

Embryonic Death in the Bovine Animal: A Review and Diagnosis

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Research and experience in the field have definitely shown that embryonic death is of common occurrence in bovines. Estimates of such deaths have been made as high as 35%. This abnormal development represents a significant interference with normal gestation and results in considerable economic loss to dairymen and beef breeders. If death of embryo occurs early (within 5 to 15 days after service) the female may return to heat within the normal three-week period as if fertilization had not taken place (2). If mortality of the embryo occurs later, the subsequent heat period tends to be delayed beyond the normal cycle.

When a cow is serviced and does not return to heat in the normal three-week period, a temporary assumption might be that she is pregnant. If she returns to heat 6, 9 or 12 weeks later, there exists the possibility that embryonic death has occurred; more likely, it indicates the estrous periods have not been observed. On the other hand, if subsequent heat periods return at irregular intervals, i.e., 28, 33, 54, etc., days after service, embryonic death very likely has occurred. Rarely do heat periods occur while a normal pregnancy exists, however, this phenomenon is observed in about 3% of the cows.

Etiology

Formerly, when breedings were accomplished largely through natural service, it was common experience to observe a substantial number of prolonged intervals between heats in many dairy and beef herds. Some individuals in such herds also revealed early abortions. Many of the embryonic deaths in those days were due to the venereal infections, trichomoniasis and vibriosis.

Following the advent of artificial insemination and a better understanding and control of venereal infections, the picture has undergone great changes. This is not to say the venereal diseases do not still exist, only that their incidence has been markedly reduced. But not to the point where we as bovine practitioners or theriogenologists can ignore them.

Even though the incidence of venereal infections has been greatly reduced and the number of cows being serviced artificially has increased, the fact remains that embryonic deaths continue to occur in both dairy and beef herds. This, of course, means there are other causes of embryonic deaths and/or early abortions.

It has been shown that the healthy, normal cow occasionally will produce an abnormal ovum which may

or may not be capable of fertilization. Following fertilization of the defective egg, a frequent sequela is death of the embryo with subsequent absorption of the uterine contents. A higher percentage of dead or defective eggs tend to be produced by cows which are referred to as hard breeders, and by aged females.

Complete information is not available as to whether defective sperm can fertilize normal eggs and produce normal zygotes. Until such information is available, there is reason to suspect that such a union might well terminate in an abnormal situation. McDonald (13) has found that abnormal embryo development can result from polyspermy (more than one sperm cell enters ovum). Other possible contributing factors to embryonic death are too late breeding during the heat period. Studies have shown that only 30% of embryos were normal at 35 days when inseminations were postponed 6-12 hours after ovulation (5).

Other possible causes are unsuitable environments in the uterine tract, and failure of the corpus luteum to produce sufficient amounts of progesterone to maintain the embryo and early fetus. Limited observations in our practice have revealed a higher percentage of embryonic deaths (about 35%) occurred when the corpus luteum was situated in the ovary opposite the pregnant horn. I have no explanation for this finding. There probably are still other unknown factors that cause or contribute to embryonic death in cattle.

A preliminary report of a National Association of Artificial Breeders' research project (6) on semen processing shows that once semen is deposited in the uterus, a high proportion of the sperm are unrecoverable after one to four hours and thus are unavailable for fertilization. The major cause of their rapid disappearance is believed to be due to leukocytes, particularly neutrophils which are abundant in the uterus during the heat period. It has been observed that one white blood cell may ingest as many as three sperm. It has also been observed that the disappearance of sperm from the uterus is not equal for different males or for sperm stored frozen as compared to liquid.

By the time the project is completed, workers hope to be able to answer such important questions as, do leukocytes distinguish live sperm from dead or injured from healthy? Which semen quality tests, if any, reflect the rate of sperm removed by leukocytes? What effects do males or methods of processing semen have on phagocytosis? These studies along

with other related projects in progress should provide even better understanding of the multiple factors involved in normal and abnormal reproductive problems.

Diagnosis

Accurately diagnosing pregnancy during all stages of gestation as well as recognizing other physiological and pathological conditions in the uterine tract are important items for consideration by the practicing theriogenologist as he carries on a reproductive herd health program. Diagnosis of approaching death, and death of the embryo must become a part of our armament if we are to render superior service to our clients.

Except for the excellent, but brief statement on diagnosis of embryonic death by Dr. Steven Roberts in his tremendous book, *Veterinary Obstetrics & Genital Diseases*, I am unaware of attempts to describe such findings encountered on palpation of the reproductive tract. It is important to differentiate the findings in the uterus which contains a normal embryo or fetus as compared with one in which the uterine contents contain an abnormal pregnancy. In as practical way as possible, I will attempt to briefly list some of the normal and abnormal findings.

Let us start with the cow that is normally pregnant 30-40 days. The horn carrying the embryo is slightly larger; it contains membranes and slightly more fluid than the non-pregnant horn. All structures can be palpated including the amnionic vesicle (single pregnancy). The vesicle is round (pea-like), has a firm wall and is larger at 40 days than at 30 days. The vesicle is usually located in the middle third of the uterine horn. Occasionally it is found near the tip, or near or in the bifurcation (body of uterus).

If the vesicle is absent, you have a right to assume resorption or destruction of the embryo has taken place. Before the diagnosis is definitely pronounced, however, it is imperative that a careful and complete search of the uterus be made. The entire length of both horns and bifurcation should be carefully and gently palpated. The corpus luteum of the ovary is invariably located on the side of the pregnant horn. However, it should be recognized that in about one out of 4,000 pregnancies, the ovary containing the corpus luteum will be located on the opposite side of the pregnant horn (4).

If numerous palpations are performed, expect to occasionally encounter a vesicle with a very thin wall which collapses with the slightest touch. This phenomenon indicates embryonic death has occurred. When the palpation reveals fluid only—membranes and vesicle absent—you very likely are dealing

either with a case of hydrometra, mucometra or pyometra. With experience, these conditions can be diagnosed without difficulty.

Now let us assume we are palpating a cow with a normal pregnancy of about 50-55 days. All structures can be readily palpated. The horns will, of course, be correspondingly larger than when a more recent pregnancy examination is made. The uterus will contain more fluid and the amnionic vesicle at this stage also will be larger. The vesicle will be oblong in shape and its wall will be softer or more resilient than the vesicle at, say, 35 days.

If embryonic or fetal death has or is occurring at this stage, structural changes will be encountered. Either the vesicle and embryo or young fetus will have disappeared, become liquefied, or parts of the vesicular wall will be discernible. The dead embryo or small fetus can sometimes be palpated as irregularly shaped, desiccated tissue. When embryonic or fetal death has occurred, the fluid content becomes diminished in volume and the uterine horns will subsequently undergo contraction. As a consequence, the fetal membranes become wrinkled, which on palpation usually presents a squishy feel. This "feel" is very diagnostic of the condition in question. It is apparent the stages of defective development as well as the stage of gestation will present various deviations which can be fairly accurately determined.

When abnormal development can be definitely diagnosed, treatment for ridding the uterine contents should be administered so that the tract may be properly prepared for a new beginning as soon as possible. If, however, a definite decision cannot be made, it is advisable to re-examine the cow at a later date or leave instructions with the owner in case the animal returns to heat.

As pointed out at the annual AABP meeting in St. Louis, December, 1977 (1), it is very important that all palpations of the reproductive tract be made with gentle care and judgment to avoid dislocation and trauma, especially to the amnionic vesicle and in the process of "slipping membranes" in the diagnosis of pregnancy.

References

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