

DAIRY REPRODUCTION



BASICS

OVERVIEW

Good reproductive performance is essential to the survivability and profitability of a dairy herd.

INCIDENCE/PREVALENCE

N/A

GEOGRAPHIC DISTRIBUTION

Worldwide

SYSTEMS AFFECTED

Reproductive and production management

SIGNALMENT

- Bovine
- Dairy breeds
- Female

GENETICS

AI bull selection for higher daughter pregnancy rates, lower stillbirth rates, and overall health traits, can impact reproductive success. Genomic testing of females can also allow for heifer selection and breeding strategies that can advance herd genetics at a faster pace than in the past.

CAUSES AND RISK FACTORS

Reproductive efficiency influences

- Calving interval (CI): affects lactation length. The longer the lactation, the lower average milk produced/cow/day. This also means less lactations in a cow's lifetime, reducing lifetime milk production and number of offspring.
- Number of replacement heifers produced: In a closed herd, the number of replacements is the primary driver behind the herd's turnover rate.
- Distribution of culling patterns: If reproductive efficiency is low more late lactation cows are culled forcing the purchase of replacements and/or the retention of less productive animals.
- Cost associated with producing a pregnancy: More services, more cost for semen, more expenditures for reproductive examinations and hormonal interventions.
- All of these contribute to the costs associated with prolonged days open (DOPN).

Goals of Reproductive Management

- Minimize risk of calving difficulty:
 - Optimize body condition score at calving
 - Proper supervision and skilled interventions at calving
 - Sire selection for calving ease
- Minimize both the risk and effects of periparturient disease problems:
 - Manage to reduce risk of retained placenta and metritis/endometritis
 - Manage to reduce the effect of periparturient disease both from a direct effect on the reproductive tract as well as indirect effect from feed intake and energy balance
- Improve breeding submission rate:
 - Improve heat detection efficiency and accuracy
 - Teach proper heat detection procedures and routines
 - Use observation, tail head markers/paint, and/or activity pedometer systems
 - Minimize risk of lameness which has detrimental effects on estrus expression
 - Maximize cow comfort to minimize lameness
 - Improve cow footing by grooving of concrete surfaces, addition of rubber floors, or allowing access to dirt or grass lots
 - Properly use estrus and ovulation synchronization program
- Improve risk of pregnancy at each service (conception rate):
 - Improve accuracy of heat detection
 - Teach proper semen handling, placement, and timing of semen delivery
 - Consider the use of timed AI to improve accuracy of timing of semen delivery
 - Minimize risk and effects of periparturient disease and return to positive energy balance
 - Minimize risk of mastitis and chronic high somatic cell counts (which may result in failure to conceive or early embryonic death (EED))
 - Manage feeding program to minimize risk of conception failure or EED due to high blood urea nitrogen levels, phytoestrogens, molds, or mycotoxins
 - Manage herd immunity through proper vaccination and biosecurity to minimize risk of EED from infectious causes
- Carry the calf to full term: Manage herd immunity through proper vaccination and biosecurity to minimize risk of abortion from infectious causes and from feeding problems such as molds and mycotoxins. Optimize genetics to select for low stillbirth rates.
- Repeat the cycle: Minimize risk of premature culling due to disease processes so that cows can efficiently conclude one lactation and start the next

Monitoring Reproductive Efficiency

- Calving interval (CI): average number of days or months from one calving until the next.
 - Only gives information for a small part of the population and does not reveal any information on cows that fail to conceive and survive to the next calving
 - Too much lag time to be used as a monitoring tool
- Days open (DOPN): Average interval from calving to conception
 - Valuable information for the pregnant cows, but does not reveal how open cows are doing
 - Better than CI, but still lacking data on the bigger population
- Heat detection rate (HDR): Valuable information regarding efficiency of estrus detection; defined as the number of cows observed in estrus divided by the total population at risk for estrus
 - Can be artificially high if cows are serviced aggressively without regard to estrus detection accuracy
 - Less lag: it can be re-calculated every 21 days
 - Is equal to breeding submission rate if the herd only reports heats that are inseminated

- Conception rate (CR): Defined as the number of cows that are found pregnant divided by the total number inseminated (the inverse of CR is services/conception).
 - Can be influenced by HDR- may be low if cows are aggressively submitted for breeding without accuracy in HDR, or may be higher than normal if cows only submitted with very obvious strong, standing estrus
 - Slightly more lag than HDR because you must wait until pregnancy diagnosis for results
- Pregnancy rate (PR): The risk per 21 day cycle of becoming pregnant. PR is calculated by dividing the number of pregnancies by the number of time periods (21-day estrus cycles) at risk. The average speed at which cows become pregnant
 - PR has the same slight lag as CR, but much less lag than CI and less bias than either CI or DOPN
 - PR can be calculated in bull-bred dairies by using the number diagnosed pregnant divided by the number of cycles at risk (once a sufficient time has elapsed for accurate diagnosis of pregnant cows)
 - Herds in the U.S. average 15 to 16% PR, with a reasonable goal of 20-25% for most herds. Well managed herds may achieve PR of 25-30%. Rarely herds exceed 30%, but economically, there is very little incentive to exceed this high level of breeding efficiency.

