NATIONAL FARM ANIMAL CARE COUNCIL
CONSEIL NATIONAL POUR LES SOINS AUX ANIMAUX D'ÉLEVAGE

CODE OF PRACTICE

FOR THE CARE AND
HANDLING OF

Dairy Cattle

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Introduction

This Code of Practice represents a significant update to the 2009 Code. In updating the Code, the Code Development Committee has made an effort to bring meaningful improvements to the welfare of dairy cattle that can be implemented on the diversity of farms across Canada and that can be defended to producers, customers, consumers, and the public.

This Code is informed by science and promotes the ethical treatment of animals in all situations. This includes meeting the Five Freedoms as well as ensuring:[1]

- Good nutrition, including water, for normal growth and physiology and to promote satiety and prevent diseases
- Housing that is clean and dry, provides thermal comfort, and opportunity for exercise and social interaction with other cows/calves
- Disease and injury prevention and prompt detection followed by appropriate treatments, including nursing care
- Positive human-animal interactions, compassionate and understanding of the animal's emotional needs and that minimize fear and distress
- Pain control for painful husbandry procedures.

Dairy cattle are sentient and deserve to be treated with compassion and respect. Farm owners, managers, and employees have an obligation to provide the same appropriate standard of care to all cattle on their farm irrespective of the animal's economic value.

The committee also recognizes the concept of One Welfare, which holds that animal welfare is interconnected with human wellbeing and the environment. A farmer who is struggling with health or other issues is less able to care for their animals. Likewise, ongoing or sudden animal care challenges on a farm can negatively impact the wellbeing of farmers. The wellbeing of animals and their care givers is, therefore, interconnected in very important ways.

As a nationally agreed upon standard, this Code of Practice is fundamentally important to improving the welfare of dairy cattle but, alone, it is not enough. The best outcomes for animals are achieved when a strong national Code of Practice is complemented by on-farm verification to the Code (currently done through a national on-farm assessment program), quality extension and other training efforts, and a close working relationship between farmers and their veterinarians, nutritionists, and other advisors.

Requirements in this Code are often outcome- or animal-based, as these are most directly linked to animal welfare and can be applied in a wide range of production systems giving the producer flexibility to determine how the outcomes can be achieved. Requirements refer to acceptable and unacceptable practices and are fundamental obligations of animal care. Recommended Practices encourage continuous improvement in animal care. However, failure to implement Recommended Practices does not imply that acceptable standards of animal care are not being met.

Where supported by a body of research evidence, specific outcomes or quantitative criteria have been used.

[1] Adapted from: Dairy Cattle Welfare Council (2018) Principles of animal welfare. Available at www.dcwcouncil.org/node/4006 Accessed: November 5, 2021.

Scope

In this Code, the word "cattle" refers to dairy cattle of all ages. This Code applies to dairy cattle (including bull calves and bulls) on dairy farms; it also applies to farms dedicated to raising heifers. It does not apply to associated industries (e.g., veal, beef, bull artificial insemination units). Consult the veal cattle and beef cattle Codes for information on the care of animals in those production systems.

The dairy cattle Code includes important pre-transport considerations but does not address animal care during transport. Consult the transportation Code of Practice for information on animal care during transport. All Codes are available on NFACC's website (www.nfacc.ca).

Glossary

Ad libitum feeding	allowing animals to eat as much as they want when they want (free choice).
All-In/All-Out	a production system whereby all animals are moved into and out of facilities and/or between production phases at the same time.
Analgesic	a drug that relieves pain. Systemic analgesics provide general (as opposed to local) pain-killing effects.
Anesthetic	a drug that induces temporary loss of sensation or awareness. A local anesthetic induces a loss of pain sensation in the area to which it is applied.
Animal welfare	an animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behaviour, and if it is not suffering from unpleasant states such as pain, fear, and distress (1). Animal welfare refers to the state of an animal; the treatment that an animal receives is covered by other terms such as "animal care".
Calves	male or female bovine animals up to the age at which they are weaned.
Cattle	in this code, "cattle" is used to refer to cattle of all ages.
Cleaning	the process of making equipment or facilities clean by removing wastes such as biofilm, manure, bedding or other organic debris. (Contrast with "Disinfect.")
Colostrum	the first milk secreted by the cow after parturition (giving birth) characterized by its high content of proteins and antibodies known as immunoglobulins (Ig).
Competence	demonstrated skill and/or knowledge in a particular topic, practice, or procedure that has been developed through training, experience, or mentorship or a combination thereof.
Compromised animal	in the context of transportation, an animal that has a reduced capacity to withstand transportation as indicated by signs of illness, injury, or weakness or due to a specific condition (2) (outlined in the *Health of Animals Regulations and Appendix F – Transport Decision Tree*). (Contrast with "Unfit animal.")
Corrective actions	actions to eliminate the cause(s) of nonconformity or other undesirable situations and to prevent recurrence. Generally, corrective actions relate to aspects of animal care or welfare that a producer can control; the action taken needs to be directed at effectively addressing a given issue. (Contrast with "Reasonable steps.")
Dehorning	removal of the horns of an animal after the horn buds have attached to the skull. Horn bud attachment occurs at approximately 2 months of age. (Contrast with "Disbudding.")

