

Prevention of Lameness: The 4C approach



The **4C approach (comfort, calmness, cleanliness, consistency)** is a set of principles that, when applied properly, can greatly reduce the impact, frequency, and severity of a variety of diseases on your farm, including lameness.

Comfort

Cow comfort is the state of physical ease and freedom from pain, restriction, stress, and/or distress¹. Comfortable cows tend to be healthier, more productive, and less prone to lameness than others.



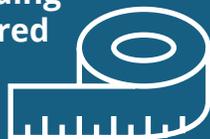
Ensure your cows are lying down an optimal amount of time per day, usually an average of 12 hours per day².

Bedding

Deep bedding is best. Comfortable stalls will reduce the development of lameness. Deep bedding also promotes lying for a longer duration and makes it easier for cows to get up and down². Aim for 12-18 inches (30-46 centimetres) of deep bedding with new bedding added at least twice per week (for sand, that's 20-80 pounds of sand per stall per day)².



Mattresses, water beds, gel mats, or rubber surfaces also need deep bedding (a good target is about 2-3 inches). This can substantially reduce lameness⁸. Be sure to provide comfortable stalls and bedding for heifers as well, as required by proAction[®].



Stall and Barn Design

Stall size and design can impact the way cattle use them, affecting lying time, their ability to easily stand up, and overall comfort. Stalls that are used appropriately can help to prevent the development of lameness and injuries. Below are some aspects of stall design that should be considered and monitored for cow comfort:

Brisket Locator or Front Curb:

- These help to locate the cow at the right depth in the stalls to keep them free of urine and manure

Adequate Forward Lunge Space:

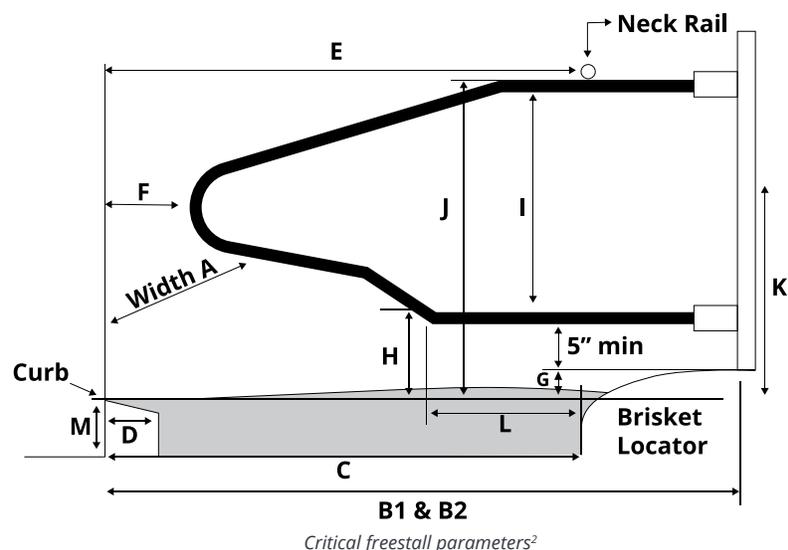
- Cows need space to lunge forward when they stand. When cows don't have enough forward space, they lie diagonally. They should have at least three feet of unobstructed space in front of them to facilitate head lunging²

Divider Loops:

