# Use of Milk Progesterone Testing for Problem Cows

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## Introduction

Knowledge of a cow's ovarian status can be very useful in not only the daily reproductive management of dairy cows, but also in supplementing diagnosis of herd reproductive problems. Milk or blood progesterone levels can provide an accurate diagnosis of bovine ovarian status. Technology to measure progesterone levels in blood and milk has been available in this research laboratory for approximately 15 years. During this time, scientists have collected some of the background information necessary to use progesterone analysis for reproductive management of dairy cattle. A commercial laboratory to measure progesterone was initiated by the New York Dairy Herd Improvement Association, however, the laboratory has not analyzed enough samples to justify continuation of the progesterone analysis as was orginally intended. The primary problem, was that turn-around time for sample analysis was too long to provide results in a timely manner for action of a specific cow by a producer. Experience in New York demonstrated that a cow-side test was needed for progesterone.

Accurate and easy to use cow-side milk progesterone assays (MPA) are an important technological advance. They represent the greatest potential for improvement of dairy cow reproductive management since introduction of prostaglandin-F-2-Alpha as a leutolytic agent. The assay not only allows a veterinarian and his/her client to diagnose the cause(s) of herd-wide reproductive problems, but it also can aid in the producer management of individual problem cows and the veterinarian's therapy of those cows. If properly used, cow-side MPAs can facilitate services offered by a veterinarian and improve the profitability of a client's dairy herd.

Effective use of the cow-side MPA requires that the dairy producer be adequately trained both in the procedures for conducting the test and in reproductive management of dairy cattle. Currently, the University of Maryland Cooperative Extension Service is conducting an educational program to train dairy producers. This educational program has two components in the University's Dairy Profitable and Efficient Production (PEP) Program: The Dairy Integrated Reproductive Management Producer Workshops and the PEP Demonstration Dairy Herds. The workshops will provide producers with not only the background information and training in use of the MPA, but also in other aspects of reproductive management of dairy cattle necessary for effective use of the test. The PEP Demonstration Herds are intended to increase statewide producer awareness of the test and to emphasize the factors important for successful test use.

**Education of the client by the veterinarian concerning the test's use(s) in that client's herd is an important factor contributing to the effective use of the MPA. Use of some or all of the University's education programs for the test by veterinarians is encouraged, and these programs, or materials from these programs, are available from Dr. J. E. Manspeaker, VA-MD Regional College of Veterinary Medicine, The University of Maryland Campus, College Park, MD 20742.**

## Milk Progesterone Assay Principles

Progesterone levels in milk parallel those of blood, and can be used as an indicator of corpus luteum (CL) function in dairy cows. The MPA can be used with a spectrophotometer to quantitatively measure progesterone. Spectrophotometers are expensive, thus preventing use by most dairy producers. However, a cow-side test that requires no sophisticated equipment has many potential uses of reproductive management of a dairy herd. The cow-side test has a lower level of precision, and is only able to determine three progesterone levels: luteal, follicular, and an intermediate level. Interpretation of the intermediate level varies according to the physiological state of the cow.

The MPA is an enzyme linked immunosorbant assay (ELISA), which utilizes the principle of competitive absorbtion to binding sites on an antibody that is specific for progesterone. Progesterone in milk competes with progesterone that is covalently bound to an enzyme for the antibody binding sites. The more progesterone in the milk, the less progesterone enzyme that ends up bound to the antibody. After separation of the antibody from the milk, enzyme substrates and cofactors are added and color development takes place. The amount of color development

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is inversely proportional to the amount of progesterone in the milk. In other words, follicular levels of progesterone would result in dark color development and luteal levels of progesterone result in light color development. Procedures for assay use are specific for the company producing the test, however the principle of the test is the same.

