

2024 Batch-Lecture No. 17

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Physiology of Gestation..... Continues

NUMBER OF FOETUSES IN THE UTERUS

1. Domestic animals may be divided into two groups with respect to the number of ova normally released at the time of ovulation and therefore the number of foetuses in the uterus.
 - i. Unipara or monotocous animals,
 - ii. Multipara or polytocous animals.

UNIPARA OR MONTOCOUS ANIMALS:

2. Such as mare and the cow; normally have one ovum released at ovulation and one foetus develop in the uterus.
3. Occasionally twins or in exceptional instances triplets or greater numbers of foetuses may be present.
4. This uniparous group of animals is characterized by the presence of a well-developed cervix.
5. The placenta of the single foetus fills both horns and the body of the uterus.
6. The weight of the foetus at the time of parturition is about 10 percent the weight of the postpartum dam.
7. In unipara the large size of the foetus and their long extremities, make dystocia due to wedging of the twins in the pelvis quite common.
8. Sheep are usually classified as unipara but the incidence of twins is so common that the term bipara has been suggested for this species.

MULTIPARA OR POLYTOCOUS ANIMALS:

1. Such as the dog, cat and sow, normally have 3 to 15 or more ova released at each ovulatory period and although an embryonic mortality of 20 to 40 percent commonly may occur during early gestation in these species, usually more than two foetuses are present in the uterus.
2. In unusual cases multipara may have only one viable foetus.
3. In general multipara have a poorly developed cervix.
4. The placenta of each foetus is limited to a portion of the horn.
5. The foetuses are nearly equally distributed between the horns.
6. The foetal membranes of one foetus rarely extend through the body and into the opposite horn.
7. The weight of each foetus at the time of parturition is only 1 to 3 percent of the postpartum weight of the dam.
8. The small size of the uterus and its short extremities make it more bullet shaped.
9. Dystocia due to wedging of the foetuses in the pelvis at parturition is rare.
10. The average number of foetuses usually present in the uterus of multipara are as follows.
Sow: 6-12, Dog variable between breeds-Large dog: 6-10, Medium size: 4-7, and Small dogs: 2-4, Cats: 3-5.

NULLIPARA, PRIMIPARA AND PLURIPARA:

1. Females that have never conceived or carried young are called nullipara.
2. Those that have conceived and have had only one gestation are called Primipara.
3. Females that have conceived two or more times and had two or more gestation periods are called Pluripara.

TWINNING AND MULTIPLE BIRTHS IN UNIPARA:

1. When an uniparous animal aborts or gives birth to two or more fetuses or young they are called twins (2), triplets (3), quadruplets (4), quintuplets (5) or sextuplets (6).
2. In the mare the incidence of twin births is about 0.5 to 1.5 per cent.
3. Double ovulation have been reported to occur in 18 to 20 per cent of the estrous periods of mare.
4. Near all twin equine pregnancies are of fraternal or dizygotic type that rarely an identical or monozygotic twin pregnancy is observed with a single allantois chorion, two separate amnions and with both fetuses of the same sex and markings.
5. The incidence of triplets in mares is reported as about 1 to 300, 000 single births.
6. It has been reported that in
 - i. 95 % of mares with twin ovulation, one or both ova are lost during the early embryonic period,
 - ii. The surviving twin embryos were usually bicornual,
 - iii. Between 7 and 9 months of twin pregnancy, death of both fetuses and abortion is common.
 - iv. Occasionally one embryo or foetus may die, be resorbed, or macerated, mummify or rarely be aborted and the other twin develop normally.
7. The high death rate of twins in mares is due to a competition between the twin fetuses for placental area.
 - i. Although the chorions may fuse anastomosis of the blood vessels does not occur.
 - ii. One chorion invaginates into the other, and in time the smaller foetus dies due to a lack of nutrients and mummifies or both fetuses die and are prematurely expelled.
8. In sheep and goats the incidence of twinning is greatly influenced by the nutritional status of the animal at the time of ovulation as well as the hereditary background of twins in the breed.
9. It has been reported that in Sweden 45 % of ewes had twins, 2.3 % had triplets, 0.1 % had quadruplets or in 1 about 10,000 had quintuplets.
10. It was indicated that under favourable conditions 60 to 70 percent of sheep may have twins, 25 to 30 percent triplets, and 2 percent quadruplets.
11. As low as 2 percent twins are reported as occurring in certain breeds and under less favourable environmental conditions.
12. Primiparous ewes bear twins and triplets much less often than do plriparous ewes.
13. Finnish Landrace sheep normally produce 2 to 4 lambs per pregnancy and large numbers are not uncommon.
14. Garole in India, Booroola merino in Australia and Hans in China and others are multiple birth producing breeds.

