Abortion in Dairy Cattle Placed in Proper Perspective

Charles D. Gibson, *D.V.M., Ph.D.*
Department of Large Animal Surgery and Medicine
Michigan State University
East Lansing, Michigan 48824

Introduction

Abortion problems in the well-managed dairy herd today are of a self-limiting nature in most cases. However, the problem of abortion is a highly visible one to the client, and as a result you, as a practitioner, are involved with an upset client who wants answers quickly. The economic importance of abortion in a well-managed herd, vaccinated for prevention of endemic diseases, appears very low compared to the economic losses from embryonic mortality and fertilization failure in reproductive dysgenesis.

Fertilization failure, embryonic mortality and abortion prevent the delivery of calves in 35% to 50% of the matings (1,2,7). Fertilization failure and embryonic mortality are the major factors and these two account for 30% to 45% of the total loss while abortion losses account for less than 5% in most herds (3). Diagnostic problems with identifying the cause as well as the low visibility of the fertilization failures and embryonic losses cause difficulty in evaluating these herd reproductive problems. The veterinarian should be aware of the economic impact of these two areas on reproductive efficiency when dealing with herd problems.

Fertilization failure is defined for the purpose of this presentation as all events leading up to and including fertilization of the egg by the sperm cell. Genetic defects, infectious diseases and environmental factors all contribute to fertilization failures. Genetic factors are nearly impossible to evaluate; however, direct evidence of lethal and sublethal factors have indicated that genetic factors do play a role in fertilization failures (7). Major environmental factors which cause fertilization failures include inaccurate estrus detection, poor semen quality, not mating or inseminating near the time ovulation occurs, and the improper use of hormones. Infectious diseases such as metritis also interfere with fertilization, however, it is difficult to separate losses from early embryonic death and those caused by fertilization failure. Although fertilization failures are difficult to identify directly, they appear to account for up to 40% of the total reproductive failures in the typical herd.

Embryonic Mortality

Embryonic mortality is defined as loss of the embryo from the time of fertilization to day 45 of gestation. Losses due to embryonic mortality are difficult to separate from fertilization failures because indirect methods must be used to identify pregnancy during the first 25 to 30 days of gestation. Measures of reproductive efficiency such as services/conception and 60-day non-return rates cannot be used to separate losses from embryonic mortality and fertilization failure. Recently the development of the milk progesterone assay as a tool to identify early pregnancies appears to allow a more objective separation of fertilization failures from embryonic mortality losses.

The data in Table 1 show the 28- and 75-day postbreeding non-return rates for dairy cattle in a recent New York study. The average percentage of animals not returning for a second mating with 28 days was 85.2%, 89.2% and 68.8% for cows, heifers, and a research herd, respectively. This data indicates conception rates were lowest in the research herd; however, estrus detection in this herd was aided by monitoring progesterone changes. Therefore, more accurate identification of cows returning to estrus probably accounted for the 16% to 20% decrease in the number of cows not detected in estrus by 28 days after breeding. The differences between the 28- and 75-day non-returns were 12.5%, 7.6% and 22.7% for these three groups, respectively. Failure to detect estrus and embryonic mortality appear to be the major factors causing this decrease in the percentage of cows not returning to estrus between 28 and 75 days postbreeding. If embryonic mortality is considered to be relatively stable, then efficiency of estrus detection would be the major variable accounting for differences in non-return rates observed in these three groups.

In another study, progesterone values were used to estimate embryonic losses in two herds. Conception was assumed to have occurred in cows which had serum progesterone elevated for 28 days or more postbreeding indicating the conceptus prevented the expected luteolysis at 17 to 20 postbreeding. Based on these criteria the embryonic losses were 4.7% and 5.1% in these two herds (Table 2). The combined losses from fertilization failures and embryonic mortality have been demonstrated to equal 30% to 50% of

the cows mated (4,5).

Abortion

Abortion is defined as death of the fetus from 45 days to term. Surveys have shown the abortion rate in New York state ranged from 2.5% in herds using artificial insemination to 5.0% in herds using natural mating (6). It appears reasonable to assume any herd experiencing greater than a 5.0% abortion rate may have an abortion problem and intensive investigation is warranted. The identification of the causative agent in cases of abortion is difficult. Successful identification of the causative agent was reported in 25% of the abortion cases submitted to diagnostic laboratories in the United States (2,3,6). The combined effect of low abortion rates and unsuccessful diagnostic efforts indicate the practitioner should carefully evaluate the clinical situation and plan a course of action before proceeding with intensive diagnostic efforts. The client also needs to be aware of the diagnostic problems associated with identifying agents causing abortions and the non-preventable (normal) abortion rate.

Although some abortions appear non-preventable, many abortions are caused by diseases, thus preventive measures should be the primary goal in any herd health program. Immunization of the herd on a regularly scheduled program is an important consideration in the prevention of abortion storms from leptospirosis and IBR. These two diseases are most often reported as the causes of abortions from diagnostic laboratories. Although mycotic abortions are reported by laboratories, these are usually self-limiting (3,6).

Practitioner's Approach to Reproduction Problems

Identifying the problem herd. The identification of herds with problems can be difficult and should be based on the following criteria: 1) abortion rate above 5.0%; 2) more than 15% of the breeding age females in a herd not pregnant because of reproductive problems; and 3) services/conception greater than 1.65% indicating abnormally high embryonic mortality, fertilization failure, or not breeding at the correct time.