### Use of Assay for Herd-Wide Problems

*A. Infertility*

Infertility problems, on a herd-wide basis, are a common problem on dairy farms. The cause(s) of infertility are sometimes difficult to diagnose. In other cases, dairy producers perceive that an infertility problem is present in the herd, when in fact the cause of the cow's reproductive inefficiency is really in another area of reproductive management. A herd-wide screening method for infertility and a common definition for fertility are needed. Infertility can be defined as a high number of breedings or services per pregnant animal. Cut off points for what is too many breedings per pregnant animal vary, but a common cut off point that is used to define an infertile or repeat breeder cow is three services. Many indexes of fertility exist, but two common indexes are available. Two of these indexes are average percentage of cows with two or fewer breedings and three or more breedings and the average services per conception. Maryland state Dairy Herd Improvement (DHI) averages are in Table 1. These averages can be used as a screening tool to determine if a herd has an overall fertility problem.

Many factors can contribute to herd-wide infertility problems. Effective problem solving techniques for dealing with infertility problems use a step-wise approach to determine factor(s) that are contributing to the overall infertility. The first step in solving infertility or repeat breeder problems is to assure that the estrus detection program is accurate. Milk samples collected on the day of breeding can be used to evaluate the accuracy of a heat detection program for a dairy herd. Milk samples should not be analyzed on a cow-side basis, so as not to influence the decision of whether or not to breed a cow. Oltner and Edqvist have examined milk progesterone levels on the day of breeding in over 200 cows. Their data can be used as reference point to determine what an acceptable error rate might be in an average estrus detection program. The interpretation of MPA results from samples collected on the day of breeding and the percentage of cows in each category are in Table 2.

TABLE 1. Percentage of cows in various categories with two or fewer breedings, percentage of cows in various categories with greater than two breedings, and average number of breedings for cows in various categories.*

| Category of cows | Percentage of Cows: Two or Fewer | Percentage of Cows: Three or More | Average Number Services |
|---|---|---|---|
| Pregnant Cows | 74.9% | 25.1% | 2.01** |
| Bred but Open Cows | 70.5% | 29.5% | 2.21*** |
| Total | 73.6% | 26.4% | 2.11 |

* Data summarized from Maryland Dairy Herd Improvement (DHI) State Summaries 7/84—6/85.
** Services per Conception from Provo System DHI Herd Summary Sheet.
*** Services per Cow from Provo System DHI Herd Summary Sheet.

TABLE 2. Interpretation of MPA results from samples collected on day of artificial insemination and the percentage of cows in each interpretation category.

| Progesterone Level | Interpretation | % of Cows* |
|---|---|---|
| High | Error in estrus detection | 3% |
| In Between | Error in estrus detection | 4% |
| Low | Accurate estrus detection | 93% |

* Source: Oltner and Edqvist, 1981.

Estrus detection accuracy was examined in over 400 dairy herds in the Northeast United States (Reimers et al, 1985). The average error rate (cows inseminated on a day that milk progesterone level was high) was 5%, similar to other studies (Oltner and Edqvist, 1981). There was a broad range in error rates of herds (0% to 60%). The distribution of error rates in Northeast dairy herds are in Table 3.

TABLE 3. Accuracy of estrus detection programs in Northeast dairy herds.*

| Error Rate** | Percent of Herds |
|---|---|
| 0% | 61% |
| <10% | 9% |
| 10-19% | 22% |
| >19% | 9% |

* 4558 Cows in 420 herds (Source: Remers etal, 1985).
** Percent Cows with high milk progesterone levels on day of breeding.

Several interesting findings concerning estrus detection accuracy were reported by Reimers et al. Estrus detection error rate was higher in herds housed in free stalls than conventional tie-stall, stanchion or loose housing barns. Error rate was not influenced by herd size, however. The primary sign of estrus (standing to be mounted) and secondary signs of estrus (riding other cows and partially and fully triggered pressure sensitive heat mount patches) were recorded on all cows. Partially triggered heat mount detectors had a 20% error rate, while fully triggered detectors had a 10% error rate. Standing to be mounted or riding other cows only had a 2% error rate, demonstrating that the use of estrus detection aid should be used only on selected cows and not on a herd-wide basis.