Disbudding	removal or destruction of the horn-producing cells of the horn buds before they have attached to the skull (which occurs at approximately 2 months of age). (Contrast with “Dehorning.”)
Disinfection	the application, after thorough cleaning, of procedures or products intended to destroy disease-carrying microorganisms. (Contrast with “Cleaning.”)
Dystocia	a prolonged calving, which may occur with or without assisted extraction of the calf (3).
Euthanasia	ending of the life of an individual animal in a way that minimizes or eliminates pain and distress (4).
Fit animal	in the context of transportation, an animal that is able to withstand the stress of transportation without experiencing suffering and expected to arrive at its final destination in good condition.
Flight zone	in animal handling, flight zone is the space surrounding an animal that, when penetrated, causes the animal to move to re-establish a comfortable distance. Low-stress handling is based on applying and releasing pressure on the edge of the flight zone ideally never penetrating the zone so aggressively that the animal overreacts and “takes flight.”
Handling aid	devices available to assist with and encourage the forward movement of livestock (e.g., flags, and other aids that serve as an extension of the handler’s body) and help direct the calm movement of cattle.
Heifers	young, female bovine animals from weaning to first calving.
Ketosis	a transition period metabolic disorder marked by elevated levels of ketone bodies, indicating that the metabolic processes in the liver are overwhelmed, leading to reduced liver function. Signs include rapid loss of body condition and reduced feed intake (and associated poor rumen fill).
Lameness	any alteration in an animal’s gait that appears to be caused by pain or discomfort. Lameness can manifest as a reluctance or inability to bear weight on a limb, shortened stride, arched back and/or head bobbing.
Laminitis	inflammation in the digits/hoof that may result in severe pain, abnormal foot growth, and lameness. Laminitis occurs in acute, chronic or sub-clinical forms, and may be a result of ruminal acidosis.
Low stress handling	the main principles of low stress handling are accommodating the animal’s natural behaviours and motivations, reducing noise and other stressors in the environment, and ensuring handlers interact calmly and patiently with cattle.
Neonatal calves	newborn calves up to 28 days of age.
Neuroma	a mass of regenerating nerve tissue (nerve bundle) that may form when nerve tissue is damaged. Neuromas can result in chronic pain.

Non-ambulatory	unable to rise or stand without assistance or move without being dragged or carried, regardless of size or age (2). An animal must never be dragged (2).
Non-steroidal anti-inflammatory drug (NSAID)	a drug that provides analgesic (pain-killing), fever-reducing, and anti-inflammatory effects but is not a steroid or narcotic.
Perinatal mortality	death of a full-term calf at birth or within the first 48 hours.
Point of balance	in animal handling, point of balance is the point on an animal's body (usually the shoulder) where an animal perceives a person to be standing in front of the animal (causing the animal to back up) or behind the animal (causing the animal to move forward).
Reasonable steps	steps taken to try to mitigate an issue that is not under a producer's control (e.g., weather, calving date). (Contrast with "Corrective actions.")
Rumen	the largest of the ruminant stomach chambers and the site of fermentation of fibrous feeds.
Ruminal acidosis	a metabolic condition that occurs when the acidity of the rumen is abnormal (i.e., pH lower than 5.5). The effects can range from disturbance of rumen function (resulting in decreased productivity) to metabolic and health disorders arising from absorption of acids and toxins from the rumen. Acidosis can occur after rapid or over-consumption of highly digestible feeds such as grains.
Rumination	the contractions of the reticulorumen (i.e., the first 2 stomach chambers) to regurgitate previously consumed solid feed, chewing of the feed for a second or more time followed by swallowing to return the bolus of digesta to the reticulorumen.
Satiety	a feeling of fullness or that hunger has been satisfied.
Sedative	a drug that depresses central nervous system activity reducing mental activity and body reactions.
Standard operating procedures	written step-by-step instructions describing how a particular task is to be done. Standard operating procedures typically include specific assignment of responsibilities, workflows, desired outcomes, and contingencies.
Thermoneutral zone	the range of ambient temperatures at which an animal can maintain a constant body temperature with minimal energy expenditure (5).
Unconsciousness	the point at which an animal can no longer feel pain or perceive and respond to its environment (e.g., light). This state is also referred to as "insensible."
Unfit animal	in the context of transportation, an animal that is unable to withstand transportation without experiencing suffering as indicated by signs of illness, injury or weakness or due to a specific condition (2) (outlined in the *Health of Animals Regulations and Appendix F – Transport Decision Tree*). (Contrast with "Compromised animal.")

Veterinarian-client-patient relationship (VCPR)	the basis for interaction among veterinarians, their clients, and their clients' animals. The VCPR is specifically defined in provincial veterinary acts but, generally, a VCPR has been established when the veterinarian has examined the cattle or visited the farm; the veterinarian has assumed responsibility for making clinical judgments related to the health of the cattle; and the client has indicated a willingness to follow the veterinarian's instructions.
Veterinary consultation	In this Code phrases such as "in consultation with a veterinarian" or "with veterinary input" refer to one-time consultations or discussions as part of an ongoing VCPR. They are not intended to imply a consultation is needed each time the procedure/practice is carried out.

1. Training and Stockmanship Skills

The people who care for cattle have an important influence on their welfare. Research in several farmed animal species, including dairy cattle, shows that attitudes and beliefs about animals and the importance of routine care influence the way people interact with animals and the diligence with which they carry out their tasks (6). These factors contribute significantly to the variation across farms in productivity and animal welfare outcomes (6).

Farm owners and managers play an important leadership role ensuring cattle health and welfare are priorities on the farm. Owners and managers also have important responsibilities to not only ensure staff are trained and competent but also to provide ongoing supervision.

REQUIREMENTS

- **Personnel who work with or care for cattle must be familiar with, and follow, the Requirements of this Code of Practice.**
- **Personnel who work with or care for cattle must be familiar with the farm's procedures and must have the competence to carry out the tasks they are responsible for.**
- **Managers must supervise personnel and retrain them if practices begin to fall below standards of care.**

RECOMMENDED PRACTICES

a. develop and implement a cattle welfare policy outlining the farm's commitment to responsible and humane care (see sample provided in Appendix A)
b. identify supervisors and other qualified professionals that personnel can approach with cattle care questions or concerns
c. develop and implement detailed standard operating procedures to support training
d. update standard operating procedures at least annually (or whenever improvements are made to procedures) and promptly communicate changes to personnel
e. track certifications and training completed.