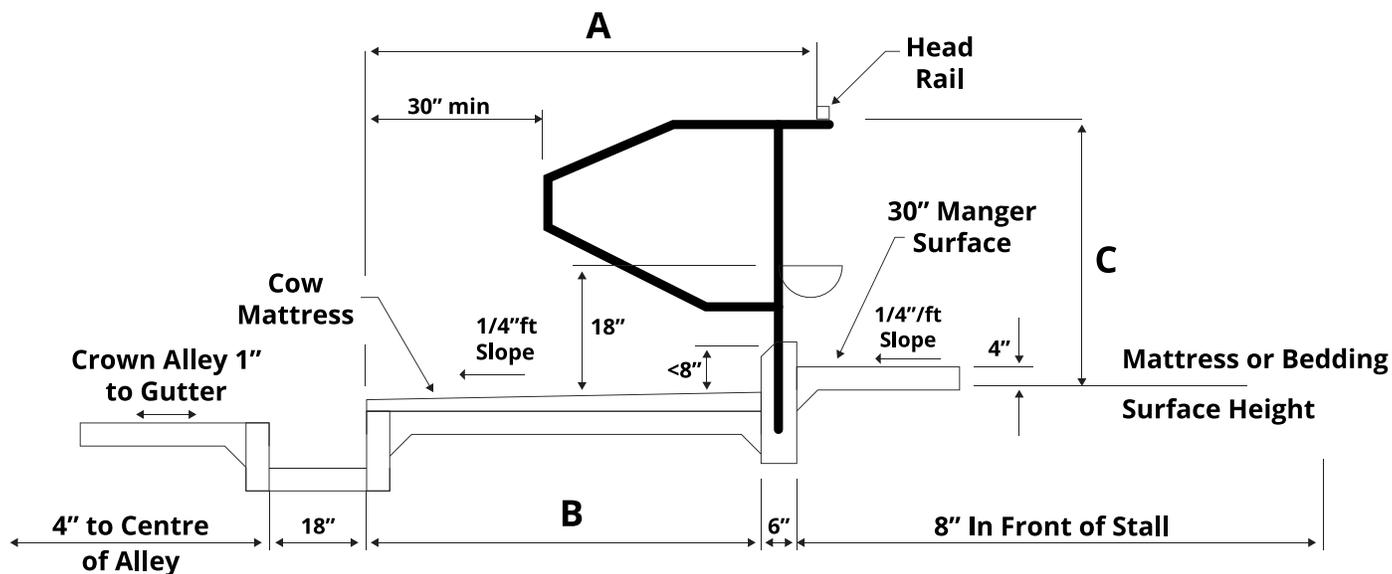
- Loops guide the cow as to where she should lie in her stall and prevent her from side-lunging

Neck Rail:

- This railing ensures that the cow is properly positioned in the stall when she is standing



Monitor cow behaviour. Cows that spend a long time standing are experiencing discomfort. These animals are at an increased risk of developing lameness. Long periods of standing also contribute to hoof growth and are associated with sole ulcers.



Target Tiestall Dimensions Based on Production Stage ³					
Dimensions (in)					
	A	B	C	Width	Chain Length
Holstein Cows					
Primiparous	84	70	44	50	C - 8
Multiparous	86	72	48	54	C - 8
Dry Cow	86	72	48	60	C - 8

Critical tie-stall parameters³

Time Out of Pen for Milking: Cows should spend no more than 1 hour (for herds milked three times daily) or 1.5 hours (for herds milked twice daily) per milking² out of their pen waiting to be milked (increased time spent standing). Target no more than 50-55 cows per robot for robotic herds so that cows do not spend prolonged periods of time waiting in line.

Bunk Space: A good goal for bunk space according to recent research is to provide at least 30 inches per cow; this will minimize displacements caused by bullying, and will allow vulnerable animals a greater opportunity to access feed without having to push in between other animals.



Stalls and Space: proAction[®] requires that dry and lactating cattle are housed in facilities with adequate stocking densities, where free-stalls must not exceed 1.2 mature cows per usable stall, and bedded-pack pens must provide 11 metres² (120 feet²) per mature Holstein cow.

The Code of Practice for the Care and Handling of Dairy Cattle provides additional guidelines that may help to further reduce competition and increase lying time recommends providing⁴:

- One stall for each cow in each group
- 160 feet² (15 metres²) per cow of resting area in individual cow maternity pens
- Wide alleys at feed bunks to allow cows to pass behind freely (approximately 14 feet, 4.3 metres)

Flooring: Slippery or traumatic flooring can lead to white line disease⁵. Cows alter their gait to prevent slipping which can cause problems. Consider rubber mats in high traffic areas (e.g. holding area, feed bunk) to reduce the stress associated with walking or standing.

Ensure concrete floors are properly grooved to prevent harmful forces on hooves:

- Surfaces should be smooth
- Grooves should be 0.75-inch wide and deep, spaced at 3.25 inches apart

Outdoor or Pasture Access: Several studies have identified that cows with access to pasture or kept on pasture have lower levels of lameness^{6,7}. It is recommended that you consider having a pasture area where cows are able to go outside for a certain portion of the day if your facility design allows for it.