Estrus detection error rate were examined in herds known by veterinarians to be problem breeding herds and compared to herds considered to have normal fertility. Error rate in problem breeding herds was almost double the

rate in normal herds (7.5% vs 4.0%). Problem breeding herds had lower conception rates than did normal herds, even when breedings that occurred on days of high milk progesterone levels were excluded, suggesting that fertility of cows in problem breeding herds was lower and that the increased estrus detection error rate accounted for only a portion of the herd-wide infertility problem. Individual cows considered to be problem breeders also had a much higher estrus detection rate than did cows of normal fertility (18.4% vs 4.0%). However, these cows with high progesterone levels would not be expected to conceive, confounding the statistical comparison of normal and problem breeding cows which was based solely on number of breedings.

The second step in solving herd-wide infertility problems is to determine the pregnancy rates at 20-22 and 27-28 days post breeding. Cows with milk samples collected on day of breeding should also have paired milk samples collected at 20-22 and 27-28 days post breeding. Interpretation of milk progesterone results from samples collected 20-22 days post breeding are in Table 4.

TABLE 4. Interpretation of milk progesterone results from samples collected 20-22 days post artificial insemination.

| Progesterone Level | Interpretation | % of Cows | % Accurate |
|---|---|---|---|
| Low | Not Pregnant | 21% | 94-100% |
| In Between | Not Pregnant | 2% | |
| High | Pregnant | 77% | 60-88% |

Source: Booth etal, 1979

Accuracy of milk progesterone results in Table 4 are based on studies by Booth et al, 1979; Bulman and Lamming, 1979; Kummerfeld et al, 1978; Nakao et al, 1982; and Zaied et al, 1979.

Interpretation of milk progesterone results from samples collected 27-28 day post breeding are in Table 5. Accuracy estimates are based upon Zaied et al, 1979 and are based upon analyses from over 200 cows.

Embryonic mortality can be defined as pregnancies that are lost prior to determination of pregnancy via a classification or examination method, such as rectal palpation, non-return rate, or milk progesterone analysis. Abortion can be defined as pregnancies that are lost after the cow has been determined to be pregnant by some method. Estimates of embryonic mortality and abortion rates vary widely. Some

TABLE 5. Interpretation of milk progesterone results from samples collected 27-28 days post artificial insemination.

| Progesterone Level | | | | |
|---|---|---|---|---|
| Day 20-22 | Day 27-28 | Interpretation | % Cows | % Accuracy |
| High | Low | Not Pregnant | 19% | 100% |
| High | In Between | Not Pregnant | | |
| High | High | Pregnant | 81% | 95% |

Source Zaied etal, 1979. Percent cows is based on cows pregnant at 20-22 days post breeding only.

of the variation in estimates may be due to differing methodology, and some variation exists in studies using the same methodology. Milk progesterone analysis has allowed pregnancy to be estimated at an earlier time post breeding than previously available, and has also provided a more accurate estimate of embryonic mortality and abortion rates. A survey of studies estimating embryonic mortality via a variety of methods is summarized in Table 6.

TABLE 6. A list of studies that estimated embryonic mortality via different methods.

| Research Study | Estimation Method | Embryonic Mortality Rate |
|---|---|---|
| Kummerfeld etal | 3/Week Milk Samples* | 7.2% |
| Kummerfeld etal | Non Return Rate | 22.7% |
| Bulman and Lamming | 2/Week Milk Samples* | 12.0% |
| Nakao etal | 1 Milk Sample** | 27.9% |
| Zaied etal | 1 Milk Sample** | 23.0% |
| Zaied etal | 2 Milk Samples*** | 5.0% |

* Milk samples collected from insemination until 60 days post breeding.
** Single milk sample collected 20-22 days post breeding.
*** Milk samples collected 20-22 days and 27-28 days post breeding.