2. Facilities and Housing

Dairy cattle in Canada are housed according to their reproductive state, size, age, and lactation period using a variety of systems. Systems may include loose housing (free stalls, bedded packs) or tie stalls, each with or without pasture access. In all life stages, cattle should be housed under conditions conducive to their health, comfort, natural behaviour, and safety. In addition to facility design, management in any given system is always important to ensuring cow comfort.

2.1 Design and Maintenance of Facilities

All housing should be designed and routinely maintained to promote cattle comfort and enable low-stress handling. Experienced handlers who understand how cattle react to noise, light contrast, and shadows will be able to move and restrain cattle more smoothly (31).

Cows benefit from rubber trackways on slatted floors in transfer alleys to and from the milking parlor.

REQUIREMENTS

- **Housing systems and their components (e.g., milking systems, ventilation, watering systems) must be maintained in good working condition and must reduce the risk of injury.**
- **Flooring must be designed and maintained to reduce the risk of injuries and lameness.**
- **Farms must be equipped for the safe restraint and handling of animals.**

RECOMMENDED PRACTICES

a. consult an experienced agricultural engineer or other technical advisor and the herd veterinarian when building a new facility or renovating an existing one

b. provide soft, high traction flooring in areas where cattle stand for long periods (74)

c. observe animal walking patterns routinely to assess floors for traction and surface conditions (e.g., level, abrasiveness, obstructions)

d. minimize the time cows spend on concrete alleyways (74)

e. flush and/or scrape alleyways 2–3 times per day to ensure clean walking surfaces

f. ensure the entrance to a restraint device is well lit and avoid moving cattle from light to dark areas (31)

g. increase light intensity if cattle balk when moving through facilities (31)

h. ensure restraint devices do not exert uncomfortable pressure points on an animal's body.

2.2 Housing Systems

2.2.1 Calves (Pre-Weaning)

Regardless of how calves are housed, several management strategies are key to keeping calves healthy and thriving especially hygiene, clean bedding, and good air quality and colostrum management.

Research generally shows that group housing itself does not increase disease risk especially when comparing small groups (or pairs) to individually housed calves (86). Some studies report a higher incidence of respiratory disease in group-housed calves but only where air quality is poor or in larger groups (>7–10 calves) (86). It can also be harder to identify sick calves in larger groups, and automated monitoring tools may be especially beneficial in these systems.

Rearing calves in pairs or small groups allows for effective monitoring and treatment of individual calves while also satisfying calves' strong motivation for social contact (86). When calves are paired or grouped early, they start sampling solid feed earlier, eat more solid feed prior to and during weaning, and have greater weight gains than those housed individually (87, 88). Calves that have full social contact with other calves from an early age are also less fearful and cope better with stressors (e.g., weaning, restraint, later transition into larger groups) (89). The earlier calves are socially housed, the greater will be their behavioural and performance advantages. Studies show no differences in solid feed intake and weight gains between calves paired at birth or at 3 weeks of age, but both show increased intake compared to individually housed calves and calves paired or grouped at 6 weeks of age (90).

Transitioning to group housing methods necessitates careful consideration and planning and very skilled daily management to ensure good outcomes for the calves. Good management includes evaluating the health status and compatibility (e.g., size, age, drinking speed) of individual calves before they are paired/grouped. Animal health and welfare indicators to carefully monitor, in consultation with a veterinarian or industry professional, include mortality rate, cross-sucking, and disease.

REQUIREMENTS

- **Housing must allow calves to easily stand up, lie down, turn completely around, stand fully upright (without touching the top of the enclosure), adopt sternal and lateral resting postures, groom themselves, and have visual contact with other calves.**
- **Calves must have a resting surface with bedding that provides comfort, insulation, dryness, and traction.**
- **Calves must not be tethered to a wall.**
- **Effective January 1, 2029, calves must not be tethered and, weather permitting in individual hutches, must be able to access an area outside the hutch large enough to allow them to rest comfortably.**
- **If tethering calves, the tether must include a collar.**
- **Effective January 1, 2033, calves that are healthy, compatible, and thriving must be housed in pairs or groups by 2–4 weeks of age (in indoor or outdoor systems).**

- **Use of pair/group housing methods can only be delayed on farms past January 1, 2033, for health and welfare reasons based on the advice of the herd veterinarian or other qualified advisor.**
- **The bedded area for group-housed calves must be large enough to allow all calves to rest comfortably at the same time.**

RECOMMENDED PRACTICES

a. house calves in well ventilated buildings or in hutches that provide ample fresh air through doors, windows, and top vents (refer also to *Section 2.4 – Ventilation*, *Temperature, and Relative Humidity*)
b. consult a veterinarian or other qualified advisor when making any changes to calf housing
c. develop, in consultation with a veterinarian or other qualified advisor, a plan for transitioning to pair or group housing methods as soon as possible after this Code's publication
d. if using individual hutches, consider arranging two together with a shared outdoor space or using hutches designed for pairs/small groups
e. group calves of similar size and age together to minimize disease risk and competition at feeding
f. once groups are formed, keep them as stable as possible (introducing a younger calf to an older group, or vice versa, can increase disease risk and competition)
g. manage groups in an all-in/all-out method to reduce disease transmission and permit effective cleaning and disinfection.

2.2.2 Heifers

Having well designed and managed heifer housing helps ensure well-developed replacement animals that will transition well into mature cattle housing. A growing animal's needs change with age. Flexible systems that accommodate changing requirements in management, housing, feeding, and overall animal care are ideal.

REQUIREMENTS

- **Housing must allow heifers to easily stand up, lie down, adopt normal resting postures, groom themselves, and have visual and physical contact with other cattle.**

RECOMMENDED PRACTICES

a. provide heifers with daily access to exercise yards or pasture, weather permitting
b. use housing systems that optimize freedom of movement and social interactions in groups
c. group heifers of similar size and age together to ensure compatibility.