Collection of history. The herd history offers invaluable clues to aid in identifying the cause or causes or reproductive problems. The herd history should include: 1) Total number of adult cattle. 2) Any additions to herd in past 12 months. 3) Current disease status of herd. 4) Current vaccination status. 5) Percentage of cows not pregnant within 100 days after parturition. 6) Number of and stage of gestation when abortions were detected within the past 3 months. 7) Percentage of cows with retained placentas in past year. 8) Percentage of cows with uterine discharge and/or metritis. 9) Number and type of malformed calves. 10) Number of weak calves or stillborn calves in past year. Individual case history may be important in arriving at a diagnosis in addition to herd data. Important information to collect on problem animals are: 1) number of previous calves; 2) any previous breeding difficulty; 3) services/conceptions; 4) sires used; and 5) artificial insemination or natural service.

Calculated herd data. All parameters of reproduction efficiency should be evaluated in attempting to resolve a herd reproduction problem including: 1) the average services/conception; 2) the average calving interval; 3) the annual abortion rate; 4) the average estrus interval; 5) the percentage of calves born alive; and 6) the annual calving percentage.

Collection and submission of samples to diagnostic laboratory. In cases involving abortions, the following tissues should be submitted if entire fetus and placenta cannot be delivered to the laboratory: *Frozen or refrigerated* 1) Fetal abomasal contents (1-3 ml in sterile syringe). 2) Fetal kidney, lung and liver and placenta tissue. *Formalin fixed* 1) Fetal lung, liver, kidney and any other organs with gross lesions for histological examination. 2) Placenta (include at least 2 cotyledons). *Sera* 1) Fetal heart sera. 2) Dam's sera.

Evaluation of data. The identity of the problem may be easily determined by the practitioner during the process of collecting the herd history, physical examinations of problem animals and/or a study of results from diagnostic laboratories. However, many times practitioners will be challenged to use all available information on a herd with reproductive problems to identify the cause or causes. Thus, integration of all available herd data is the function of a practitioner in making the final diagnosis and designing preventive procedures.

Summary

The relative magnitude of fertilization failure and embryonic mortality (>30%) when compared to abortion (<5%) in the total scope of reproductive failure dictates a need to change the attitude and priority of veterinarians regarding herd reproduction problems. We need to place a high priority on research efforts to identify causes of fertilization failure and embryonic mortality. The development of objective methods for analysis of these losses is important. The milk progesterone assay is one example of a new research tool for the study of early conception failures.

In spite of the relatively low incidence, abortion problems have historically posed a serious dilemma for the veterinarian. The client is upset by the event and expects to have answers which are quite difficult, expensive and sometimes impossible to obtain. The abortion syndrome in most cases is limited to individual animals. A positive determination of the causative agent can be confirmed in about 25% of the cases if samples are submitted to the diagnostic laboratory. Diagnostic laboratories have been unfairly criticized in many cases because of their failure to identify the agent responsible for the abortion in about 75% of the submitted cases. Practitioners have to assume some responsibility for perpetuating the

false assumption that answers to abortion problems are easily obtained by the submission of samples to the laboratory.

The role of the practitioner should be to educate the client to the problems of diagnosis as well as indicating many of the spontaneously occurring abortions cannot be prevented. This is especially true if single abortion events ossur without other clinical symptoms as in the case of mycotic abortions which are generally self-limiting. The practitioners should also educate clients about practices which can prevent many reproductive diseases. A good client education program must include all areas of preventive medicine including genetic problems, herd nutrition, management factors and infectious diseases. Establishing effective immunization programs should be the goal of every practitioner.

The final goal of these efforts should be a well-educated clientele who understand the problems of reproductive failure and as a result are able to reduce the factors over which they have some control. The well-educated client is the best client and should be the goal of every practitioner-client relationship.

References

1. Graden, A. P., Olds, Durward, Mochow, C. R., and Mutter, L. R. Causes of Fertilization Failure in Repeat Breeding Cattle. J. Dairy Sci. 51, (1968): 778. - 2. Hubbert, W. T., Booth, G. D., Bolton, W. D., Dunne, H. W., McEntee, K., Smith, R. E., and Tourtellotte, M. E. Bovine Abortions in Five Northeastern States, 1960-1970: Evaluation of Diagnostic Laboratory Data. The Cornell Vet. 63, (1973): 291. - 3. Kirkbride, C. A. Abortive Diseases of Cattle: Their Significance and Prevalence. Proc. Soc. Theriogenology Annual Meeting, 1977 (in press). - 4. Kummerfeld, H. L., Oltenacu, E. A. B., and Foote, R. H. Non-returns, Estrous Detection and Cyclic Milk Progesterone as Indicators of Embryonic Mortality in Dairy Cows. Abst. Proc. Soc. Anim. Sci., (1977): 181. - 5. Mather, Edward C. Milk Steroid Studies and Their Use in Fertility Examination. Proc. Soc. Theriogenology Annual Meeting, 1977 (in press). - 6. McEntee, Kenneth. Diagnosis of Abortion in Cattle. Proc. 5th Annual Convention Amer. Assoc. Bovine Pract., (1972): 54. - 7. Miller, R. B. The Pathogenesis of Bovine Abortion. 68th Annual Conference for Veterinarians, 1976.

Table 1
Non-Return Rates in Dairy Cattle

	Commercial Herds*		Research Herds**
Days Post-Breeding	Cows (350,180)	Heifers (25,368)	Cows (221)
28	85.2%	89.2%	68.8%
75	72.7%	81.6%	46.1%
Difference	12.5%	7.6%	22.7%

*Estrus detected by observation.
**Estrus detected by observation and progesterone.
From: Kummerfeld, *et al.*, 69th A.S.A.S. Abst. 453, 1977.

Table 2
Embryonic Loss* in Dairy Cows

	Herd 1	Herd 2
Number of Cows	43	156
Embryo loss (%)	4.7	5.1

*Based on 3 times weekly progesterone values (embryonic loss = elevated progesterone for 28 days or more post-breeding before decreasing).

From: Kummerfeld, *et al.*, 69th A.S.A.S. Abst. 453, 1977.