Methods to improve PR

- Improve HDR (breeding submission rate): more aggressive but accurate estrus detection, and through the use of timed artificial insemination programs for cows not showing heat
- Consider using AI if currently using bulls
 - AI decreases the risk of venereal disease transmission within a herd
 - Herds that use bulls cannot take advantage of timed AI programs (prostaglandin use) or genetic improvements from AI bull selection
 - If managed properly, AI will outperform natural service bulls.
- Maintain (or improve) CR as HDR is increased
- Improve periparturient cow management to minimize negative effects on CR
- Decrease the interval between pregnancy examination visits to more quickly discover non-pregnant cows and intervene to reduce the interval to rebreeding
- Ultrasonography, blood and milk pregnancy tests may be useful tools to lower the days post-breeding at pregnancy evaluation if used accurately and consistently. Proper intervention must be applied to non-pregnant cows in a timely manner. Cows checked early should be rechecked after 75 days to identify those that have experienced EED or abortion.



DIAGNOSIS

DIFFERENTIAL DIAGNOSES

N/A

CBC/BIOCHEMISTRY/URINALYSIS

N/A

OTHER LABORATORY TESTS

N/A

IMAGING

N/A

OTHER DIAGNOSTIC PROCEDURES

N/A

PATHOLOGIC FINDINGS

N/A



TREATMENT

THERAPEUTIC APPROACH

- Appropriate estrus / ovulation synchronization programs

SURGICAL CONSIDERATIONS AND TECHNIQUES

N/A



MEDICATIONS

DRUGS OF CHOICE

Appropriate hormonal protocols for estrus/ ovulation synchronization

CONTRAINDICATIONS

Appropriate milk and meat withdrawal times must be followed.

PRECAUTIONS

N/A

POSSIBLE INTERACTIONS

N/A



FOLLOW-UP

EXPECTED COURSE AND PROGNOSIS

N/A

POSSIBLE COMPLICATIONS

N/A

CLIENT EDUCATION

- Importance of keeping accurate and timely records
- Importance of compliance in the implementation of management actions (estrous synchronization)

PATIENT CARE

N/A

PREVENTION

N/A



MISCELLANEOUS

ASSOCIATED CONDITIONS

Infertility, repeat breeding, and periparturient diseases

AGE-RELATED FACTORS

N/A

ZOONOTIC POTENTIAL

Certain reproductive diseases are known to be zoonotic. Care must be taken when working with potential pathogens.

PREGNANCY

Follow label directions on vaccines and hormones, as some have risk to pregnant cows.

BIOSECURITY

Consider proper care of equipment used for breeding, pregnancy checking, and injections as there is risk of disease spread when used for multiple animals.

PRODUCTION MANAGEMENT

- Maximize accurate heat detection system and properly AI breed cows. Consider the use of timed insemination programs to improve accuracy of timing of semen delivery.
- Minimize risk and effects of periparturient disease and return to positive energy balance.
- Minimize risk of mastitis and lameness, both are detrimental to achieving great PR.
- Manage feeding program to minimize risk of conception failure or early embryonic death (EED) due to high blood urea nitrogen levels, phytoestrogens, molds, or mycotoxins
- Manage herd immunity through proper vaccination and biosecurity to minimize risk of EED and abortion from infectious causes.
- Utilize pregnancy detection between 28-42 days bred to find open cows and get them re-inseminated quickly.

ABBREVIATIONS

- AI= artificial insemination
- CI = calving interval
- CR = conception rate
- DOPN = days open
- EED = early embryonic death
- HDR = heat detection rate
- PR= pregnancy rate

SEE ALSO

- Abortion: Bovine
- Artificial Insemination: Bovine
- Body Condition Scoring: Dairy Cattle (www.fiveminutevet.com/ruminant)
- Dairy Economics (www.fiveminutevet.com/ruminant)
- Dairy Record Evaluation (www.fiveminutevet.com/ruminant)
- Estrus Synchronization: Bovine
- Infertility and Subfertility Issues
- Nutrition and Metabolic Diseases: Dairy
- Parasite Control Programs: Dairy
- Reproductive Pharmacology

Suggested Reading

Fricke, P., Giordano, J., Valenza, A., Lopes Jr, G., Amundson, M., Carvalho, P. 2014
Reproductive performance of lactating dairy cows managed for first service using timed artificial

insemination with or without detection of estrus using an activity-monitoring system. *J Dairy Sci* May; 97(5): 2771-2781.

Galvao, K., Federico, P., De Vries, A., Schuenemann, G. 2013. Economic comparison of reproductive programs for dairy herds using estrus detection, timed artificial insemination, or a combination. *J Dairy Sci* Apr; 96(4): 2681-93.

Pryce, JE and Daetwyler, HD. 2012. Designing dairy cattle breeding schemes under genomic selection: a review of international research. *Ani Prod Sci* 52: 107-114.

Ricci, A., Carvalho, P., Amundson, M., Fourdraine, R., Vincenti, L., Fricke, P. 2015. Factors associated with pregnancy-associated glycoprotein (PAG) levels in plasma and milk of Holstein cows during pregnancy and their effect of accuracy of pregnancy diagnosis. *J Dairy Sci* Apr; 98(4): 2502-14.

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