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Automatic Calf Feeders: A Recap

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This past February, I spent a week delivering educational workshops in Idaho discussing the use of automatic systems in the dairy industry. This extension program, which is titled *Risk Management Associated with the Use of Automatic Milking and Feeding Systems (robots) for Western Dairies*, is a collaboration with my colleagues Hernan Tejeda, Mireille Chahine, and Rick Norell (University of Idaho) and was funded by USDA-NIFA through the Western Extension Risk Management Education program. Following is a recap about the use of automatic calf feeders.

Raising dairy replacements can be done in multiple ways, with pre-weaning housing as a major component of dairy calf rearing. In general terms, calves can be housed individually or in groups, and each of these systems have their own advantages and disadvantages. Some advantages of individual housing include the "all-in/all-out" management, the lack of calf-to-calf contact, the ease of moving animals to new ground and sanitizing stalls, and the individualized monitoring of calf behavior and health status. On the other hand, individual housing is labor intensive and may expose the operator to harsh inclement weather when calves are housed outdoors.

Indoor housing might attenuate the exposure of personnel to weather adversities but still exposes personnel to intensive labor. However, automatic calf feeders have become an alternative solution to decrease labor intensity and to provide a more controlled environment. More specifically, less time is spent mixing milk replacer, a greater volume of milk can be fed, and cleaning is performed by the machine. This change in the feeding system will also increase the time to monitor and treat calves at the calf barn and to attend cows at the maternity pen.

From a nutritional perspective, feeding calves through an automatic calf feeder allows a more "natural" feeding behavior in which calves have more meals throughout the day. Also, through automatic calf feeders, calves can be fed individually or have "tailored" nutritional plans according to specific needs based on their age. Another advantage is that, through the automatization of the feeding process, a more consistent feeding with less variation or human error is accomplished. Finally, the acquisition and recording of data through

Figure 1. Holstein calf using an automatic feeder.

the system permit a comprehensive monitoring of the health status of the calves. These data include daily intake, drinking speed, and the number of rewarded or unrewarded visits to the feeder.

Every system has its challenges, and group housing with automatic calf feeders is not an exception to this rule. The most concerning challenge is the prevention of diseases. Because calves are housed in groups, the spread of disease through nose-to-nose contact is harder to control in this system. Still, if nose-to-nose contact could be controlled, spreading of disease by suckling from a common nipple cannot be avoided. Another challenge of the system is the unwanted behavior known as cross-suckling, which may lead to lesions and infections.

Training calves to drink from the feeder nipple is another challenge that requires careful consideration. In this regard, researchers from University of Kentucky recommend "initiating" calves to the nipple while they are housed in hutches during the first 10 to 14 days of life, which are the most critical ones in the pre-weaning period. The outcome of this individualized training is faster learning by the calf to drink from the nipple of the automatic calf feeder and less dependence on operators, which could reduce labor costs.

Cleanliness is paramount for successful use of automatic calf feeders. The cleaning routine should include cleaning and sanitation of nipples once a day, an (automatic) cleaning of the mixing cup multiple times a day, a cleaning of the milk circuit or hoses (ideally once a day), the cleaning of the pen, and the cleaning of water troughs.

Lastly, but not least, a proper design of the barn is critical for the success of the grouping housing with automatic calf feeders. When designing the barn, ensure there is adequate ventilation. Make sure that the predominant winds cross the barn without any obstructions, such as trees or other buildings. Also, ventilation must be sufficient but without drafts when using positive pressure ventilating systems in the winter. As far as barn size, 35-40 squared-foot per calf of bedding area should be available in the calf pens. Finally, make sure that the barn is designed so that the milk circuit is not too long. When milk circuits are too long, it is harder to maintain the temperature of the milk from the mixing cup to the nipple.

In summary, housing calves in groups and with automatic calf feeders is an alternative system to decrease labor and to improve lifestyle quality. However, the system may fail if colostrum management is not adequate, if stocking density is excessive, if ventilation is not sufficient, and if cleaning and sanitation is not frequent and sufficient.