Review of the studies estimating embryonic mortality reveal an interesting trend. Increasing the precision of pregnancy determination via frequent milk progesterone analysis lowers the embryonic mortality estimate. In general, the most precise estimates of embryonic mortality are all near 10% or below, and the least precise estimates are over 20%. This trend has two important implications. First, a veterinarian estimating embryonic mortality in a client's herd should make comparisons only with studies that utilize the same methodology. Second, the number of days post breeding that pregnancy is terminated and abortion occurs may be used to identify the most likely cause of the abortions. Interpretation of trends in milk progesterone anaylsis are summarized in Table 7.

TABLE 7. Interpretation of trends in milk progesterone analysis from samples collected on days 20-22 and 27-28 post breeding from cows accurately detected in estrus.

| Pregnancy Rate | | Possible Infertility Causes |
|---|---|---|
| Day 20-22* | Day 27-28** | |
| Low | High or Adequate | Poor AI Technique<br>Inadequate Nutrition<br>Established Metritis |
| High or Adequate | Low | Infection Introduced At Time Of Insemination |
| High or Adequate | High or Adequate | Infectious Abortions |

* Pregnancy rate at Day 20-22 post breeding of cows with low milk progesterone levels on day of breeding.
** Pregnancy rate at Day 27-28 post breeding of cows with high milk progesterone levels at Day 20-22 post breeding.

Low pregnancy rates at 20-22 days post breeding suggest that conception never occurred, and that the cause(s) of infertility are related to improper artificial insemination technique, poor nutrition, or established uterine endometrial problems, such as chronic metritis. Adequate to high pregnancy rates at 20-22 days post breeding and low pregnancy rates at 27-28 days post breeding suggest that something is occurring at the time of artificial insemination to contaminate the uterus, such as Ureaplasma organisms or improper sanitation of AI rods. High abortion rates occurring after 28 days post breeding are indicative of infectious abortive organisms. Further, milk progesterone analysis can pinpoint timing patterns of abortion that may be indicative of a given disease.

### Use of Assay for Herd-Wide Problems

*B. Anestrous*

Many dairy producers often complain that cows are not observed in estrus prior to the time they wish to breed cows for the first time. The usual cause of this problem, as ascribed by the producer, is anestrous. One possible cause of the problem is cystic follicles, but the most common cause is unobserved estrus in cows that are cycling normally. Paired milk samples, collected at 27 and 35 days postpartum, can be used in conjunction with rectal palpation of the ovaries to estimate the anestrous and cystic follicle rates of a herd. Interpretation of milk progesterone and palpation results is summarized in Table 8.

TABLE 8. Interpretation of milk progesterone results from samples collected at 27 and 35 days postpartum in conjunction with ovarian size based on rectal palpation.

| Progesterone Level | | Ovarian | | |
|---|---|---|---|---|
| Day 28 | Day 35 | Size | Interpretation | % of Cows* |
| Low | Low | Small | Anestrous | 12% |
| Low | Low | Normal | Cystic Follicle | 10% |
| Low | High | Variable | Cycling Normally | ** |
| High | Low | Variable | Cycling Normally | ** |
| High | High | Variable | Cycling Normally | ** |

* Sources: Ball and Lamming, 1983 and Coleman etal, 1985.
** 78% of all cows cycling normally.

Occurrence of herd-wide anestrous problems are rare, even though many dairy producers believe they have such a problem. The MPA can provide a veterinarian with a tool to directly demonstrate to the dairy producer that the cows are cycling normally. Causes of herd-wide anestrous problems are usually nutritionally related, with a shortage of energy in the diet being the most likely direct cause. Solving these problems can usually be accomplished by balancing ration and ensuring that estimates of feed intake are accurate. Producers sometimes have a ration balanced for an estimated intake level that is too high for the herd.

