Introduction

Modern dairy herd management practices have increased the frequency with which animals must be handled. Animals must be isolated and restrained regularly for physical examination, vaccination, artificial insemination, pregnancy checks, treatment, dehorning, calving, etc. Table 1 lists the activities often performed on dairies. Animal handling is critical because each cow in the herd may be handled 40-50 times per lactation. For example, practices such as Ovsynch®, an estrus synchronization protocol, require animals to be restrained four times per breeding. Because of worker specialization, several different people often work with animals housed in the same group. Veterinarians often perform herd health examinations at the same time as the breeder is identifying and inseminating cows. As our dairies increase in size, more of the routine tasks are subcontracted to off-farm labor—such as professional technicians who visit the dairy daily. These professional technicians identify cows to be bred, breed them and maintain associated records. Self-locking manger stalls (headlocks), allow the producer to have several pens of animals ready for these support people who need access to the animals. Headlocks offer these support people flexibility in arrival time and an efficient way to observe, identify and service animals. Dairy facilities need to be designed to optimize the performance of both the animals and humans managing them. Whether headlocks are incorporated into all or part of a producer’s facility must be based on individual management needs and preferences, since very little research has been reported in this area.

Animal handling options

Sorting and restraining activities are independent of each other and can be performed in varying sequences. Dairy producers may sort animals using manual or electronic sort gates, or headlocks. With headlocks, animals are restrained in random order and then identified; whereas, sort gates are used to select animals that are then restrained in palpation rails, parlor return lanes, treatment chutes, or headlocks. The options selected influence work routines, labor requirements, and animal stress levels associated with animal handling activities. Options should be selected and incorporated into an animal handling system that is flexible enough to support the dairy’s current and long-term needs. The type of barn and features selected form a “system” that supports the producer’s management choices. Alley width, placement of crossovers and

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Table 1: Activities that require animals to be restrained

<table>
<thead>
<tr>
<th>Stage of lactation</th>
<th>Activity</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Just-fresh</td>
<td>Temperature to monitor health status, 1x/d for 14 d</td>
<td>14</td>
</tr>
<tr>
<td>Before breeding</td>
<td>Pre-breeding examination, 1x</td>
<td>1</td>
</tr>
<tr>
<td>Estrus synchronization</td>
<td>Ovsynch (GnRH, PGF, GnRH), 2.5 services x 3 shots</td>
<td>7.5</td>
</tr>
<tr>
<td>Insemination</td>
<td>AI breeding, 2.5 services/conception, 1x/service</td>
<td>2.5</td>
</tr>
<tr>
<td>Post-breeding</td>
<td>Pregnancy exam, most breedings</td>
<td>2</td>
</tr>
<tr>
<td>60d post-breeding</td>
<td>Pregnancy exam, recheck pregnancy</td>
<td>1</td>
</tr>
<tr>
<td>About day 110</td>
<td>Hoof trimming</td>
<td>1</td>
</tr>
<tr>
<td>60d to end of lactation</td>
<td>BST injections, every 14d for 245 days</td>
<td>17</td>
</tr>
<tr>
<td>End of lactation</td>
<td>Sort and dry treat cows</td>
<td>1</td>
</tr>
<tr>
<td>Dry period</td>
<td>J5 injections at –6 wk, -3 wk, calving</td>
<td>3</td>
</tr>
<tr>
<td>Dry period</td>
<td>Hoof trimming</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>51</td>
</tr>
</tbody>
</table>

1 The dairy management and handling routines vary between operations based on circumstances and the philosophy of the manager. The list of activities above can give some insight into the importance of such decisions.

Rough or prolonged handling of cattle can be a major source of stress. Stressed animals produce less milk and milking efficiency is reduced. Stressed cattle are difficult to handle, posing an increased risk of accidents and injuries for handlers and animals. Poorly designed handling facilities cause animals to balk. Properly designed handling facilities allow easy animal movement, reduce the need for rough handling, and result in calmer, less fearful animals.

**Possible animal handling systems**

Animal handling systems can be classified as “home-based”—where the animals are restrained and treated where they are housed, or “treatment-area based”—where animals are restrained and treated in some special area away from where they are normally housed.

Home-based systems normally utilize headlocks, where cows lock themselves in place when they return to a manger full of fresh feed after being milked. The self-locking feature is activated when the animal puts her head in a stanchion to eat. A few dairy producers treat animals by cornering them in a freestall. This practice is discouraged because of safety concerns—the animal could move or the worker might slip.