Ventilation

Heat stress can play a role in causing lameness in cattle. Animals experiencing heat stress have reduced ability to buffer their rumen pH, and also spend more time standing.

When it is hot in the summertime, consider implementing some of the best management practices listed below to help mitigate heat stress and its impacts on your herd:



Shade: Provide shade so cows can get out of the sun



Ventilation: Move the air at cow-level to a speed of two metres per second



Sprinklers: Promote evaporative cooling (you need to move the air above the cow), particularly in holding areas; larger water drops can provide better cooling than mist

Hoof Trimming

Well-trimmed feet distribute a cow's weight more appropriately. Your hoof trimmer should be at (visit) your farm often and should be working with you and your veterinarian to develop the best hoof health program for your herd.



This should include:

- **Two hoof trims per cow, per lactation** (typically at peak lactation and dry-off)
- Prompt lameness identification and treatment
 - This should be happening between routine hoof trimming visits to ensure the best chances of treatment success
- Evaluate lame cows after treatment to ensure a proper response

Where possible, consider investing in a chute for your farm to make it convenient and safe for you and/or your trimmer to quickly investigate the feet of cows showing signs of lameness. This way, you don't have to wait for your hoof trimmer's next visit to lift their feet!

Cleanliness

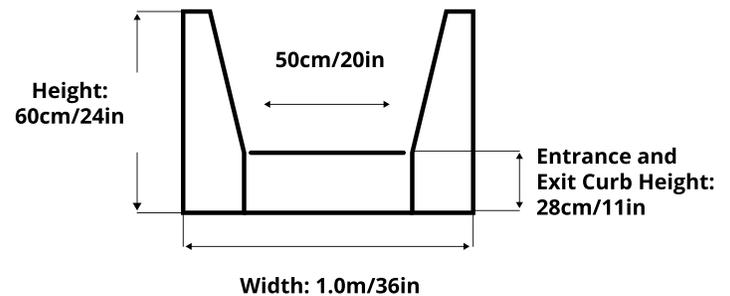
Environments with excessive manure, urine, and water accumulation/pooling can provide excellent breeding grounds for the bacteria that can cause digital dermatitis or heel horn erosion. Keeping floors as clean and dry as possible can help prevent softening of the skin and hoof, making them less susceptible to footrot and other hoof lesions.

Have your veterinarian or advisor assess the cleanliness of the cows in your herd to determine if your cleaning efforts are paying off, or identify areas for improvement (stalls, alleys, crossovers, holding areas, and parlours):

- Clean these areas frequently enough to prevent moisture from accumulating
- Floors and stalls should be sloped appropriately with excellent drainage
- Automatic alley scrapers can serve as a manure bath for cows' feet. Run scrapers frequently enough to prevent this

Footbaths

Footbaths are one of the most important ways to control footrot and heel horn erosion in freestall settings.



There are a few key considerations when implementing a routine footbath program for your herd:

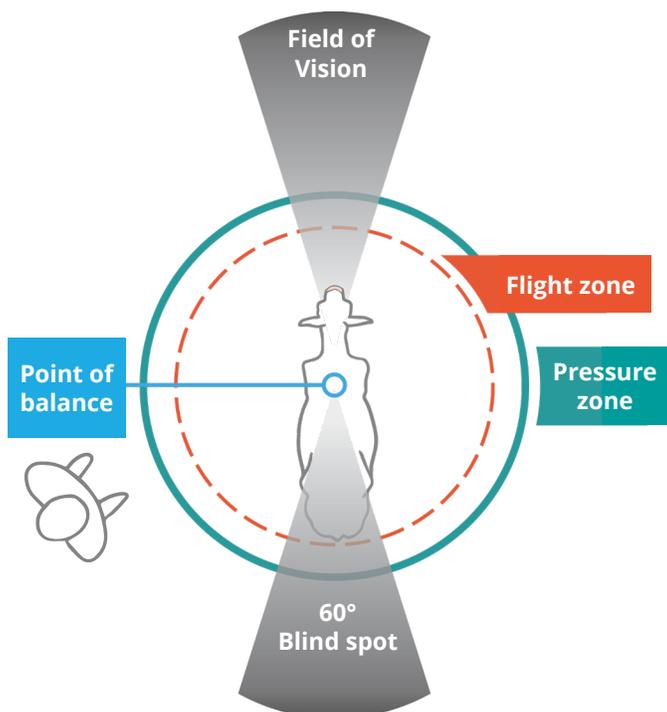
- Every foot needs two dunks in the footbath; therefore, footbaths should be 3-3.7 metres in length
- The only two footbath solutions that are supported by research are copper sulfate and formaldehyde. Talk to your veterinarian about the best products to use to maximize effectiveness, and how to calculate the appropriate concentration. Always follow the directions on the label to ensure safe handling
- Change footbaths after ~200 cow-passes⁸
- Start with footbaths four times per week:
 - If you are not seeing improvement after four weeks, increase the frequency
- Be sure to include heifers in your footbath program