2.2.3 Lactating and Dry Cows

Housing systems should be designed, constructed, operated, and maintained to meet the needs of the cows. There are important advantages and disadvantages to all housing systems—this is reflected in both the research and everyday experience of those who care for cattle. Regular freedom of movement and the ability to socialize are among the benefits of loose housing but cows can experience competition in these systems. Tie stalls offer cattle a competition-free environment that facilitates observation of individual cattle and, therefore, earlier detection of changes (e.g., body condition). However, freedom of movement beyond the stall is only possible when they're given access to loose housing or an outdoor area.

A significant body of research shows no overall benefit for several welfare indicators (e.g., lameness, hock and knee injuries) when comparing tie and free stalls (5,74). Yet cattle clearly benefit from, and are motivated to have, regular opportunities to move freely (5). While more research is needed to determine specific frequencies and durations, giving cattle regular access to open outdoor areas or bedded packs improves hoof health, reduces the frequency and severity of injuries, and can reduce the occurrence of lameness by 3.5–8% (5). Outdoor access and/or less restrictive indoor housing also enables social grooming and walking/trotting.

The number of tie stall barns being built in Canada and internationally has been steadily declining for many years. Farmers building a new barn are encouraged to continue this trend, one that was initiated within the dairy industry and that aligns with research on consumer/public viewpoints, and the long-term social sustainability of the industry. Farmers building new barns are encouraged to select options that most effectively achieve the Requirement below for daily freedom of movement and social interactions year-round. Bedded packs and free stalls are among the many examples of systems that effectively meet the needs of the cattle in our care.

REQUIREMENTS

- **Housing must allow lactating and dry cows to easily stand up, lie down, adopt normal resting postures, groom themselves, and have visual and physical contact with other cattle.**
- **Lactating and dry cows must be provided opportunities for movement as often as possible taking into consideration factors such as the age/class of animal, weather, and pasture and laneway conditions. Producers must do at least one of the following:**
  - house lactating cows in loose housing or at pasture
  - house dry cows in loose housing or at pasture
  - provide regular access to exercise yards and/or pasture for dry cows year-round (e.g., covered exercise area for winter, shaded area in the summer)
  - provide regular access to exercise yards and/or pasture for lactating and dry cows year-round, weather and conditions permitting.
- **As of the publishing of this Code, newly built barns must allow daily freedom of movement, exercise, and social interactions year-round.**

RECOMMENDED PRACTICES

a. as a guide, provide cows with ~50 hours of outdoor access within a 4-week period (~1.5–2 hours per day), weather and conditions permitting (96).

2.2.4 Breeding Bulls

Bulls need to be segregated for the safety of other cattle. Allowing bulls to have visual contact with other cattle may mitigate stress associated with isolation. Mature bulls are unpredictable and aggressive, and handlers should never work alone with them.

REQUIREMENTS

- **Housing must allow bulls to stand up and lie down with ease, adopt normal resting postures, and mount safely.**
- **Bulls must have a resting surface with bedding that provides comfort, insulation, dryness, and traction.**

RECOMMENDED PRACTICES

a. ensure bulls have visual contact with other cattle and a minimum of 200ft² (18m²) of pen space
b. build secure, sturdy housing
c. design the bull pen so the bull can be fed, watered, and restrained without anyone entering the pen.

2.3 Facilities for Special Needs

Special needs facilities are an option for segregating animals to provide for the special needs of calving, transition, or sick/injured cattle. All components of these facilities should be designed to minimize stress.

REQUIREMENTS

- **Special needs facilities must include a resting surface with bedding that provides comfort, insulation, dryness, and traction.**

2.3.1 Calving Areas

Cows are especially active in the hours before calving, so factors affecting the comfort of the calving area are especially important. A separate calving area allows for easier observation and management of individual cows and calves. However, calving can also be successfully managed in group calving pens.

Newborn calves are susceptible to disease making it critically important to maintain clean calving areas.

REQUIREMENTS

- **Calving areas must provide the cow and calf a well bedded area that is clean, dry, safe, separated from the main herd (through partitions/penning), and that provides enough space for the cow to turn around and be assisted if needed.**
- **Effective January 1, 2028, cattle on all farms (existing or newly built since the publishing of this Code) must calve in loose housed pens or pastures.**

RECOMMENDED PRACTICES

a. provide soft, non-slip flooring (e.g., soft rubber mats, straw pack)
b. ensure cows, and especially heifers, are familiar with their calving facilities prior to calving, to avoid additional stress around the time of calving
c. avoid moving or regrouping cows after they have been moved to calving areas
d. monitor and manage cows in group calving pens for aggressive behaviour
e. clean and disinfect calving pens after each use
f. where feasible, manage group calving pens in an all in/all out manner to reduce disease transmission and permit effective cleaning and disinfection (27).

2.3.2 Post-Calving (Fresh Cows)

Fresh cows need special care and a less competitive environment, which may be best achieved if managed as a separate group in loose housing systems. Research on both lying stalls and feed bunk space shows that the effects of overstocking are greatest for transition cows, including first lactation animals introduced into a pen of older cows (5) (refer to *Section 2.6 – Space Allowance* and *2.7 – Feeding Areas*).

RECOMMENDED PRACTICES

a. provide softer, non-slip flooring (e.g., soft rubber mats, straw pack).

2.3.3 Areas for Sick or Injured Cattle

Sick or injured cattle benefit from being housed in areas that facilitate additional care and treatment and allow them to recuperate without having to compete for feed, water, and lying areas. When ill, cows often separate from herd mates if given the opportunity (91). However, isolation is stressful to cattle, and they should only be segregated when necessary to support their recovery (e.g., prevent injury by herd mates) or minimize transmission of a contagious disease.

Refer also to *Section 5.3 – Caring for Sick, Injured, or Compromised Cattle*.

