

CYSTIC CORPORA LUTEA AND LUTEAL CYSTS IN CATTLE

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Introduction:-

There have been relatively few reports concerning cystic corpora lutea. Some of them are contradictory as to its etiology, formation and influence upon reproductive cycle upon reproductive cycle and fertility of the animal.

Controversy also exists as when to consider a corpus luteum cysts. Clinically, the condition is difficult to diagnose. This may be the reason why only relatively few investigations have been carried out. (McEntee & Jubb, 1957). Hensel, in a discussion of McEntee's work, (McEntee, 1958), was of an opinion that cystic corpora lutea were not found in pregnant cattle suggested that inadequate production of progesteron by cystic corpora lutea during early pregnancy may be an important cause of reproductive failure in cattle and may be even more important than cystic follicles as a cause of infertility.

Formation of the normal corpus luteum:-

A brief review on formation of a normal corpus luteum should be helpful in the discussion of cystic corpora lutea.

In the normal development of the corpus luteum, when ovulation takes place, granulosa cells are transformed to luteal cells may also be formed from the theca interna. The mature normal corpus luteum may be either globular or oblong and it

normally bulges somewhat above the ovarian surface. The protruberance usually has a central depression marking the point of rupture of the follicle. The corpus luteum may be as large or even larger than the remaining part of the ovary. The colour change of the corpus luteum is associated with the change in quantity and character of the lipoid material in the lutein cells. (*Salisbury & VanDemark, 1961*). The colour is believed to be that of carotene in the tissue. (*Lagerlof 1967*). When the corpus luteum is first formed it is yellowish brown. Its color changes to old gold by the seventh day, to yellowish orange by the twentieth day, then to orange and finally to bright brick red during involution. (*Salisbury & VanDemark, 1961*) The corpus luteum is brownish during pregnancy (*Settergrea, 1967*). The consistency of the corpus luteum is liver-like but when regressing, rough and fibrotic.

Function of the normal corpus luteum:—

Under the influence of the luteinizing hormone (L.H.) and luteotrophic hormone (L.T.H.) the corpus luteum becomes a temporary endocrine gland secreting progesterone, which prepares the uterine lining for implantation and continuation of pregnancy. It causes growth of the uterine glands, reduces uterine motility and prevents ripening of more follicles and ovulation. Together with estrogens, it also stimulates the growth of the alveoli of the mammary glands, (*Salisbury & VanDemark, 1961*) and depresses L.H. and F.S.H. production by the pituitary gland, (*Roberts, 1956*) Late in pregnancy, it produces another kind of hormone relaxin to cause decalcification at the pelvic girdle and relaxation of the birth canal in guinea pigs. A similar phenomenon occurs in other animals but the basic causes are not wellknown, though presumably are the consequence of a relaxin-like effect of hormones. (*Salisbury & VanDemark, 1961*).

If fertilization and pregnancy take place the production of estrogens by the placenta or the presence of the ovum in the uterus maintains the corpus luteum by stimulating the secretion of luteotropic hormone (LTH) or prolactin from the anterior pituitary gland.

In pregnancy, the corpus luteum does not protrude above the ovarian surface as much as does the corpus luteum in nonpregnancy. It remain essentially the same size until parturition. Removal of the corpus luteum in the pregnancy of less than about 200 days causes abortion in the cow.

In non-pregnant animals, removal of the corpus luteum mostly brings the cows into heat in about 3-5 days.

Lagerlof (1967) is of an opinion that removal of the corpus luteum before attachment of the placenta in the very early embryonic development (approx. before 4-5 weeks) may not cause abortion.

If pregnancy does not occur, then the corpus luteum degenerates and the production of progesterone declines. FSH is again produced and the new follicles begin to grow, followed by pro-estrus. (*Roberts* 1956).

Review of Literatures:-

Williams, W.L. (1921) considered cystic corpora lutea the commonest disease of the ovary, rarely seen the pregnant cow, and "When it does occur, the cyst is usually very small." He observed, from his post-mortem and clinical examination, that it caused adhesion of the ovary and that it could be infection entering the crater of the ruptured follicle.

Williams, W.W. (1964) during 1927-1928, examined about 4000 cows for reproductive fitness and found about 250-300 cases of cystic or retained corpora lutea with less frequency of cystic than retained ones. He noted that larger cysts were found mostly in older animals.

Hancock, J.L. (1948) found in one Guernsey herd of 27 animals, 11 cases of cystic corpora lutea, and 15 cases of cystic follicles.

