It is well known in our industry that mastitis is a persistent problem affecting the dairy herd. Depending upon the type of mastitis and its incidence, the economic losses vary but generally include production losses, increased cost of treatment, increased culling, and death. In addition to these losses today we know that mastitis is also a critical factor affecting the reproductive success of the herd.

How does mastitis affect reproduction?
Extensive research has reported that both clinical and sub-clinical mastitis alter the reproductive process at several levels. Some of these alterations include the delay of the postpartum ovarian function and the alteration of key processes like ovulation, fertilization, implantation, and pregnancy maintenance. Furthermore; according to recent research, mastitis could also have negative effects even before birth as demonstrated by reports evaluating daughters of cows that suffered mastitis during the gestation.

During fetal development and puberty:
According to preliminary research conducted at Michigan State University (1,2,3) a persistent mammary gland infection during gestation (as determined by somatic cell counts of ≥ 200,000 from milk DHIA records) could have a negative impact on size of the ovarian reserve (total number of healthy follicles and oocytes in ovaries) and potentially fertility of their offspring. In other words,
mastitis in pregnant cows could decrease the number of healthy follicles and compromise future fertility of their heifers. This has been suggested by the evaluation of circulating concentrations of anti-Müllerian hormone (AMH) in heifers and the mastitis events of their dams during gestation (Figure 1). The anti-Müllerian hormone is known as a reliable biomarker for potential fertility of cattle because of its correlation with number of follicles growing during follicular waves, size of the ovarian reserve, ovarian function, and many other characteristics associated with fertility. In figure 1 we can observe how heifer concentrations of AMH decrease as the number of mastitis events during gestation of their dams increase.

During early postpartum: Several studies have reported that cows suffering mastitis early in lactation (before their first insemination) take longer to reactivate their ovarian function, show estrus, and ovulate. These alterations increase the interval from calving to first service, decrease the insemination risk or heat detection rate of the herd, and ultimately increase days open affecting profitability.

During ovulation and fertilization: This is another critical period where mastitis has a negative impact. It has been reported that cows affected by clinical mastitis close to the time of ovulation have an altered hormonal environment unfavorable for ovulation and fertilization. These hormonal alterations include decreased pulsatile secretion of luteinizing hormone (LH), significant decrease of the ovulatory LH peak, decreased estradiol production, decreased estrus expression, and ovulatory failure (6).

A recent study from Cornell University (7) evaluating 10,380 lactations calculated the probability of conception by artificial insemination in relation to the time of mastitis occurrence (Figure 2). In their final model the probability of conception decreased by 44% when mastitis occurred the week before insemination, by 7.9% when mastitis occurred the week of insemination, and by 52% when mastitis occurred the week after insemination.

During pregnancy: Pregnancy maintenance is also negatively affected by mastitis. Recent studies (8,9) have reported that cows suffering mastitis during gestation are two to three times more likely to lose the pregnancy than uninfected cows according to evaluations conducted between days 28 and 45 of gestation (Figure 3). In general the literature reports an incidence of pregnancy loss for cows affected with mastitis during gestation of 10 to 20% higher than uninfected cows.

Figure 2. Probability of conception in relation to the occurrence of mastitis.

Figure 3. The effect of mastitis on pregnancy loss.

What is the economic impact associated with decreased reproductive efficiency? If we use the information presented on Table 1 where cows affected by clinical mastitis have on average 25 additional days open than uninfected cows and use an estimated value per day open ranging from $2 to $4 (most models report values of day open ranging from $2.11 to $7.46 depending on level of production, days postpartum, and milk price) (10,11) we could estimate that the reproductive economic loss per affected cow could range between $50 and $100. This means that for a herd with 500 cows in lactation and an annual incidence of clinical mastitis of 30% (150 cows clinically diagnosed) the losses could range between $7,500 and $15,000.

Additionally, if we consider that cows suffering mastitis during gestation have an increased incidence of pregnancy loss (approximately 15% higher than uninfected cows) and use $300 as the approximate value of an average pregnancy (9,10), mastitis could account for a potential additional reproductive loss of $45 per affected cow during gestation (15% of extra increase incidence in pregnancy loss by $300 of pregnancy value).

Obviously the economic losses due to mastitis are not limited to poor reproductive performance. These losses are also associated with production losses, increased cost of treatment, and increased culling and death rates; among others.

How can I stop mastitis from affecting my herd and my profits?

• Effective milking hygiene, dry treatments with use of approved udder health products, and regular machine maintenance can help prevent mastitis and improve not only udder health and milk quality, but also reproductive efficiency.

• Focus on close-up heifers and cows, dry cows, and early lactation cows. Maintain clean, dry, comfortable milking hygiene, dry treatments with use of approved udder health products, and regular machine maintenance can help prevent mastitis by keeping the immune system healthy and helping to prevent metabolic disease.

For more information on how to prevent and treat mastitis, consult your veterinarian or visit www.nnconline.org

References
1. Ireland JJ, et al., 2009. Variation in the ovulation rate is linked to alterations in follicularular estradiol production and ovarian biomarkers of follicular differentiation and oocyte quality in cattle. Biol Reprod. 80:554.