### Use Of Assay for Herd-Wide Problems

*C. Inefficient Estrus Detection*

Inefficient detection of estrus is the most common reproductive problem in dairy herds. Many producers do not believe that such a problem exists, and the MPA can be used to estimate estrus detection efficiency and demonstrate to the producer that the estrus detection rate is a problem. Previous methods that have been used to estimate estrus detection efficiency require frequent sampling (Varner et al, 1983), however, an alternative has been proposed that requires less milk sampling (Bulman and Lamming, 1979). Milk samples are collected every 10 days from all open cows from day 25 postpartum until pregnancy is confirmed . The percentage of low milk progesterone values when an estrus was observed (within 2 days either before or after the milk sample was collected) is calculated. Observed estrus periods without a milk sample collected within 2 days of the estrus are excluded. While some observed estrus periods are missed by this sampling regime, a proportional number of unobserved are also missed, resulting in an accurate estimate of estrus detection efficiency. Excellent estrus detection rates are rates over 80% of potential estrus periods detected. An adequate estrus detection rate is in the range of 66-79%. A moderate problem would be rates between 50-65%, and any herd with an estrus detection efficiency rate of under 50% would be considered to have a serious problem (Varner et al, 1984).

### Use of Assay for Individual Cow Problems

*A. Confirmation of Estrus*

One of the most important uses of the cow-side MPA can be confirmation of estrus for cows that have questionable signs of estrus. The importance of this was highlighted by the retrospective study of Oltner and Edqvist, 1981. Milk progesterone results were not available at the time of breeding, so as to not influence the decision of whether or not to inseminate. Milk samples were collected, however, to determine the effect of milk progesterone level on conception rate (Table 9).

TABLE 9. The influence of milk progesterone level on conception rate in dairy cows.*

| Progesterone Level | Conception Rate |
|---|---|
| Low | 44.7% |
| High or In Between | 0.7% |

Source: Oltner and Edqvist, 1981.

Interpretation of milk progesterone results on the day of breeding are summarized in Table 10. Expected percentages of cows with various milk progesterone levels on day of second sample are currently not available.

TABLE 10. Interpretation of milk progesterone levels from samples collected on day of suspected estrus.

| Progesterone Level | Interpretation | % of Cows |
|---|---|---|
| Low | Cow in estrus | 83% |
| High | Cow not in estrus | 4% |
| In Between | Take a second sample in 24 hr | 13% |
| **Second Sample** | | |
| Low | Cow coming into estrus, bred in 48 & 72 hr | ? |
| High | Cow going out of estrus | ? |
| In Between | Cow going out of estrus | ? |

Source: Oltner and Edqvist, 1981.

Timed inseminations after milk progesterone levels fall provides acceptable conception rates. Milk samples must be collected and analyzed daily and cows should be bred twice, once at 48 hr post progesterone decline and a second time 72 hr post progesterone decline. Conception rate of cows inseminated at observed estrus, or at a time predicted by milk progesterone levels are in Table 11.

TABLE 11. Conception rates of cows inseminated at observed estrus or at a time predicted by milk progesterone levels.*

| Insemination Based Upon | Number of Cows | Conception Rate |
|---|---|---|
| Estrus | 132 | 65% |
| Predicted** | 55 | 60% |

* Source: Ball and Jackson, 1979.
** Cows were inseminated twice, 48 and 72 hr after the first low milk progesterone value.

### Use of Assay for Individual Cow Problems

*B. Diagnosis of Ovarian Dysfunction*
*1. Cystic Follicles and C.L.*

Fluid filled structures on the ovary can be either follicles or CL. Follicles that remain on the ovary for a prolonged period of time are pathological, and will require corrective endocrine therapy. Most fluid filled CL are nonpathological, and do not require therapy. Most cows diagnosed with cystic CL, are presented to the veterinarian due to unobserved estrus and endocrine therapy to synchronize estrus is often required. This dilemma of injecting a cow even though she was diagnosed with a non pathological condition can lead to confusion on the part of dairy producers. They often fail to understand the significance of treating cows with cystic CL, when the cows are really being treated for unobserved estrus.