Asdell, S. et al (1949) noted four corpora lutea from 18 heifers with a pool of fluid inside, ranging from 0.25-1.6 c.c., having 5-15 R.U. of estrogen. Two of which were from unovulated follicles, as there were no visible rupture points.

Lagerlof, N. & S.Hoflund (1949) differentiated luteal cysts from cystic corpora lutea as follows: "Follicular luteal cysts are formed inside unruptured follicles. The content is reddish yellow and the inner wall is covered totally or partially with lutein cells. The wall consists, in addition to this, of theca externa. The corpus luteum is formed from a ruptured follicle, and a cystic corpus luteum is formed from the center of the corpus luteum."

McEntee, K. & K.V. Jubb (1957) found cystic corpora lutea more frequent than cystic follicles, especially in heifers under 2 years of age.

McEntee, K. (1958) found cystic corpora lutea to be 2 1/2 times more frequent than cystic follicles in a slaughter house survey. He observed that large cystic corpora lutea were not found in pregnant animals. He observed that cystic corpora lutea were probably associated with infertility and overlooked.

According to *Dawson, F.L.M.* (1959), from the study in 286 cows, including 274 discarded for failure to breed, 27 cases of cystic corpora lutea were found with average tissue volume of only 37 per cent of normal, a mean cavity diameter of 1.6 cm. and a mean age since last estrus of 13.5 days. 21 cases were said to be accurately diagnosed by rectal examination.

Moberg, R. (1964) stated that cystic degeneration of the corpus luteum was "certainly fairly rare".

Edward, M.J. (1965) found the slaughter house materials, clinically examined before slaughtering, small and large fluid filled cavities of from 0.2-3.2 cm. in 63 of 216 cases in mature diestrus (29.2%) and 4 of 53 regressing corpora lutea in estrus specimens (7.6%). All had ovulation scars.

Author's note:-

During training at Kalmar slaughterhouse, an interesting number of both cystic corpora lutea and luteal cysts was found, approximately 10 per cent of the total female genital organs examined and more frequent than cystic follicles. The exact figures, however, were not noted.

Formation and causes of cystic corpora lutea :-

Willians, W. L. (1921) suspected ascending infection to interfere [normal luteinization and cause cystic corpora lutea. He observed that the cyst occurred on the same side with bursitis and associated with adhesion. He noted that in many sterile animals, luteal cysts advanced rapidly with no material enlargement but the lutein tissue was gradually destroyed until it no longer inhibit ovulation. He indicated that up to 10% of animals with normal ovaries may produce some abnormal corpora lutea.

Hammond. J. (1927) cited Krupski to state that in the stage following blood coagulum, the cavity of the corpus luteum became filled with much fluid if the point of rupture closed before the cavity [is filled with luteal cells. From appearances, the fluid was the same as that of the liquor follicli. After the egg was shed granulosa cells still went on producing this fluid. Not until the capillaries of the corpus luteum became organized that this substance was absorbed into the blood. Under certain abnormal conditions, the resorption might not occur but gave rise to cysts.

Trimberger and Hansel (1955) reported 4 cases of cystic corpora lutea and 8 cases of large corpora lutea in a series of 30 cows given progesterone to control estrus. Rectal examination before the treatment revealed no abnormality of the corpora lutea. The progesterone in the dosage of 50-100 mg./day was injected daily, started at the 15th. day of the cycle for 3-13 days.

McEntee and Jubb (1957) and **McEntee** (1958) assumed that delayed ovulation, failure of ovulation with formation of luteal cysts and cystic follicles were the results of different degrees to which [luteinizing hormone is released from the pituitary. They were of the opinion that cystic corpora lutea were the less severe manifestation of the same basic defects that led to the formation of cystic follicles.

That is the cystic corpus luteum is formed when insufficient LH is released whereas the cystic follicle develops when the pituitary gland releases less or no LH. **McEntee** (1958) described 2 types of cystic corpora lutea: Those formed from the follicles that had ovulated or started to ovulate. This type has a bulged protrusion above the ovarian surface on the ovulated or about to ovulate point. (This type is generally known as *cystic corpora lutea* by many workers: Lagerlof & Hoflund, 1946: Zemjanis, 1962: Hansel, 1964, also stated that ovulation is generally considered a prerequisite for cystic corpora lutea, so they are distinguished from luteinized follicular cysts, at least on developmental grounds.) The cyst cavity of this type is irregular. The other type are those formed from the follicles that failed to rupture. (Generally known as *luteal cysts*) They had a round form with smooth surface, The lutein tissue is crescent in the invaginated portion and the cyst cavity is smooth and spherical.

