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Develop and manage heifers with a focus on age at conception

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Dairy producers and their health management team are well aware of best management practices to keep their herds healthy and productive. Unfortunately, they don't always know how well those practices are implemented.

The three largest expenses of a dairy business are feed costs for the lactating herd, raising replacement heifers, and labor. As heifers will not provide a return on investment until after first calving and the initiation of lactation, it is imperative that dairy producers recognize the importance of timely and consistent pregnancy production in order to be profitability.

In the past, average age at first calving has been used to evaluate heifer raising programs. While the recommended target of 24 months of age or less at calving remains valuable, the focus should be on age at conception. Age at conception will determine age at first calving. A delay in age at conception will lead to a delay in age at first calving, along with increased rearing costs and lost income opportunity. Consequently, implementation of a reproductive program focused on age at conception is beneficial to the long-term viability of the heifer-raising enterprise.

Monitoring growth is critical

Heifers will reach puberty at approximately 40 to 50 percent of mature weight (about 550 to 700 pounds for Holsteins). In general, well-managed Holstein heifers should reach that size by 9 to 11 months of age. Monitoring growth of heifers is critical, as well-managed heifers fed a total mixed ration may grow faster and achieve puberty earlier than expected. Under poor management, heifers may grow slower and achieve puberty later than predicted, leading to delayed age at conception (and age at first calving), increased rearing cost, and lost income opportunity.

Milk production during first lactation is directly related to weight, height, and body condition of the heifer at first calving, not age. Holstein heifers weighing about 1,260 pounds after first calving produced 700 pounds more milk in the first lactation than heifers weighing about 1,150 pounds at calving. Consequently, if Holstein heifers are to achieve a post-calving weight of about 1,250 pounds, then heifers must gain an average of 1.8 pounds per day in order to reach a calving weight of about 1,400 pounds at 24 months of age.

If, however, age at conception is targeted at 13 to 14 months of age and about 800 pounds, then age at first calving will be 22 to 23 months of age and average daily gain must be greater than 1.8 pounds per day. Dairy producers and heifer growers should consult a nutritionist to provide expertise in feed sample analyses, ration balancing and growth monitoring.

The largest expense of a heifer-raising enterprise is feed. Consequently, days on feed are important to profitability, as days on feed is determined by age at first calving, which is determined by age at conception. Consequently, time is very important, including time from birth to entry to AI pen, time from entry into the AI pen to first insemination, age at conception, and age at first calving.

All dairy producers and heifer growers must have a plan for getting heifers into the reproductive program. Growth (weight and wither height) of heifers should be monitored regularly. Groups of heifers should be moved into the AI pen as soon as target size is reached. If heifers gain weight faster than expected and attain the proper size for breeding earlier, then breeding should not be delayed, as the heifers will likely become over-conditioned.

Unfortunately, many dairy producers think it is easier and cheaper to use natural service bulls on heifers, either as the sire of choice or as a cleanup bull. Management must recognize the costs of natural service, however, which include the purchase price of the bull, daily feed costs, veterinary costs, and lost income because offspring of the natural service bull will produce less milk than offspring of an AI sire.

The USDA Sire Summary (ftp://aipl.arsusda.gov/pub/bulls/evalrpt.txt) provides evidence that Holstein AI bulls have a distinct advantage in predicted transmitting ability for milk, fat and protein over non-AI sires. Furthermore, natural service bulls can introduce venereal disease into a herd, which can be devastating to profitability as heifers may become infected, abort and become either temporarily or permanently infertile.

Natural service has many risks

Natural service bulls may also suffer from lameness, low libido and/or be subfertile, leading to decreased pregnancy rate and profitability due to increased age at conception and age at first calving. In contrast, health, semen quality, and fertility of AI bulls are routinely monitored by the AI industry. Natural service bulls also pose a health risk to producers and their employees. Bulls are dangerous and unpredictable. Artificial insemination eliminates the risk of catastrophic injury or death to producers and their employees.

On dairies using AI in lactating cows, heifers are the most genetically advanced group of females on the farm. Therefore, AI-sired calves from heifers have greater genetic merit than AI-sired calves from older cows. Furthermore, first lactation heifers represent the greatest potential contribution to a herd's genetics.

Why? Because on most farms, first lactation heifers represent the highest number of calvings per lactation group. Whether a dairy calves out 60 or 500 replacement heifers a year, the potential additional lifetime income from using AI is quite large. On the day of sorting into the AI pen, all heifers should receive PGF2a to minimize days to first AI. The greater the number of animals that are in heat simultaneously, the greater the opportunity for AI personnel to identify them.

Keep in mind, however, that efficient and accurate heat detection is the primary factor limiting reproductive performance on most dairies. Heat detection aids (chalk, tail paint, visual pressure-sensitive devices) may be used to achieve greater heat detection rates.

Heat detection has limitations

It is important for AI personnel to know the limitations of heat detection aids while keeping in mind that the primary sign of heat is "standing to be mounted by a herdmate." Secondary signs include clear mucus discharge, ruffled hair on the tailhead, increased activity, mounting other heifers, and chin resting.