Treatment-area based systems often use sort gates to separate selected animals from their group as they leave the milking parlor. These sort gates can be manually controlled by the parlor operator or controlled automatically by a computer if animals are electronically identified. Animals sorted in this manner may be directed into a palpation rail (management rail) system, or placed in a holding pen and handled using a head chute or some other restraint system. Some producers restrain and treat selected animals in parlor return lanes. This animal handling technique requires very little capital input, but may slow cow traffic from the parlor and may increase labor requirements as workers wait for animals to be milked. Additionally, these systems have been questioned from an
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animal behavior standpoint, since cows do not like changes in their daily routines.

◆ **Headlock-based animal handling systems**

Dairy managers selecting an animal handling system should compare the cost of headlocks to the cost of a separate treatment area, plus any labor differences over time. The following are some advantages of headlock-based animal handling systems:

- Less traumatic handling of cows, since they are treated in familiar surroundings.
- Cows may eat their proper ration while waiting to be treated.
- No time is wasted returning animals to their pen after treatment because they were restrained in their own pens.
- Minimizes the risk of mixing pens of animals following treatments.
- Manger uprights decrease feed wastage and minimize the effect of boss-cow domination of a large section of the feed bunk.
- Large numbers of cows can be automatically restrained saving labor for routine tasks such as tail chalking, hoof spraying, bST injections, animal examination, etc.
- Manure from restrained animals is handled with normal procedures.
- Locking cows after milking allows teat sphincter muscles to close before the cow lies down, thereby decreasing the risk of mastitis.
- Parlor efficiency can be improved, since animals leaving the parlor do not need to be channeled through a narrow sort lane and operator time to sort or move animals is avoided.
- Allows workers to perform several different activities simultaneously while cows are locked (e.g., breeder and veterinarian can be working animals in the same or different groups).
- Two people can quickly identify and treat a large number of animals (e.g., one person in front identifying animals, researching their status and recording activities while a second person performs the treatment).
- Animals not automatically caught in headlocks may be directed into an open headlock or wedged between animals in a row of headlocked cows for treatment, which is safer than cornering cows in freestalls.
- Allows flexibility of arrival time for veterinarian and other workers handling cows—late arrivals or unexpected delays do not cause parlor slow down.
- Animals become conditioned to a consistent restraint method, which should reduce stress on treatment days.
- Animals restrained as a group are much calmer than animals that are separated from the group for individual treatments.
- Animals can be locked away from feed. This can improve animal movement past feed bunks and allows producers to deliver fresh feed to animals before they leave their pens to be milked, but does not allow them to eat until they return.
- Headlocks support the daily heat detection and A.I. breeding of custom breeding programs, such as RMS® by ABS Global, that may be difficult without headlocks.

As with all animal-handling options, producers’ report some concerns with headlocks:

- Initial cost may be high, but care needs to be taken to evaluate the “annual cost” of each system (annual cost = all initial costs adjusted for life expectancy and all associated labor costs).
- Concern that headlocks my depress dry matter intake exists, but insufficient research exists to prove whether observed decreases in intake are caused by the headlocks themselves, high stocking rates, improper animal acclimation periods, or a combination of the above.
- Some brands of headlocks make noise as cows access them.
- Since animals are locked along the length of a feed bunk, the walking distance can
be extensive for large herds and treatment supplies must be taken to the animal.

• Finding an animal may be difficult since animals are caught and restrained in a random order.

• Heifer housing costs may increase slightly because headlocks should be present for training heifers how to access feed through them. This can also be viewed as a positive in that it facilitates handling of heifers for health and reproductive reasons—labor costs are cut and the genetic potential of the herd is increased because artificial insemination becomes more feasible.

• Workers must handle animals differently if they are not automatically caught. Handling these animals can be time consuming, dangerous and stressful on the animal.

◆ Where have headlocks been used?

Headlocks have been installed and used in many different ways. Some of the more typical are:

• Complete Pens: The complete feed bunk of a freestall barn is lined with headlocks and all animals in the group are locked simultaneously. Desired animals are identified, treated and/or moved before the remainder of the animals are released. This is the most typical use of headlocks and very common in large herds.

• Partial Headlocks: Headlocks are only placed on a portion of the feed bunk length and gates are used to isolate a sub-pen. Selected animals are pre-sorted and placed in this sub-pen to be caught and treated, then the gate separating this sub-pen is opened allowing animals to rejoin their group. This technique can decrease the initial expenditure for headlocks, but may complicate animal management, and animals may show a preference for eating in the section containing no headlocks.