McEntee (1958) stated that cystic corpora lutea should be produced by administration of estrogens. Two heifers in his study developed cystic corpora lutea after prolonged administration of stilbestrol. Two clinical cases developed cystic corpora lutea following estrogen treatment for the expulsion of mummified fetuses. He cited Carm that cystic follicles most frequently occur between 30 and 90 days following parturition. If cystic corpora lutea were due to the same basic effect, they should also be common at this time.

Hansel & Wagner (1960) experimentally produced cystic corpora lutea in the bovine by oxytocin injections and uterine dilatation.

Staple, McEntee & Hansel (1961) performed an experiment in which embryos were collected 15 days after insemination from 20 of 27 Holstein heifers untreated with oxytocin and those collected per hundred weight. No embryo was recovered from animals with less than 10 mg. of total progesterone in their corpora lutea, The weight of the corpora lutea in the 15 oxytocin treated heifers

which had precocious ovulation was significantly reduced and they contained few normal luteal cells. Ten cystic corpora lutea were found in the treated and one in the untreated heifers. Only 2 heifers with cystic corpora lutea had embryos. Low levels of progesterone were found in cystic corpora lutea and most [were not likely to be associated with live embryos even if some might produce enough progesterone to maintain embryos until the 15th. day. *Hansel*. (1964) stated that higher dosage of oxytocin did not increase incidence of luteal cysts, perhaps inhibition of the developing luteal tissue was more complete. He also found that cystic corpora lutea are slightly less inhibited by the oxytocin treatments than the non-cystic ones.

Moberg (1964) stated that there was some evidence which would point toward the possibility of luteal cysts to be connected with "hyper-progesteronism" *Edwards* (1965) was of an opinion that hormonal derangement alone seemed unlikely to be involved in the formation of the luteal cysts-

High prolactin level during the first few months following parturition was also suspected to possibly be associated with the formation of the luteal and follicular cysts. (*McEntee*, 1958).

Histopathology of cystic corpora lutea :-

McEntee (1963) stated that pathogenesis of the cystic corpus luteum was very probable that it was the same as that of cystic follicles. That is by failure of the hypophysis to release adequate amounts of LH. The two conditions are assumed to have different degrees of the same dysfunction. When pathologic, the luteal cysts are larger in diameter of the cavity. The lutein tissue in the cyst wall does not differ cytologically from the normal, but occurs primarily in the theca interna. The cavity has a well developed lining of the fibrous tissue. *Malven, Hgnsel et al* (1963) fluid and the concentration of which did not appear related to the age of the corpus luteum. The experiment was done by detecting the cystic corpora

lutea per rectum. The cyst fluid was aspirated from the needle introduced through ischio-rectal fossa directed to the ovary by guidance of a hand in the rectum. According to *Hansel* (1964), the total progesterone levels and concentrations [in the cystic corpora lutea from Holstein heifers discovered at days 7 and 11 of the estrous cycle were lower than in the normal corpora lutea. He stated that the biological importance of this lowered level is questionable, since *Staple et al* (1861) found that no embryo was recovered from the animals with less than 100 mg. of total progesterone in their corpora lutea. He found [the average level of progesterone in cystic corpora lutea from heifers untreated with oxytocin at day 11 was well above this figure.

Some cystic corpora lutea of known ages were found to contain very few normal luteal cells with extremely low progesterone concentrations. The lowered level of progesterone in cystic corpora lutea of the untreated heifers may be [evidence of a deranged steroid metabolism more important as a cause of infertility than the lowered progesterone level (*Hansel*, 1964). The presence of variable amounts of estrone and estradiol 17-B and a very small amount of progesterone in the luteal cyst suggests that such may be the case. In vitro studies in which acetate- $1-C^{14}$ was not incorporated into estrogen (*Savard*, K. C., 1963-cited by *Hansel*, 1964 (as personal communication) suggest that the normal bovine corpus luteum does not produce estrogen. However, recent studies indicate that theca derived cells may play an important role in the development of the bovine corpus luteum. If it is so, a normal corpus luteum might be expected to produce estradiol-17-B (*Short*, 1961-cited by *Hansel*, 1964).

Jnbb & McEntee (1955) noted from their study that marked degranulation of delta (gonadotropic) cells which normally occurs during the first hours of estrus was not seen in animals which failed to ovulate and were slaughtered 3 days after estrus. Cows with cystic corpora lutea which were slaughtered later in the

cycle had degranulated delta cells. (McEntee & Jubb, 1957) But this occurred later and not as completely as in the normal animals. The degranulation of acidophils also appeared to lag behind the normal schedule.