REQUIREMENTS

- **Areas must be available to segregate and treat sick, injured, or severely lame cattle.**

RECOMMENDED PRACTICES

a. design or modify facilities to have dedicated areas exclusively for sick or injured cattle
b. ensure sick pens provide enhanced comfort conducive to recovery (e.g., deep bedding or sand, soft rubber mat, supplemental heat, no drafts, separation from the herd)
c. ensure convalescing cattle that need to be segregated have visual contact with other cattle
d. clean and disinfect sick pens after each use.

2.4 Ventilation, Temperature, and Relative Humidity

Ventilation

Good ventilation, whether natural or mechanical, brings in fresh air and effectively removes dust, airborne pathogens, gases, and excess heat and humidity (5). Dust and ammonia irritate animals' eyes and respiratory tracts and can make cattle more susceptible to respiratory infections. However, definitive thresholds for cattle have not been established, including for ammonia (5).

The risk of pneumonia and other calf diseases can be dramatically reduced through good ventilation (without drafts) and the provision of adequate air space (i.e., at least 6 m^3 per calf up to 6 weeks of age and 10 m^3 per calf up to 12 weeks of age) (59). One of the biggest pneumonia risks for young calves is if they share airspace with older classes of cattle (92).

Temperature and Relative Humidity

Mature dairy cattle are generally able to tolerate low temperatures better than high temperatures (>25°C) (5). When the ambient temperature is above the thermoneutral zone, heat stress occurs because heat load

(accumulated both metabolically and from the environment) is higher than the animal's ability to dissipate heat (5). The specific ambient conditions (temperature, humidity) that lead to heat stress vary based on the cow's previous temperature acclimation as well as level of milk production, breed and size, and other factors (5). High-producing cows are most susceptible to heat stress due to the increased energy demands of milk production (5).

The thermoneutral zone for young calves (up to 3 weeks of age) is 15–25°C (5). Particular attention should be paid to temperatures inside calf hutches, which can far exceed ambient temperatures on hot days (5).

REQUIREMENTS

- **Facilities (e.g., hutches, barns) must provide cattle with fresh air; prevent the build-up of gases, dust, and moisture; and mitigate the risk of heat and cold stress.**
- **Refer also to Section 3 – Feed and Water for other Requirements related to cold or heat stress.**

RECOMMENDED PRACTICES

a. consider how many days above or below ideal temperatures for cattle are experienced in a typical year when choosing an appropriate cooling system
b. monitor cattle routinely for behavioural responses to heat stress, which occur prior to dips in productivity (e.g., increased standing time with shorter lying bouts, panting or increased respiration rate, competition for cooling resources, increased drinking bouts) (5)
c. limit reliance on misters and sprayers in high humidity regions (5)
d. always evaluate air quality, temperature, and speed at cattle level
e. if ammonia is ever readily detected by smell: test actual concentrations and take steps to ensure it stays below 5–10 ppm
f. remove manure and soiled bedding from facilities frequently
g. avoid housing calves in the same air space as older cattle to reduce the occurrence of pneumonia (59)
h. avoid situating calf pens in areas of the barn that tend to be cooler or draftier (these conditions are associated with higher disease risk for calves) (60)
i. avoid exposing cattle to sudden extremes of temperature

When facing cold stress:

j. gradually increase energy intake of calves and heifers in anticipation of cold weather to ensure that growth and weight gain are maintained during periods of cold temperatures
k. protect cattle from wind and moisture
l. protect cattle, and especially young calves, from drafts (e.g., build temporary walls/shelters in open-sided barns in the winter) (60)
m. ensure that the relative humidity inside a housing facility does not exceed 75%

n. provide calves with clean and dry calf coats in addition to deep bedding (5)

When facing heat stress:

o. avoid unnecessary procedures or other stressors during the hottest times of the day

p. provide cattle with access to shaded areas (5)

q. increase air flow by opening barn doors and vents fully and adding more fans, especially in areas where cattle are misted/sprinkled (5)

r. open all vents in hutches or elevate the back of the hutch (by 20 cm [8 in], as an example) to promote better air flow (5)

s. sprinkle or mist the backs of cattle when they are feeding or otherwise away from resting areas (wetting resting areas may increase mastitis risk) (5)

t. modify hutches and other facilities to have a reflective covering in the summer (5)

u. position hutches in shaded areas (5)

v. design and locate outdoor enclosures to take advantage of prevailing summer winds and reduce the amount of solar radiation that enters the barn (barns with an east-west orientation allow less heat from the sun to enter) (5)

2.5 Stall Design

Stalls that are compatible to the body size of cows allow natural lying positions that are associated with longer lying times, improved ease of movement, and reduced risk of injurious contact with stall dividers (5). Longer stalls and bed lengths increase lying time and decrease lameness and other injuries (5). Some research suggests that longer stalls and bed lengths may lead to slightly dirtier stalls, suggesting that enhanced stall cleaning routines may be needed when using longer stalls/beds (5).

Stall dimensions should always be considered relative to the size of the animals, genetic improvements and their effect on size of cattle in the future herd, as well as the behaviour of cattle when using stalls. Stall dimensions (width, brisket boards, neck rail placement) and tie-stall chain length should be set to maximize cow comfort and use of the lying area.

A guide on evaluating cow comfort, troubleshooting stall configuration problems, and recommended stall configurations is provided in *Appendix K – Resources for Further Information*.