Differentiation of cystic follicles and CL is difficult. Seguin reported that 39% of all cows treated with GnRH, hCG, or LH for cystic follicles had high milk progesterone levels. The percentage of cows diagnosed as having cystic follicles when milk progesterone levels were high varied between individual veterinarians, ranging from 0% to 67% (Seguin, 1980). Endocrine therapy for cystic follicles is different than the treatment usually given to cows with cystic CL, thus emphasizing the need for proper diagnosis. Paired milk progesterone levels, collected 7 days prior to rectal palpation and on the day of rectal palpation, can facilitate the diagnosis of ovarian status and if required, subsequent endocrine therapy. The interpretation of milk progesterone results from samples collected 7 days prior to rectal palpation and on day of rectal palpation are in Table 12.

TABLE 12. Interpretation of milk progesterone results from samples collected 7 days prior to rectal palpation and on day of rectal palpation.

| Progesterone Level | | | |
|---|---|---|---|
| 7 Day Prior | Palpation Day | Interpretation | % of Cows |
| Low | Low | Cystic Follicle | 65% |
| High | Low | Nonpathological Follicle | 65% |
| Low | High | Early CL | |
| High | High | Cystic CL | 35% |

Source: Nakao etal, 1983. 160 Cows in study.

### IV. Use of Assay for Individual Cow Problems

*B. Diagnosis of Ovarian Dysfunction*
*2. Prolonged CL*

Prolonged CL are discussed often, and they are blamed for many cows not coming to estrus. Good estimates of their incidence have not been available until recently. Most prolonged CL are associated with uterine pyometria and/or metritis. The incidence of prolonged CL was investigated by collecting milk samples thrice weekly from calving until pregnancy. Prior to 60 days postpartum no cows were inseminated, and 6.5% had prolonged CL with estrous cycles longer than 25 days. Of these affected cows, only 28% didn't recover spontaneously by 60 days postpartum, accounting for only 1.8% of all cows. Some affected cows were treated with Cloprostenol, and these treated cows had a reduced days to conception when compared to prolonged CL cows that did not receive treatment (112.9 days vs 101.1 days). Treatment of cows with prolonged CL is similar to cows with unobserved estrus, and the percentage of affected cows is so low as to not inflate the incidence of prostaglandin treatment significantly, unless abnormally high rates of pyometria and/or metritis also are present in the herd. Measuring milk progesterone levels can improve ability to prescribe effective endocrine therapy for pyometria.

### Use of Assay for Individual Cow Problems

*C. Monitoring Results of Endocrine Therapy*
*1. Anestrous*

Progesterone therapy for anestrous cows has been shown to be an effective treatment for inducing estrous cycles in anestrous cows. Herd-wide anestrous problems are caused

most often by a shortage of energy in the cow's diet, and the effectiveness of progesterone therapy in cows that are nutritionally inadequate has not been determined. Milk progesterone analysis can not only be used to identify cows that are truly anestrous, but the analysis can be used to monitor the effectiveness of the therapy. Interpretation of milk progesterone results from samples collected on day of treatment for anestrous and 10 days post treatment are in Table 13.

TABLE 13. Interpretation of milk progesterone results from samples collected on day of treatment* for anestrous and 10 days post treatment.

| Progesterone Level | | | |
|---|---|---|---|
| Treatment Day | 10 Days Post Treatment | Interpretation | % of Cows** |
| Low | High | Treatment Effective | 89.7% |
| Low | Low | Treatment Ineffective | 10.3% |

* Treatment with progesterone for 10 days.
** Source: Ball, 1982.

