

Early Ultrasound Pregnancy Diagnosis and Reproductive Efficiency of Dairy Cattle

*Sarah J. Lien, John R. Wenz, R. Page Dinsmore,
Derek Foster and Franklyn B. Garry
Integrated Livestock Management,
Colorado State University*

The dairy industry suffers significant economic loss due to impaired reproductive efficiency. Failed estrus detection alone accounts for losses of approximately \$300 million per year in the U.S. dairy industry. Breeding programs have been developed to eliminate the need for heat detection by controlling the timing of ovulation. Ovsynch and other similar programs, which control the follicular wave, allow for a timed insemination without the need for heat detection for that particular breeding. However, poor heat detection following synchronized breeding still result in significant losses if cows are not determined to be open until pregnancy examination. If these animals are not observed for signs of a return to estrus, and subsequently not rebred, the potential opportunity cost of those breedings are diminished. It has been estimated that the cost for every additional day that a cow is open past 100 days in milk is between \$2.50-4.00.

The use of portable ultrasound units has made both early pregnancy diagnosis and evaluation of the reproductive tract of dairy cows more convenient and accurate. Experienced operators can diagnose cows open as early as 20 days post breeding. Due to the rate of early embryonic death (10-16%) between day 28 to day 56 of pregnancy, cows diagnosed pregnant via ultrasound at an early stage should be scheduled for a recheck pregnancy exam. This is ideally done at greater than 56 days post-AI, after which time the risk of fetal loss decreases to 2%. The use of ultrasound to describe ovarian structures has also been shown to be more reliable than rectal palpation alone allowing practitioners to more accurately determine the stage of the estrus cycle in non-pregnant animals. This knowledge is useful when synchronizing non-pregnant cows because it has been shown that there is a significant difference in response, as well as pregnancy rates, depending on the point of the estrus cycle that Ovsynch is initiated. Accurately determining the reproductive status of animals earlier in their normal estrus cycle via ultrasound enables veterinarians and producers to provide beneficial intervention more rapidly. It has also been shown that there is a greater economic return the earlier non-pregnant animals are identified.

A recent survey of veterinarians estimated that 77% diagnose pregnancy in cows by rectal palpation while 22% also utilize ultrasound. Only 1% of veterinarians that responded used only ultrasound for pregnancy diagnosis. As portable ultrasound machines continue to become more affordable, the cost benefit and practical use in dairy cow reproductive management need to be further assessed.

This past June the dairy specialists (Drs Wenz, Dinsmore and Garry) of the ILM at CSU began a study to compare days open, average times bred, reproductive culling, as well as measures of reproductive efficiency (PR pregnancy rates, SR service rates, CR conception rates) between cows scanned for pregnancy by ultrasound 30-36 days post-AI and those examined manually for pregnancy *per rectum* at 43-50 days post-AI followed through an entire lactation. It is anticipated the study will be finished early next year. This study was part of the ILM Food Animal Intern research program in which the interns (Lien and Foster) take part in clinical research projects pertinent to the livestock industry.

The 348 cows presently enrolled in this study were past their voluntary waiting period and had received their first postpartum insemination following synchronization of ovulation using both a traditional Presynch and Ovsynch breeding program. Their days since first breeding were between 30-36 days and they were paired as closely as possible by parity and predicted 305 milk production. Cows within a pair were then randomly assigned to the ultrasound treatment group (US) or rectal palpation control group (RP). The treatment group (US) presently consists of 159 cows (105 multiparous and 54 primiparous) and 189 cows were enlisted in the rectal palpation control group (RP) (130 multiparous and 59 primiparous).

Animals in the early ultrasound group (US; n=159) were examined via transrectal ultrasound at days 30-36 post-AI using a Sonosite 3-5 MHz sector transducer to determine their pregnancy status. Animals that were determined to be pregnant based on visualization of uterine fluid, amniotic vesicle, and/or embryo, were subsequently scheduled for a recheck pregnancy exam at 45+ days post-AI to confirm that diagnosis. Pregnant cows were then rechecked by palpation alone two more times (days 100+/-5 and 190+/-). Animals that were found to be open at their initial exam were managed according to their ovarian status. Animals that had a corpus luteum on either ovary were immediately resynchronized via the Ovsynch program. Cows that had no evidence of luteal tissue at the time of their initial ultrasound exam, including animals that were determined to have two inactive ovaries and those with only follicular tissue, were noted and scheduled to be rechecked by ultrasound the following week during the routine herd check. Cows that were found to be cystic at the time of pregnancy diagnosis were subsequently treated with GnRH or PGF₂ dependent on the presence of luteal tissue. Animals were not reexamined if they were rebred on an observed heat during the previous week. All subsequent examinations of cows in the treatment group were performed by ultrasound alone, including the identification of ovarian structures and future pregnancy exams.

Cows assigned to the rectal palpation group (RP; n=189) were examined 40-46 days post-AI by palpation alone. Pregnant cows were then rechecked by palpation alone two more times (days 100+/-5 and 190+/-). Cows that were found to be open were treated in a similar manner as mentioned above for the treatment cows. All subsequent examinations of control cows were by rectal palpation only, including the identification of ovarian luteal tissue and future pregnancy exams.

Cows that were enrolled and subsequently not caught during the assigned vet check were removed from the study. Cows remained in their assigned group for the duration of the study (culling or dryoff). A decrease in days open between the ultrasound group and the rectal palpation group was expected because the cows in the ultrasound group would be identified as non-pregnant 7-12 days earlier than rectal palpation. This early identification along with hormonal intervention would return these animals more quickly to the breeding herd and subsequent services. The first service conception rate is presumed to be equivalent between the two treatment groups, and the animals that become pregnant following a single breeding, therefore have little effect on the results obtained. Animals that are the most important to identify and continue to provide reproductive management for, and that will have the greatest impact on the average days open, are those animals that are determined to be open after their initial pregnancy exam. These animals, characterized as open or bred, are where the biggest potential impact could be made.

This study is still ongoing. Presently, the average days open ranged from 13-19 days and are not statistically significantly different between the two groups. To date there is also no significant difference in average times bred between the treatment and control groups. As with average days open, the animals that will affect these values the most are the cows that require more than one or two breedings to conceive. These numbers may change as the remaining animals enrolled complete the study.

The largest differences so far pertain to reproductive efficiency (SR, CR, and PR). Service rates by cycle, as well as overall pregnancy rates between treatment groups in first lactation heifers (US 30%; RP 20%) were statistically different. Thus, preliminary results indicate that the use of portable ultrasound to view reproductive tracts of dairy cows coupled with a resynchronization program may lead to an improvement in reproductive efficiency and subsequent decrease in economic losses.