REQUIREMENTS

- **Stalls and their components must be compatible with the size of cattle, in that the animal must be able to rest comfortably and rise and lie down with ease and minimize the risk of lameness and injuries.**

- **Prior to installing new stalls, or renovating stalls, producers must determine that the size of the stalls is compatible with the size of the cattle.**
- **Tethers or other head restraints must allow cattle to rest in a head back position.**

RECOMMENDED PRACTICES

a. build and/or modify stalls so that they allow cows to lay comfortably for at least 12 hours per day
b. build stalls that are sized to the largest animals in the group/class while also ensuring design and maintenance keep cattle clean (27)
c. build stalls with a lying surface length of at least 1.2 x the height of the cow's rump and a width of 2 x the hip bone width of the cow (and, for tie stalls, another 15.24–20.32 cm [6–8 inches] in width, depending on the design of the side dividers) (5)
d. modify the stall if cattle are frequently seen standing in the stall but not eating or drinking (see also *Section 2.8 – Bedding Management*) (93)
e. modify the stall if cattle show abnormal resting or standing postures (e.g., perching, kneeling) (see also *Section 2.8 – Bedding Management*) (93)
f. modify free stalls that are frequently avoided by cows
g. observe cattle for abnormal movements as they lie down and rise (e.g., brisk movements, hesitation) (93)
h. evaluate the time it takes cattle to rise or lie down (cattle should ideally rise in 3–5 seconds and lie down in <5 seconds) (93)
i. routinely observe the legs of the cows over pressure points for signs of abrasions, swelling or sores and modify stalls as needed (5)

2.5.1 Electric Trainers

Electric trainers are meant to train cattle in tie stalls to step back to the gutter curb when defecating and urinating, so that manure and urine do not fall on the surface of the stall (negatively impacting cattle comfort, cleanliness, and udder health). Electric trainers may impair hygiene and increase hock and foot injuries; however, research results are inconsistent indicating that the proper placement of the trainer is imperative to its efficacy (5).

Correctly positioned trainers can help ensure cattle cleanliness, udder health, and do not restrict animal's ability to show signs of estrus. The correct location above the chine is slightly ahead of the point where the back begins to arch when a cow defecates or urinates.

Electric trainers should be a tool of last resort. On some farms, they can be replaced with modified management strategies (e.g., more frequent cleaning and bedding changes).

REQUIREMENTS

- **Electric trainers must only be used when needed to train or retrain individual cattle.**
- **Trainers must be safe, secure, adjustable, and positioned to enable normal eating, standing, and lying behaviour.**

RECOMMENDED PRACTICES

a. for training: position the trainer about 5 cm (2 in) above the top line of cattle for about 24 hours
b. for maintenance: position the trainer to 10 cm (4 in) or higher above the top line of cattle after the training period
c. for remedial training: lower the trainer 5 cm (2 in) for 24 hours and then raise it again to 10 cm (4 in) above the topline of cattle
d. consult an electrician for grounding and installation of electric trainers.

2.6 Space Allowances

Space allowance is itself an important resource-based measure for animal welfare in loose housing systems, but the **ideal** density for any given farm should also be considered in the context of relevant outcomes outlined in this Code of Practice (e.g., keeping cattle clean, reducing lameness).

Free Stalls

Research consistently demonstrates that measures of lying behaviour, most notably lying time, are improved when the availability of lying stalls is increased (5). Free-stall stocking density is often expressed as the number of cows relative to the number of stalls (e.g., 110 cows for 100 stalls, which is equivalent to 1.1 cows per stall). Improvements to lying time and feed bunk access are most pronounced when moving from a high stocking density (e.g., 1.5 cows/stall) to an even stocking density (i.e., 1 cow/stall) (5). However, benefits are still seen when moving from an even density to a low density (e.g., 0.75 cows/stalls) (5). Beyond reducing competition, understocking may allow subordinate cows to avoid lying beside a dominant cow (5).

Many producers understock or maintain an even stocking density but some overstock (94). The free stall Requirement below is an upper limit not to be exceeded on either a routine or temporary basis (e.g., when expanding the herd, change in milk demand).

Bedded Packs

More space is generally needed in bedded packs (compared to free stalls) to achieve similar outcomes related to cleanliness and mastitis management (95). Optimal space allowances range from 7.4–15 m^2 (80–160 ft^2), or

higher, depending on several factors (e.g., climate, bedding, pack management, and breed/size) (95). North American studies suggest a need to provide at least 9.3 m² (100 ft2) per cow (95). Higher densities may increase pack compaction and cause excessive moisture (95).

REQUIREMENTS

- **Stocking density must not exceed 1.1 cows per stall in free-stall systems.**
- **Resting areas in bedded packs pens must provide at least 9.3 m² (100 ft²) per Holstein cow.[1]**

  [1]This minimum required space allowance is based on average weights for large breeds (e.g., Holstein) and will be adjusted for medium and small breeds.

RECOMMENDED PRACTICES

a. maintain a free stall density of 0.9 cows per stall (5)
b. reduce stocking density, or modify stall components, if cattle are seen lying outside the stall (refer also to *Section 2.5 – Stall Design* and *Section 2.8 – Bedding Management*)
c. determine optimal bedded pack space allowance based on overall bedding and pack management and increase space allowance (e.g., to 11–15 m² [120–160 ft²]) if cow cleanliness is suboptimal or cows tend not to rest at the same time
d. provide 15 m² (160 ft²) per cow of resting area in individual cow maternity pens
e. build wide alleys at feed bunks to allow cows to pass freely while other cows eat (approximately 4.3 m [14 ft]).

2.7 Feeding Area

Dairy cattle tend to synchronize their feeding activity and if feeding space is limited (i.e., not all cows can feed at the same time) increased competition may occur, preventing access to feed during peak feeding times (e.g., fresh feed delivery, returning from the milking parlor) (5). Synchronicity driven by milking may be reduced in barns using automatic milking systems, but adequate feeder space is still important (5).

Competition at the feed bunk affects vulnerable cows the most (5). Physical barriers, including head locks and feed stalls, can help reduce competition at the feed bunk and increase feeding time, particularly for subordinate cows (94). Compared to post-and-rail barriers, headlock barriers are associated with fewer displacements, less aggression, and more similar feeding times (5).

In addition to feed space and use of physical barriers, overall feeding management is important towards ensuring cattle have good feed access (refer to *Section 3.2 – Nutrition and Feeding Management for Cattle*).