Influence of cystic corpora lutea on the normal reproductive cycle:-

It has been generally agreed that the corpora lutea with small cavities do not affect the normal reproductive function. The corpus luteum has a cavity of usually more than 7 mm. in diameter is considered cystic (Hansel, 1964). Williams, W. L. (1921) found luteal cysts advanced quickly and cause irregularity of the estral cycle.

Hancock, (1948) stated that the characteristic cystic corpus luteum was enlarged up to the size of a golf ball, fluctuated slightly, ruptured readily and often showed no evidence of an ovulation point. He stated that such corpora lutea might be active because they were noted in 3 pregnant cows and manual rupture of the cysts did not interrupt the course of pregnancy. However, the ages and termination of pregnancy in those cows were not stated.

McEntee (1957, 1963) found that heifers with cystic corpora lutea had normal length of estrus cycles but pro-estrus and estrus may be irregular. Periods of "silent" estrus may be irregularly interspersed. The condition is repeated in some heifers. Anestrus is not always the feature of the condition.

Zamjanis, (1962) classified ovarian cysts into 3 types: cystic corpora lutea, cystic follicles and luteal cysts. The last two are formed from unovulated follicles. He stated that the first type does not appear to have any influence on the reproductive performance. The type, lined with lutein tissue, always caused anestrus whereas follicular cysts, the 2nd. type caused hyperestrus or marked masculine behaviour.

From the work of McEntee (1958), it is interesting to note the high frequency of cystic corpora lutea in his materials. Pregnant cows did not have any cystic corpora lutea in the samples studied. A few small cavities of not more than 3 mm. were found in the corpora lutea of the pregnant cows. Large cysts may occasionally be found in cows having apparently normal embryos approximately 45 days of age. Many cysts disappeared during the first 2&3 months of pregnancy. In some cases, firm corpora lutea were diagnosed at 80-120 days even though earlier rectal palpation at 40-45 days indicated the presence of cystic corpora lutea.

Willams, W. W. (1964) believed that pathologic large luteal cysts observed mostly in older animals are associated with anestrus but not nymphomania and that retained or cystic corpora lutea retard the development of the follicles in the ovary. Hansel, (1964) is of an opinion that although results of several studies suggest that cystic corpora lutea be a cause of infertility in cattle, relatively little specific information concerning these structures is available,

Diagnosis :-

Clinical diagnosis of cystic corpora lutea is always difficult. When trying to enucleate a corpus luteum, a cystic corpus luteum may be diagnosed as it may rupture and could be felt but, unlike the ovarian follicle which leaves a depression after rupturing, the cystic corpus luteum still leaves a firm mass to be felt after it has ruptured. The luteal cyst (not the cystic corpus luteum) with a big cavity and thin layer of lutein tissue may be confused with a follicle when palpated or ruptured per rectum.

A cystic corpus luteum fluctuates more than a normal one. Post-mortem examination reveals an abnormal cavity (the cavity of more than 7 mm. is considered cystic-Hansel, 1964): The cavity is irregular. It has a protruberance or papilla sometimes with a central depression denoting the ovulation point. A luteal cyst

which is formed from an unruptured follicle is round and smooth without any protuberance above the surface of the ovary. The cavity is also smooth and spherical.

The cystic fluid has amber colour, containing estrone, estradiol-17-B and a very small amount of progesterone.

Symptomatology and anamnesis should always be brought into consideration in diagnosis.

Differential diagnosis:-

Cystic corpora lutea or luteal cysts may be distinguished from cystic follicles by the following differences:

	Cystic Follicles	Cystic corpora lutea
1. Incidence	All ages from puberty to senility, but mostly 30-90 days after par.	More in heifers & young cows. None 45 days.
2. Consistency	Tense	Soft
3. Pressure Required to rupture	Usually more, esp. if thick wall.	Less
4. Nymphomania	Yes or no	No
5. Single or multiple	Frequently multiple	??

The differences between the cystic and the normal or persistent corpora lutea are:

	Normal C.L.	Cystic C.L.
1. Fluctuation	None	Yes
2. Size	Smaller	Usually larger

Prognosis:-

The importance and prognosis of this functional ovarian disturbance is to a great extent still an open question.

Treatment:-

The treatment is done in the same manner as in the cases of persistent corpora lutea. (See seminar on NYMPHOMANIA, F.A.O. International Course).

Dawson, (1959) is of the opinion that no harm is likely to result from the ruptured of a cystic corpus luteum. In certain cases, good effect may be expected.

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