When heat detection is performed infrequently (once or twice daily), heifers should be inseminated at the next most convenient time after first detection, since the onset of heat is not known. Ovulation is physiologically tied to the start of heat. Consequently, there is a limited window of opportunity to breed the heifer and maximize fertility. Research using HeatWatch reveals that fertility was maximized when AI was performed within 16 hours of the onset of heat.

Synchronization programs for dairy heifers are available. As mentioned previously, synchronization of heifers with PGF2a when entering the AI pen reduces the time to first AI in herds with good heat detection. Heifers not inseminated after the first PGF2a should receive a second injection 11 to 14 days later. Alternatively, a timed-AI protocol for heifers (CIDR in 5 d - CIDR out + PGF2a – 72 h – GnRH +TAI) developed at the University of Florida has achieved pregnancy/AI of nearly 56 percent and may be beneficial in herds that struggle with heat detection.

Breeding-eligible heifers should be observed daily to identify those that return to heat. Pregnancy (open) checks should occur regularly; at a minimum every 14 days. This strategy allows for the quick identification of open heifers, facilitating management (PGF2a or a timed-AI protocol) to ensure a timely re-insemination. Reconfirm pregnancy (70 to 90 days in calf), and re-enroll or cull heifers that have aborted.

Visual sizing is guessing

Functional facilities for efficiently managing dairy heifers are mandatory. Although many dairies have a scale to weigh feedstuffs as they are delivered, few have invested in an appropriate weighing and sorting facility for heifers. Consequently, visual estimation of weight, or selection of heifers based on age, leads to inefficient and costlier-than-necessary heifer rearing.

To optimize nutrition, growth and development, and to attain an age at conception goal, heifer raisers should use a scale and sorting system regularly to monitor growth and decrease variation in groups. Heifers should not be overcrowded in AI pens and each pen should be constructed with a back fence and headlocks to facilitate a 100 percent lockup rate.

Although conception rate (number of pregnant heifers divided by the number inseminated) is commonly used to describe reproductive success (or failure) among heifer raisers and dairy producers, pregnancy rate is the preferred metric for evaluating reproduction. Why? Because pregnancy rate is the percentage of eligible heifers within a given interval (21 days, the typical length of an estrous cycle) that actually become pregnant.

An eligible heifer is one that is post-pubertal, is not pregnant, and does not have a breeding with an unknown outcome. By dividing the breeding program into 21-day intervals, the effect of recent events or management changes on reproductive efficiency can be determined. This definition of pregnancy rate provides a method to monitor the rate at which heifers become pregnant.

What about the use of sexed semen? Sexed semen has been commercially available in the U.S. for less than a decade. Early research focused on maximizing fertility of sexed semen in heifers, because well-managed heifers are highly fertile following AI with conventional semen, whereas lactating cows are less fertile.

Published reports from Select Sires describe an average conception rate at first service of 47 percent (31,815 services) in Holstein heifers and 53 percent (2,064 services) in Jersey heifers. Further, the conception rate achieved following AI with sexed semen averaged 80 percent of that achieved with conventional semen at first service.

In Holstein heifer herds that reported at least 50 services to sexed and conventional semen, the overall conception rate to sexed semen (for all services) averaged 45 percent (ranging from 27 to 70 percent; 39,763 services), compared to 56 percent (ranging from 34 to 83 percent; 53,718 services) for conventional semen.

There is ample research and commercial data in dairy heifers to support the expectation of an average conception rate to sexed semen of approximately 80 percent of the conception rate to conventional semen used at first service. Consequently, if a dairy or heifer raiser currently achieves a 65 percent conception rate at first service in heifers with frozen-thawed, conventional semen, a reasonable expectation (with good management) is a conception rate between 46 and 52 percent with frozen-thawed sexed semen.

Sexed semen fertility varies

As can be seen from data in the previous paragraph, there is large variation in fertility following AI with sexed semen. This is not surprising, as the level of management of each herd must be considered, as well as the bias introduced by the owner or AI technician when choosing animals to receive AI with sexed semen (first service only as compared to multiple services, for example).

Victor Cabrera (Extension Specialist, Dairy Management, at the University of Wisconsin-Madison) argues, however, that the single most important parameter in the decision to use sexed semen is the current conception rate with conventional semen.

A free decision support tool, *"Economic value of sexed semen programs for dairy heifers"* is available at http://dairymgt.info/tools.php#1 under the section Management Tools.

As mentioned previously, raising replacement heifers is usually the second largest expense associated with the dairy business. Replacement cost, as described by Greg Bethard (DRMS, Raleigh, NC) and Albert Nunes (Genske, Mulder, and Co., Salida, CA) is the cost of maintaining herd size and structure. To determine replacement costs on a cash basis, the following formula may be used:

[(cost of raising or purchasing replacements - cull cow income)/cwt milk sold].

As can be seen from the formula, replacement cost is expressed on a hundredweight basis. Therefore, replacement cost is size and production neutral. Consequently, replacement cost may be compared among small and large herds or for herds milking 50 or 100 pounds per day. Lastly, a reasonable replacement cost goal in most areas of the U.S. is less than $1.50 per hundredweight.

Heifers do not provide a return on investment until after first calving and initiation of lactation. Therefore, it is imperative that dairy producers and heifer raisers set realistic goals and monitor the growth of their heifers. Age at conception will determine age at first calving, and implementation of management strategies for timely and consistent pregnancy production will enhance overall dairy profitability.

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