REQUIREMENTS

- **Provide adequate linear feed bunk space to meet the animals' nutritional needs.**

RECOMMENDED PRACTICES

a. in free stall and bedded-pack barns:
   - provide at least 60 cm (24 in) of linear feed bunk space per lactating cow
   - provide at least 76 cm (30 in) of linear feed bunk space per transition cows (5)
b. ensure feeding surfaces are smooth and approximately 10–15cm (4–6 in) higher than the standing area
c. use physical barriers at the feed bunk
d. ensure alleys at the feed bunk are at least 4.3 m (14 ft) wide to allow easy movement of cattle
e. check for the prevalence of neck injuries and adjust the feed rail accordingly.

2.8 Bedding Management

Of all possible stall improvements, the provision of large amounts of dry bedding has one of the greatest impacts on cow comfort, lying times, and healing of injuries (5). While both the stall base and bedding contribute to the softness and traction of the stall, bedding depth appears to be the most influential and increasing the depth of bedding not only increases lying times and reduces lameness and other injuries but it also improves cattle comfort by compensating for hard or abrasive surfaces (5, 74).

Bedding quality, namely dryness, is a key component of cattle comfort (5). Cows and calves consistently show a preference for dry lying surfaces and will spend much more time standing when only wet bedding is available (5). Like mature cattle, calves spend most of their time lying down, and wet or insufficient bedding draws away their body heat. Keeping bedded areas dry also improves cattle cleanliness and reduces lameness, ammonia emissions, and fly infestations (53,74).

REQUIREMENTS

- **Cattle must have a resting surface with bedding that provides comfort, insulation, dryness, and traction.**

RECOMMENDED PRACTICES

a. provide generous amounts of clean, dry bedding (the more the better and at least 5 cm [2 in]) to help prevent lameness and promote healing of injuries (5, 74)
b. incorporate a bedding guard into stalls and pens to keep the bedding in the animal's area
c. ensure stalls and pens are routinely bedded and raked out
d. add new sand and level sand routinely in sand-bedded stalls
e. routinely observe the legs of cows over pressure points for signs of abrasions, swelling or sores and increase bedding depth if the rate or severity of injuries increases (5)
f. increase bedding depth and/or improve bedding management if cattle are frequently seen standing in the stall or pen but not eating/drinking or show abnormal resting or standing postures (e.g., perching, kneeling)
g. use straw choppers to enable an increased bedding depth without a significant increase in the overall amount of straw needed

h. replace or top up bedding if your knees get wet in 25 seconds of kneeling in the rest area (an indicator that bedding is too wet)

i. for stalls and bedded-packs: add clean, dry bedding daily

j. for bedded-packs: remove cow patties a few times each day to maintain cow cleanliness

k. for composted bedded-packs: bed as needed depending on climate and other factors and till twice per day to maintain cow cleanliness

l. in the summer: provide bedding that effectively conducts heat away from cattle (e.g., sand) (5)

m. in the winter: provide straw bedding (which offers more insulation than other bedding types) and ensure the depth permits cattle, and especially young calves, to nest (5,53).

2.9 Milking Systems

Minimizing stress on cows in the milking facility is very important. As there is a correlation between the amount of time standing on hard surfaces and lameness, minimizing the time cows spend away from feed and water and a comfortable stall is desirable.

REQUIREMENTS

- **Milking equipment must be properly maintained and calibrated.**
- **Electrified crowd gates must not be used to move cows into the milking parlor.**

RECOMMENDED PRACTICES

a. ensure milking areas are free of protrusions or other hazards and that gates and restraining devices operate safely

b. ensure milking areas are uniformly lit and increase light intensity if balking is frequent or light levels do not permit effective inspection of cattle or equipment

c. monitor cow behaviour during milking and refine equipment if signs of discomfort, fearfulness, or restlessness are observed (27,44)

d. ensure the milking facility is designed to minimize the time cows spend away from feed, water, and rest

e. in robot barns: have a low-stress system to prompt any cows that are not leaving the milker in a timely way (thereby preventing access by other cows)

f. in robot barns: have a system for identifying cows in early or peak lactation that are not voluntarily milking on time.

2.10 Pasture and Exercise Yards

Cattle are naturally motivated to graze and access pasture (5). Optimal pasture conditions offer not only a comfortable lying surface but also a cushioned surface with good traction for walking, and freedom to move around and graze (5). Outdoor access can also be provided in the form of an exercise yard or a sheltered bedded pack, which offer many of the advantages of pasture (freedom of movement, comfortable resting areas) (5).

Overall hoof health is generally improved the more cows have access to comfortable footing (e.g., pasture, bedded areas) (74). Giving cows more freedom of movement and opportunities for exercise also improves hoof health by increasing blood flow to the feet and legs (74).

RECOMMENDED PRACTICES

a. use geotextile fabric to build laneways, trackways to pastures, high-traffic gateways, yards, or outdoor feeding areas to reduce soil loss and promote drainage
b. ensure areas chosen for pastures and yards have good drainage
c. ensure pastures and fences (including electric fences) are safe and properly maintained
d. ensure cattle are provided with shade and protection from inclement weather when provided outdoor access (e.g., natural or artificial shade in the summer, overhead shelter in the winter)
e. inspect and maintain cow paths to minimize risk of injury and lameness.

2.11 Emergencies and Safety

Emergencies may arise and can compromise cattle welfare (e.g., power failure, flooding, disruption of supplies). Pre-planning will assist producers to respond in a timely and effective manner, better providing for the welfare of cattle during these events. Resources to support emergency planning are provided in *Appendix K – Resources for Further Information*.

RECOMMENDED PRACTICES

a. ensure staff are familiar with emergency procedures
b. ensure new or renovated facilities are designed with consideration to emergency procedures (e.g., rapid evacuation of cattle, emergency lighting)
c. develop a plan for evacuating cattle in the event of an emergency (e.g., transportation, alternate facilities)
d. install an effective alarm system for fire and power failure
e. consult local fire services on the correct number of fire extinguishers for all facilities
f. ensure fire extinguishers are maintained according to manufacturer's instructions and that personnel know where they are located and are trained in their proper use

g. ensure back up generators are available and functional
h. employ corrective measures in the event of stray voltage problems
i. ensure electrical panels are not accessible to cattle.