• Treatment Holding Pens: Headlocks are used in pens where animals are held after being sorted, are treated, and then returned to their permanent pen.

• Removable Headlocks: Groups of headlocks can be placed at the feed bunk on treatment days and removed the remainder of the time.

• Individual Pens: Here a worker can use gated pen sides to direct an animal into a headlock to be restrained during calving, treatment, etc.

Recommended headlock management practices

Headlocks, like any other tools, are more effective if incorporated into a complete animal management system that capitalizes on strengths and avoids weaknesses. If headlocks are to be used, the producer should:

• Allow animals time to learn how to access feed through headlock openings. If possible, raise heifers so they are exposed to headlocks at an early age. Purchased animals or mature animals should be given...
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time before calving to adjust. It is not recommended to start this training process with close-up cows.
• If headlocks are to be used in the just fresh pen to support early lactation health monitoring, animals should be conditioned to their use before calving.
• Avoid selective use of headlocks. A major advantage of headlocks is the ease with which animals access them if they become part of the animal’s normal routine. Removing routine headlock access may decrease the effectiveness of animal catching and/or feed intake.
• Minimize over-crowding of freestall barns. If there are more animals in a group than headlock openings, dry matter intake may be reduced.
• If a new facility is being planned and headlocks will be used, producers may want to avoid three- and six-row barn designs because of feed intake concerns and the inability to capture one-third of the cows at a time. On existing farms with three- and six-row barns, if self locks are desired, the owner should consider extending the existing feed bunks to provide sufficient headlocks to support the barn’s capacity.
• Animals should not be locked longer than necessary to minimize the time they are forced to stand on concrete away from water and freestalls. Under normal conditions, having cows locked 1.5 to 2 hours periodically should not impact animal health or performance. Bolinger’s research has shown that animals restrained for four hours had no drop in dry matter intake or milk production levels.
• Placing headlocks in freestall barns does not eliminate the need for a separate treatment area where non-routine surgeries, hoof trimming, etc. are done, but it does decrease the size, usage frequency and labor requirements for animal movement.
• Producers should consider mounting headlocks above the manger in a 10 to 20-degree sloped position. Research has shown that barriers placed at a 20-degree sloped position provided the cows better access to the feed manger and caused less impact on the cows or pressure on the feed barrier than when they are placed in a vertical position. Sloping headlocks more than this amount may affect the automatic closing ability of the headlock and increase the possibility of damage from equipment moving through the center feed alley.
• The inclusion of headlocks, like the investment in other barn features, should be evaluated and prioritized based on the producer’s circumstances. If the initial cost of headlocks is a concern because of budget constraints, designs can be selected that allow their inclusion later or headlocks may be placed in only those pens that house animals with high management needs (just fresh, breeding, etc).

Figure 2: Even with self-locking manger stalls, a dairy operation still needs a conveniently located, well-lighted area to treat cows needing special attention.

Housing No. 702
Talking to producers who use headlocks to determine what they like and dislike about different brands or styles is recommended. This should be done before the barn is built to ensure that curb heights match the manufacturer’s design specifications for the headlock type selected. Care must be taken to install headlocks according to the manufacturer’s recommendations, since pivot points mounted too high or low will affect the ability of the animal to enter or exit the headlock.

Feed bunk management is extremely important in order to maximize intake and milk production. Whether headlocks are used or not, care should be taken to keep fresh feed in front of animals and to maintain stocking rates that allow animals to access it.

◆ What do other people think about headlocks?

When major facility design decisions are being made, it is advisable to listen closely to advice from people who actually work with cows every day. The following are a few actual quotes from such people:

• “Handling cows without headlocks is like bow hunting without arrows.” Dairy farmer.
• “If the owners had built a four-row barn with headlocks instead of this six-row with a separate treatment area, I could cut my labor force by four people.” Herd manager for 1800-cow dairy.
• “I prefer headlocks because I can walk into a pen of animals, inspect every foot, and select animals that need hoof care.” Professional hoof trimmer.
• “Headlocks allow me to tail chalk a large number of animals and to identify and breed selected animals very efficiently.” AI inseminator.
• “My time on this farm could be cut in half if this producer had headlocks.” Veterinarian.
• “Conducting an effective reproductive management program on a modern dairy farm is very difficult without headlocks.” Reproduction specialist.

◆ What about dry matter intake concerns?