**Use of Assay for Individual Cow Problems**

*C. Monitoring Results of Endocrine Therapy*
*2. Cystic Follicles*

Effective treatment of cystic follicles is difficult in herds where the veterinarian visits the herd only monthly on a routine visit, because so much time elapses between treatments. Therapy may be more effective if response to the first treatment is known. The MPA can be used to determine whether the treatment for cystic follicles was effective and can speed up additional therapy if needed. As the cow-side MPA has not been available, use of MPA results to improve the effectiveness of additional therapy has not been tested. However, the MPA has been used to determine the effectiveness of the first treatment of properly classified cystic follicles (Nakao et al, 1983) and this is summarized in Table 14.

TABLE 14. Interpretation of milk progesterone results from samples collected on day of treatment* for cystic follicles and 10 days post treatment.

| Progesterone Level | | | |
|---|---|---|---|
| Day of Treatment | 10 Days After Treatment | Interpretation | % of Cows** |
| Low | High | CL Formed | 70.2% |
| Low | In Between | Follicle Luteinized | |
| Low | Low | Treatment Ineffective | 29.8% |

* Treatment with GnRH.
** Source: Nakao etal, 1983.

**Use of Assay for Individual Cow Problems**

*C. Monitoring Results of Endocrine Therapy*
*3. Luteinized Follicles or Cystic CL*

Prostaglandin compounds have proven to be extremely effective luteolytic agents. Determination of milk progesterone levels can improve treatment effectiveness by identifying cows with luteinized follicles or cystic CL. Once identified, these cows respond well to prostaglandin therapy (Dobson et al, 1977). Interpretation of milk progesterone results from samples collected on day of treatment and 3 day post treatment for cows with luteinized follicles or cystic CL are in Table 15.

TABLE 15. Interpretation of milk progesterone results from samples collected on day of treatment* and 3 days post treatment for cows with luteinzed follicles or cystic CL.

| Progesterone Level | | | |
|---|---|---|---|
| Treatment Day of | 3 Days After Treatment | Interpretation | % of Cows** |
| High | Low | Luteolysis | 93% |
| High or In Between | High or In Between | Partial or No Luteolysis | 7% |

* Treatment with Prostaglandin-F-2-Alpha or Similar drug.
** Source: Dobson etal, 1977.

**Use of Assay for Individual Cow Problems**

*C. Monitoring Results of Endocrine Therapy*
*4. Unobserved Estrus*

Unobserved estrus is a very common problem on dairy farms, with most herds having the problem. Estrus synchronization is an effective short term treatment for unobserved estrus, however, the only long term solution to the problem is to improve the estrus detection program of the individual dairy producer. The MPA can be used to facilitate diagnosis of ovarian structures and can also be used to determine if induced luteolysis has occurred and improve conception rates after timed breeding. Table 16 summarizes interpretation of MPA results.

TABLE 16. Interpretation of milk progesterone results from samples collected on day of treatment* and 3 days after treatment for unobserved estrus.

| Progesterone Level | | | |
|---|---|---|---|
| Day of Treatment** | 3 Days After Treatment | Interpretation | % of Cows*** |
| High | Low | Luteolysis | 85% |
| High | High | No Luteolysis | 7% |
| High | In Between | Abnormal Luteolysis or Later Luteal Development | 8% |

* Treatment with prostaglandin-F-2-Alpha or similar compound.
** Day of estrous cycle 10-14 based on milk progesterone analysis.
*** Source: Ball and Jackson, 1984.

## Summary

Milk progesterone analysis can be a useful tool to both the practicing veterinarian and the dairy producer. The MPA does not do away with the need for rectal palpation of cows by a veterinarian, rather, the MPA facilitate diagnosis and choice of drug therapy for an individual animal. The MPA can also be used to help diagnose the cause(s) of herd-wide reproductive problems. Effective use of the MPA requires a good working relationship between the veterinarian and the client, and an educational effort for dairy producers to properly manage animals being tested for milk progesterone levels. The cow-side MPA has the potential to significantly improve the reproductive efficiency of dairy herds.


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