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WESTERN EXTENSION RISK MANAGEMENT EDUCATION

Common problems with breeding dairy heifers

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A successful replacement heifer program is rooted in solid nutrition and health plans that will ensure heifers conceive, maintain a pregnancy and calve without complications so they may become a valuable addition to the herd. Suggested reproductive benchmarks are to breed heifers at 13-16 months of age so they calve at 22-25 months of age. Calving at this time will set heifers up to achieve their greatest lifetime milk production potential.

It can be challenging to meet these breeding and calving benchmarks, and operations that are struggling with their heifer breeding efforts likely are experiencing many of the same problems. Here is some advice to help you meet your heifer breeding benchmarks.

Do not use heifer age as your primary guideline for breeding

Heifers must achieve a certain age before puberty can occur, but body weight and body condition setpoints must also be met before puberty can occur. Table one provides the ideal body weights and heights at breeding for various breeds. Some herds may achieve these goals before 13-14 months of age. Breeding earlier than 13 months of age is feasible in this circumstance. Age becomes an important metric for heifers when they fail to achieve adequate body weight and height by 15-16 months of age. Breeding before these body weight and height goals are

achieved is problematic both for getting these heifers pregnant and for dealing with the compensatory growth needs of heifers so they can have a productive, problem-free first lactation.

Table 1. Suggested body weights and heights for breeding-age heifers[1]

Breed	Body Weight (pounds)	Withers Height (inches)
Ayrshire	700-750	46-48
Brown Swiss	750-800	48-51
Guernsey	700-750	46-49
Holstein	750-800	48-50
Jersey	525-575	43-45
Milking Shorthorn	750-800	46-48

[1]Adapted from https://extension.psu.edu/monitoring-dairy-heifer-growth

Consider heifer body condition when making breeding decisions

Body condition is an excellent way to confirm that body weights and heights are on-track for successful breeding, but it is most useful for ensuring that heifers are not depositing too much fat. This can negatively affect lifetime milk yield by limiting mammary gland development. Strive for a BCS range of 2.5-3.0 before breeding, 2.5-3.25 during breeding and 3.5-3.75 at calving[1].

Do not rely heavily on natural mating to breed heifers

Heifers have the best overall conception rate in the herd and they usually contain the newest genetics, so breeding heifers to high genetic merit bulls is an excellent way to maximize genetic gains for the herd. Choose AI sires with high calving ease. One may also consider using X-sorted semen, but only if the first service conception rate is >60%; otherwise the cost of sexed semen will be too great. The use of X-sorted semen will reduce the incidence of dystocia and increase the numbers of heifers coming from the newest genetics in your herd.

Focus on optimizing your AI plan for heifers

Several options are available to minimize the time and effort required to breed heifers by AI. Breeding heifers based on heat detection is still used heavily in dairy heifers. You may consider trying one of the estrous detection-based AI schemes presented in below in Figure 2. Option A utilizes a progesterone-releasing device (*e.g.* CIDR) and a single prostaglandin F2alpha (PGF) injection so that estrous detection occurs during a seven-day window whereas Option B does not use a CIDR (a $12-14 savings) but requires two periods of estrous detection. In either option, most heifers will be detected in estrus on the second, third, and fourth day following PGF, but a few heifers will be in estrus earlier or later, so estrous detection for seven days is recommended. The use of heat indicator paint or patches is recommended in both options.

Option B will not work effectively on prepubertal heifers. This should not be a problem since dairy heifers should have experienced one or two estrous cycles before they are being bred. However, prepubertal heifers will respond to the Option A protocol. A cost-effective alternative is to feed melangestrol acetate (MGA) for 14 days, then detect estrus for 10 days.