Research conducted by Kansans State University in the summer of 2000 shows that headlocks do not decrease feed intake if cows are accustomed to them. The study used 216 mid-lactation cows housed in two-row freestall barns, with a switch-back design, which exposed cows to both treatments. They found that for a herd accustomed to headlocks, removing those headlocks did not improve dry matter intake or milk production. Earlier, Batchelder, 2000, looked at the impact of head gates and overcrowding on production and behavior patterns of lactating dairy cows. He reported decreased intake for animals with head gates over those without head gates after cows...
were given one week to adapt. He went on to point out that head gates or the lack of them had less influence on eating behavior than they did on overcrowding. This result emphasizes the need to have animals exposed to headlocks before they reach the milking herd. Also, it is essential that overcrowding of barns be minimized when using headlocks.

◆ How long can cows be locked-up without affecting milk production

Research has shown that restraining cows in headlocks for four hours did not affect milk yield, milk fat percentage, somatic cell count, or daily dry matter intake (Bolinger, et al., 1997), but milk protein percentages were slightly lower. The only major behavioral change observed in cows locked up for four hours was their acts of aggression were elevated during periods following restraint. Arava et al. found that lock-up was more stressful, as measured by blood cortisol increases, during hot summer days than during cooler spring weather. Based on these results and personal observations, it is felt that every effort should be made to minimize the amount of time cows are locked, but herd milking and animal treatment schedules can be coordinated such that headlocks may be used without affecting milk production, within reasonable stocking rate limits.

◆ How much time can headlocks save?

Very little research has been conducted regarding labor usage in different animal handling systems. Palmer et al., 2000, conducted an on-farm labor usage study of nine midwestern dairies, ranging in size from 150-1700 cows. Veterinarian on-farm time and work activity times were recorded during routine herd health visits. Preliminary results show that the average amount of time necessary to actually palpate and treat each cow was less with palpation rail systems. This was because cows had been pre-selected and the veterinarian did not need to travel as far between animals. However, the average veterinarian on-farm time was less for headlock systems because fewer delays were experienced between groups. Standardized annual costs per cow per year were estimated using these average on-farm veterinarian times and estimated system costs for a 500-cow herd. Based on these values, the total annual cost per cow per year was $25.18 for farms using headlocks and $28.40 for farms using palpation rails. The highest average annual cost in this study, $32.83/cow/year, was associated with a herd using sort gates to select animals and a separate pen with headlocks to restrain animals. Statistical significance was not tested because of the small number of herds involved and the different animal handling protocols used. These results are meant to demonstrate an approach producers should consider when making their buying decisions.

◆ What should be considered when selecting a headlock brand?

The following is a list of features that may be considered when selecting a brand of headlocks:

- Can animals remove their head from the top and bottom of the opening? This helps animals that fall to exit the stall.
- How easy and safe is it to release individual animals? Can fingers get caught when animals are released?
- If a few animals are to be locked in place, how can the remainder of the animals be released—individually or as a group? What is the status of these unoccupied stalls after cows are released? Can other cows enter them? Will they be locked?
- Do uprights have counterweights or some other feature to insure the stall stays open when empty? Will they function correctly considering the slope of the barn and the feed fence slope?
- Can animals be released easily from behind the animal? Some manufactures have forks to release animals from behind or from a distance in front of the animal.
- How easy and safe is it to release a downer animal?
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- Does the design prevent two animals from entering a single opening and getting caught together?
- How wide is the head opening? Some newer models have openings as large as 18 inches. Wider openings allow easier entry and exit of animals and training time may be decreased. Bulls and cows with large heads may get stuck in narrower openings.
- Are the stalls made of materials that will wear well over time? Is the self-locking control mechanism durable enough that it will not require regular maintenance and adjustment?
- Is the product made of new materials? Has it been galvanized?
- Does the headlock’s catch dog ride back and forth on the rail causing long term wear?
- If parts of the stall are removable, will the removable part be dislodged easily and get into the manure handling system?

Conclusion

Knowing how animal management activities will be preformed is very important when designing a new or modifying an existing facility. When animal management systems are evaluated, it is important to determine the effects each system will have on the animals, management, facility layout, work routines, and labor requirements. All initial costs should be prorated and added to the expected on-going labor costs to arrive at an estimated annual cost of using each system. Whatever animal handling system is selected, it should be flexible enough to support daily disruptions and future animal management changes that will inevitably occur. Putting a value on convenience and flexibility is difficult, but substantial, when considering the implications of a structure that will last 10-20 years.
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References