Calmness

Cows should always be handled using quiet, low-stress techniques. Cows that are more reactive and excitable are more likely to slip, fall, and injure themselves.

The Code of Practice for the Care and Handling of Dairy Cattle outlines some excellent recommendations for proper handling of dairy cattle, including⁴:

- understand the field of vision, flight zone (personal space), and point of balance (shoulder) when moving cattle
- refrain from using loud noises to frighten or move cattle
- move cattle at a slow walk
- use panels, flags, plastic paddles, flappers (a length of cane with a short strap of leather or canvas attached), plastic bags, and metallic rattles as aids for moving animals
- provide flooring with good traction
- provide adequate lighting
- have routine contact with cattle and handle them in a calm fashion
- provide sufficient area that new animals can move into free space
- restrain animals for as brief a time as possible



Consistency

Cows are creatures of habit. Some areas to ensure consistency to prevent lameness include:

- Keeping the barn clean, dry, and well-bedded
- Ensuring the ration your cows eat is always there at the right time, mixed appropriately, and accessible to all without competition
- Staying on top of your footbath routine
- Making sure every cow gets two trims per lactation, every lactation
- Ensuring the entire farm staff is knowledgeable and trained in monitoring cow health and behaviour, and can employ excellent animal handling techniques are critical to preventing lameness

Nutrition

A well-balanced and mixed diet will minimize sorting which can prevent rumen acidosis and subsequent lameness. Providing copper and zinc at the appropriate levels can promote proper keratin (hoof) formation. Biotin supplementation can also increase hoof hardness.