Timed AI (TAI) strategies are very popular in heifers because they avoid the need to detect estrus and because it is extremely effective. Eighty-five to ninety percent of heifers should respond properly to the protocol regardless of their pubertal status. A popular five-day TAI synchronization protocol is

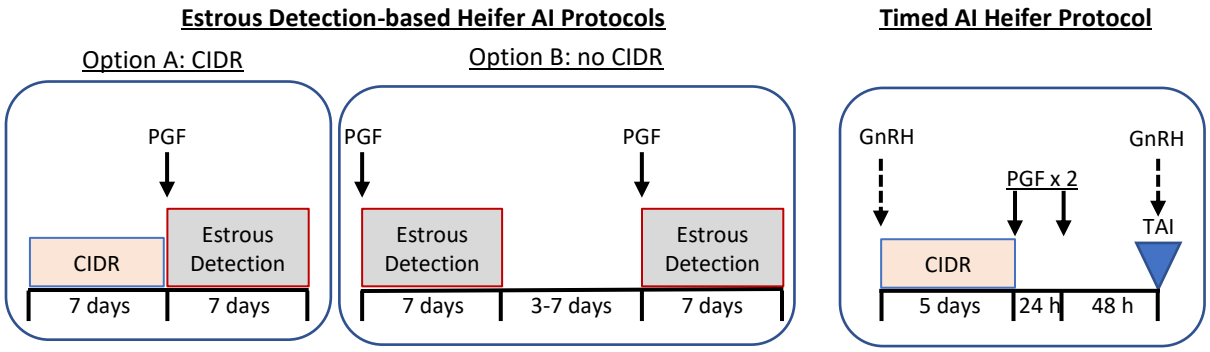

Figure 2. Estrous synchronization and timed AI strategies for dairy heifers. Adapted from[2]

shown in Figure 2. Regardless of the AI method used, the recommended goal of these AI programs is to achieve at least 50% and ideally >60% conception rates. Some producers may need to identify alternative AI protocols to fit their heifer breeding program. These producers may refer to the Dairy Cattle Reproduction Council for additional protocols and other excellent recommendations for breeding heifers[2].

Be aggressive with re-breeding open heifers
Missed breeding opportunities is a major limitation with getting heifers pregnant within the 13-16 month of age window. One way to ensure that most heifers will conceive within this window is to identify and re-breed open heifers in a timely manner. Estrous activity should be monitored in all bred heifers beginning 17 days after AI. Again, the use of heat indicator paint or patches is advised to facilitate estrous detection. Heifers identified in estrus can be re-bred immediately, using the AM-PM rule, or they may be bred at a later time once a group of open heifers is identified by enrolling them in any of the AI synchronization protocols outlined in Figure 2.

Rectal palpation should be completed 45-60 days after breeding in heifers that were not observed in estrus after breeding. A common way to re-breed any open heifers is to give a single PGF shot, detect estrus and AI. Heifers that are not detected in estrus after seven days be enrolled in the five-day TAI synchronization protocol described in Figure 2 to ensure that this subsequent breeding will occur as early as possible.

To sum things up;
It is easy to overlook heifers, but bear in mind that replacement heifer costs usually represent the second or third largest cost for dairy operations. So, develop a nutrition, health and reproductive plan that is best suited for your operation, and seek help if your age at first breeding or age at first calving goals are not being achieved.

[1] https://extension.psu.edu/monitoring-dairy-heifer-growth
[2] https://www.dcrcouncil.org/

Upcoming Events

State Dairy Quiz Bowl
March 19, 2022

North American Intercollegiate Dairy Challenge Academy
March 31 – April 2, 2022

Pittsylvania Youth Dairy Show
April 23, 2022

Dairy Skill-a-thon
April 29, 2022

Little All-American Show & Banquet
April 30, 2022

Virginia Spring Holstein Show (Youth)
April 30, 2022

Hokie Cow Classic
May 16, 2022

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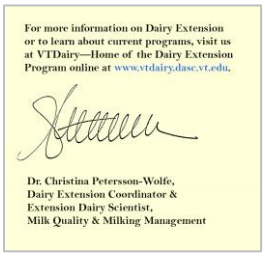

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