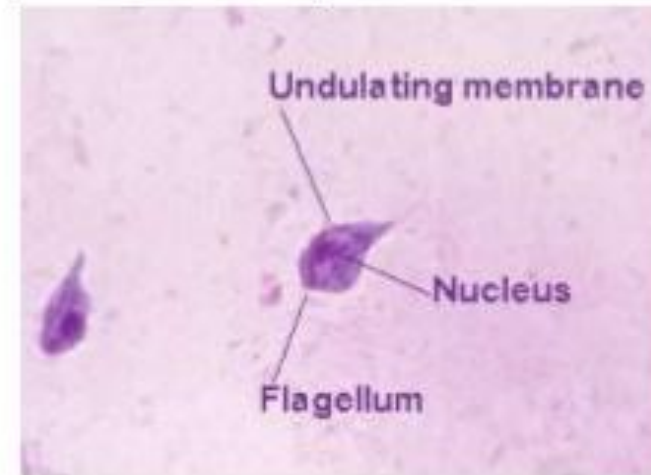
- ✓ Sporadic abortion occurring towards the end of gestation.
- ✓ There may be pyrexia before abortion in some animals. Aborted fetus often has characteristic multiple yellow or grey foci in the liver.

Treatment:

Oxytetracycline or Penicillin.

Trichomoniasis:

- ✓ Venereal disease of cattle caused by a protozoa organism, *Tritrichomonas fetus*.
- ✓ Small, motile organism is found only in the reproductive tract of infected bulls and cows.
- ✓ characterised by low pregnancy rate, a profuse muccoflocculant Vulval discharge, early abortion and pyometra.



Transmission:

- ✓ From infected bull during service
- ✓ Contaminated semen in case of AI.



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6. Abortion

What to do in case of abortion?

First, collect samples to submit to the lab

Save and place the whole foetus and placenta in a clean bag, and refrigerate it as soon as possible.

Paired blood samples may also help to diagnose an active infection in the cow, such as BVD or leptospirosis.

The first one, taken as soon as possible after the abortion is noted.

The second one after 2-4 weeks.

Then, prevent abortion problems

- Establish biosecurity practices to minimise the risk of introducing diseases onto the farm and the spread of disease within the herd.
- Maintain health and immune function of cows.
- Evaluate the feed for mycotoxins and other phytotoxins.
- Check the vaccine programme against infectious diseases that can cause abortions.
- Be careful not to administer drugs that can cause abortions to pregnant cows.
- Focus your attention on the bulls' health status.