Methods for and Implementation of Pregnancy Diagnosis in Dairy Cows

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KEYWORDS

• Transrectal palpation • Transrectal ultrasonography • Pregnancy loss
• Progesterone • Pregnancy-associated glycoproteins

KEY POINTS

- Although coupling a nonpregnancy diagnosis with a management strategy to quickly reinitiate artificial insemination (AI) may improve reproductive efficiency by decreasing the interval between AI services, early pregnancy loss limits the accuracy of many direct and indirect methods for early pregnancy diagnosis currently under development.
- These limitations make the benefits of many currently available methods for early pregnancy diagnosis questionable and require that all cows diagnosed pregnant early after insemination be scheduled for pregnancy reconfirmations at later times during gestation to identify cows experiencing pregnancy loss.
- Although research and development efforts are being made toward development of an indirect pregnancy test for dairy cows, it remains to be seen whether these indirect tests will replace transrectal palpation or transrectal ultrasonography as the primary methods used for pregnancy diagnosis in dairy cows or whether veterinarians will combine these methods in a reproductive management program.
- Future technologies for pregnancy diagnosis in dairy cows may someday overcome current limitations of direct and indirect methods for pregnancy diagnosis, thereby improving reproductive performance.

The authors have nothing to disclose.
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Vet Clin Food Anim 32 (2016) 165–180
http://dx.doi.org/10.1016/j.cvfa.2015.09.006 **vetfood.theclinics.com**
0749-0720/16/$ – see front matter

ATTRIBUTES OF THE IDEAL PREGNANCY TEST

An ideal early pregnancy test for dairy cows would fulfill the following criteria:

1. High sensitivity (ie, correctly identify pregnant animals)
2. High specificity (ie, correctly identify nonpregnant animals)
3. Inexpensive to conduct
4. Simple to conduct under field conditions
5. Ability to determine pregnancy status at the time the test is performed

A final attribute of an ideal early pregnancy test would be the ability to determine pregnancy status without the need to physically handle the cow to conduct the test. Such a test may overcome the inherent limitations of current tests caused by pregnancy loss and may make pregnancy diagnosis before 28 to 35 days postpartum in dairy cows an economically viable reproductive management strategy. Although all of the methods described in this article require physical handling of individual cows to administer the test, future technologies for early pregnancy diagnosis may someday realize all of these criteria.

From an economic perspective, the sensitivity of an early nonpregnancy test (ie, correct identification of pregnant cows) is more important than the specificity (ie, correct identification of nonpregnant cows) based on an economic simulation.[1] Inaccurate diagnosis of nonpregnancy (ie, false negatives), however, increases the rate of iatrogenic pregnancy loss when prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) or one of its analogues is administered to synchronize estrus or ovulation to reduce the interval to the next artificial insemination (AI) service. The economic loss incurred because of pregnancy loss depends on many factors and has been estimated to range from $46[2] to $300.[3] Because a management intervention can only be implemented for nonpregnant cows, it is critical that a pregnancy test accurately identify nonpregnant cows to avoid iatrogenic pregnancy loss. Nonetheless, a high rate of false-positive results diminishes the usefulness and cost-effectiveness of an early pregnancy test by failing to present a management opportunity to return nonpregnant cows to AI service early after AI and potentially increasing the interval to the subsequent AI.

RETURN TO ESTRUS AS A DIAGNOSTIC INDICATOR OF PREGNANCY STATUS

Accurate identification of cows returning to estrus from 18 to 32 days after AI is the easiest and least costly method for determining nonpregnancy early after insemination. This assumption, however, is being challenged by new research and long-recognized reproductive problems. First, estrous detection efficiency is estimated to be less than 50% on most dairy farms in the United States.[4] Only 51.5% of the eligible cows were detected in estrus and inseminated in a recent study in which detection of estrus was performed through continuous monitoring with activity tags after a previous insemination until pregnancy diagnosis 32 $\pm$3 days after AI.[5] Second, estrous cycle duration varies widely with a high degree of variability among individual cows.[6] Finally, the high rate of pregnancy loss in dairy cows can increase the interval from insemination to return to estrus for cows that establish pregnancy early then undergo pregnancy loss later during gestation.[7]

PREGNANCY LOSS IN LACTATING DAIRY COWS

Pregnancy loss contributes to reproductive inefficiency because fertility assessed at any point during pregnancy is a function of both conception rate and pregnancy loss.[8] Pregnancy loss can be monitored using a variety of methods, including