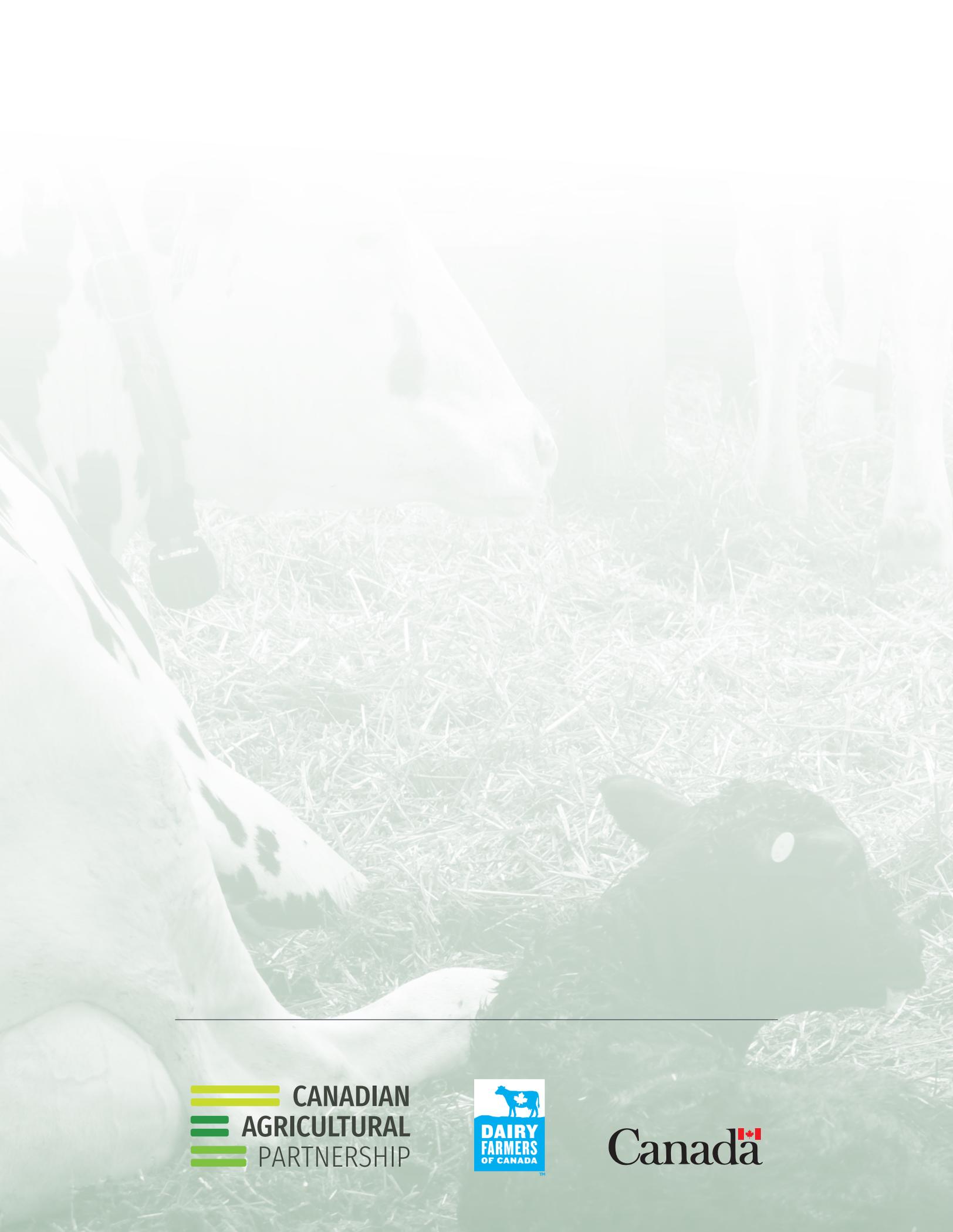
Ensuring enough bunk space for every animal to eat minimizes the effects that sorting can have on your herd.



Your nutritionist and veterinarian can help you formulate your ration and make sure your feeding management program is successful.

References

1. Anderson, N.G. 2019. Introduction: Building from the Cow Up. *Vet Clin North Am - Food Anim Pract.* 35:1-9. doi:10.1016/j.cvfa.2018.10.001.
2. Cook, N.B. 2019. Optimizing Resting Behavior in Lactating Dairy Cows Through Freestall Design. *Vet Clin North Am. - Food Anim Pract.* 35:93-109. doi:10.1016/j.cvfa.2018.10.005.
3. House, H.K., and N.G. Anderson. 2019. Maximizing Comfort in Tiestall Housing. *Vet Clin North Am - Food Ani. Pract.* 35:77-91. doi:10.1016/j.cvfa.2018.10.004.
4. NFACC. 2009. Code of practice for the care and handling of dairy cattle.
5. Endres, M.I. 2017. The Relationship of Cow Comfort and Flooring to Lameness Disorders in Dairy Cattle. *Vet Clin North Am - Food Anim Pract.* 33:227-233. doi:10.1016/j.cvfa.2017.02.007.
6. Chapinal, N., Barrientos, A. K., von Keyserlingk, M. A. G., Galo, E. & Weary, D. M. 2013. Herd-level risk factors for lameness in freestall farms in the northeastern United States and California. *J Dairy Sci.* 96(1):318-328.
7. de Vries, M., Bokkers, E. A. M., van Reenen, C. G., Engel, B., van Schaik, G., Dijkstra, T. & de Boer, I. J. M. 2015. Housing and management factors associated with indicators of dairy cattle welfare. *Prev Vet Med.* 118(1):80-92.
8. Cook, N.B. 2017. A Review of the Design and Management of Footbaths for Dairy Cattle. *Vet Clin North Am - Food Anim Pract.* 33:195-225. doi:10.1016/j.cvfa.2017.02.004.



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