GOATS:

1. In goats, about 63.3 % of births are of twins.

CATTLE:

1. Twinning is to some extent a breed characteristic.
2. Twinning rate was lower in primipara than pluripara.
3. A high incidence of infertility associated with double ovulation in cows.
4. While a double ovulation rate of 13.1 % but the incidence of twinning was only 1.92 %.
5. Many multiple conceptions terminate early in the gestation period in embryonic death and absorption and later in abortion or premature birth.
6. It was reported that 90 percent of bovine twin pregnancies were bicornual and 10 percent were unicornual.
7. This is probably a reflection of a higher embryonic death rate in unicornual pregnancy after double ovulation on the same ovary.
8. The incidence of monozygotic or identical bovine twins and dizygotic or fraternal twins to all twins was 4 to 6 % and 93 to 95 %, respectively.
9. The incidence of monozygotic bovine twins to all like-sexed twins was 8 to 12 % or about 10 %.
10. The incidence of monozygous twins to all cattle births was 0.05 to 0.3 per cent.
11. The incidence of monozygotic twins to all twins varied from 0.7 to 18 %.
12. Monozygotic twins arise from one fertilized ovum that divides into two zygotes in the oviduct.
13. Dizygotic twins usually arise from the rupture of two follicles, often one in each ovary, or rarely the rupture of a single follicle containing two ova.
14. Monozygotic twins may occur as members of triplet or greater multiple births.
15. The higher the order of multiple births, the more likely the occurrence of monozygotic pairs.
16. Monozygotic twins are of no value in many types of nutritional, physiological and behavioural experiments in which animals with the same hereditary genes are desired for the evaluation of different environmental factors.
17. Monozygotic twins have similar characters in respect to colour, colour pattern, number of teats, topline, tail, hair whorls, muzzle pattern etc.
18. They are always of the same sex and have the same blood type.
19. Skin or organ grafts survive for an indefinite period when exchanges are performed between monozygotic twins.
20. Dizygotic or fraternal twins bear no greater resemblance to each other than do full siblings.
21. Dizygotic twins have different blood types that frequently show blood chimerism due to early anastomosis of the placental vessels of the two twins and the exchange of primitive erythrocytic cells that become established in birth embryos,
22. Approximately 90 to 92 per cent of all bovine twins develop placental anastomosis.

FREEMARTIN:

1. A freemartin is an infertile female with a modified genital tract born co-twin, or in greater multiples, with a bull with which it has exchanged whole blood.
2. Around 90 % of the female twins are sterile and other were fertile.

3. This infertility is of importance and interest from both the economic as well as the scientific standpoint.
4. The freemartin is one of two dizygotic individuals that are of different sexes and do not resemble each other.
5. Two corpora lutea are invariably present in the ovaries.
6. Judging from statistics on sex ratios the freemartin should be a female.
7. There is rarely any sex intergrading between the freemartin and the male.
8. Freemartins have recently been proven to be of genetic females as they are positive for sex chromatin bodies and their tissue cells have a female, XX, karyotype.
9. Development of the free martin condition was described by indicating that blastodermic vesicles from each developing zygote meet in the uterus by about 18th to 20th day of gestation.
10. The allantois soon meet and by the time the embryo is 28 days old the allantois chorion and blood streams of two placentas have united.
11. This occurs well before sex differentiation, which takes place about 40 to 50 days of gestation.
12. Lillie proposed that the genital structure especially the interstitial cells of the testes, of the male developed earlier than the female ovaries.
13. It was believed that some chemical substance secreted by the male reached the female embryo by way of anastomosing blood vessels in the placenta.
14. This chemical substance, apparently not an androgen as originally believed by Lillie, inhibited the development of the cortex of the undeveloped female gonad and the genital tract.
15. Lillie's humoral or hormonal theory is presently questioned.
16. Since anastomosis of the placental vessels precedes migration of the primordial germ cells from the wall of the yolk sac to the genital ridge, there is the possibility, requiring further confirmation, that migratory primordial germ cells could pass from the male foetus to the female foetus in early pregnancy causing the freemartin condition by the presence of the XY cells in the genital ridge. This is called cellular theory of freemartinism.
17. Some workers indicated that humoral theory is correct with an inductor substance such as "Medullarin" passing from male to the female foetus causing the retention of the medullary cords in the female genital ridge, resulting in atresia ani of the XX germ cells before birth.
18. In freemartins the ovaries usually fail to develop and remain small about the size of a flattened barley grain and undifferentiated.
19. In rare cases some differentiation towards the female or male gonad may occur.
20. The genital tract especially the portion arising from the paramesonephric duct is markedly arrested in development.
21. Often in the region of the cervix the tubular structures or remnants of the mesonephric duct resembling seminal vesicles are present.
22. The vagina is undeveloped.
23. But the vulva is fairly normal except for the occasional presence of a prominent clitoris and a large tuft of vulvar hair.
24. In the yearling animal, no estrous cycles develop.
25. The udder and teats remain very small and the
26. External characteristic resemble a steer.

27. A tube test for the vagina has been developed for detection of a free martin female calf in which positive result with tube test is considered when a tube could be inserted only for 7.5-10 cm while in a normal calf it can be inserted to 12-18 cm.
28. When rectal examination is possible, marked arrest in the development of vagina, cervix, uterus and gonads can be noted. Usually these structures cannot be found on rectal examination or are very minute in free martin calf.
29. Male co-twin although considered to be fertile but testicular degeneration, oligospermia, infertility and sterility have been reported in some co-twins.
30. In other domestic animal, free martin is rare, although few cases have been reported in sheep, pigs & possibly goat, the rarity of this condition in other species may be due to no anastomosis of blood vessel in twin or multiple foetuses in these species.