3. Feed and Water

3.1 Body Condition Scoring

Assessing body condition score (BCS) at dry-off, calving, first breeding, and throughout the lactation cycle can help determine whether an optimal nutritional program is in place and help troubleshoot health and fertility problems (7).

Both excessively fat and excessively thin cows may experience poor welfare (7). Cows that are too thin (BCS ≤2) may be experiencing hunger due to inadequate feed intake, have an underlying health condition, and may not have enough body fat reserves to maintain good health or support milk production.

Cows with excessive BCS at calving have poor appetites and lower dry matter intake compared to their thinner counterparts, and this may be a result of the cows' biological drive to return to their natural target BCS of 3 during early lactation (7). High BCS at calving (BCS >3.25) often results in a rapid loss of body condition following calving (7). Farms that have many over-conditioned dry and lactating cows are, therefore, more likely to have many cows that become too thin after calving as well as a higher occurrence of retained placenta and ketosis. High BCS at calving also significantly increases the risk of dystocia (8).

Over-conditioning is most appropriately addressed through herd-level corrective actions focused on the overall feed program, dry off management, and/or reproductive management. Reducing energy intake of individual cows that are over-conditioned negatively impacts the developing calf and is not a suitable corrective action.

Cows fed even moderate energy diets during the dry period easily over consume relative to their energy requirements. Research has shown that allowing dry cows to consume excess energy results in many changes typical of excessive BCS, even if cows do not appear to be over conditioned (7). Cows fed a high fibre, controlled energy diet to limit intake to near requirements showed a better metabolic profile after calving than cows fed higher energy close-up diets (7). Research has demonstrated that increasing BCS at calving from 3.0 to 3.5 (or from 2.75 to 3.00) results in a very modest increase in milk production (9).

REQUIREMENTS

- **Corrective action must be taken for cattle at a body condition score of 2 or lower.**
- **Refer to Appendix B – Body Condition Scoring Chart.**

RECOMMENDED PRACTICES

a. use *Appendix B – Body Condition Scoring Chart* to regularly assess body condition and keep records of the assessments

b. aim for the following **ideal** BCS ranges: (7,9)

- dry off: 2.75–3.25
- calving: 2.75–3.25
- growing heifers: 2.75–3.25

c. take corrective action if more than 15% of the herd is above or below ideal BCS for their production stage (11)

d. refine feeding and management strategies if >3% of cattle are over conditioned at calving (i.e., BCS >4)

e. ensure cows in early lactation have a BCS of at least 2.25 (7,9)

f. avoid a loss of >0.5 BCS point in early lactation (9,10)

g. keep BCS as consistent as possible throughout the dry period.

3.2 Nutrition and Feeding Management for Cattle

A significant portion on the variability in feed intake and milk yield in herds fed an identical diet are attributable to non-dietary factors such as stocking density, feed delivery frequency, and feed push-ups (12,13). Feeding management, therefore, has a major impact on the overall health and welfare of cattle. Cattle that are not fed adequately will be hungry and are more likely to have reduced immune function (14).

Strategies to improve feed access include: (5,14,15)

- reducing stocking density
- increasing the quantity of feed offered
- providing feed ad libitum
- increasing the per animal linear bunk or trough space
- using physical barriers to separate cows as they feed
- increasing feeding frequency and the frequency of feed push ups

Increasing the frequency of feed delivery (to at least twice a day) has also been shown to reduce feed sorting thereby improving the quality of diet cows ingest (16, 17).

Rumination facilitates digestion and stimulates chewing and saliva secretion, which may improve rumen pH and function (18). The amount of time an animal spends ruminating is affected by the characteristics of the diet, health, feed intake, degree of overcrowding, and grouping strategies (18,19). Rumination is more likely to occur when cows are lying down, making it important to ensure that dairy cows have comfortable resting areas (19).

Changes in rumination rate are an important early indicator of stress or illness (18). A reduction in rumination often occurs sooner than other indicators (e.g., fever, reduced feed intake, decreased milk yield) (18). Cattle with greater lying and ruminating times in the week before calving have higher dry matter intake and milk yield during the first two weeks after calving (18). Shorter rumination time, both prior to and after calving, is associated with increased risk of metabolic disorders (18). Additional guidance on rumination and assessing rumen fill are provided in *Appendix K – Resources for Further Information*.

REQUIREMENTS

- **Cattle must have daily access to a palatable ration that meets their nutritional needs, promotes satiety and maintains body condition, health, and vigor.**

RECOMMENDED PRACTICES

a. establish a feed program for all classes of cattle in consultation with a nutritionist
b. ensure the composition of diets reflects production level, reproductive stage, body size, and environmental temperatures
c. test nutrient content of feed ingredients used
d. ensure all rations have been balanced and that all feed components used in the ration are of good quality and free of spoilage
e. offer frequent feedings on a consistent schedule
f. adopt multiple strategies to minimize competition at feeding (e.g., increase feeding frequency, use physical barriers, increase the quantity of feed offered)
g. ensure continuous access to feed by frequently pushing up feed in the bunk
h. ensure provision of fibrous feeds that increase chewing activity or the time it takes to consume the ration (this increases salivary secretions, which helps reduce the risk of acidosis)
i. consider using automatic sensors for monitoring rumination activity of individual cattle (these are integrated in many commercially available monitoring devices, ear tags, or neck collars) (19).

3.2.1 Additional Considerations for Heifers

The energy requirements of heifers are influenced by their size and growth rate and ambient temperatures. Good nutrition, particularly protein, helps ensure adequate frame size, wither and hip heights, and growth rates (20). Growth rates are an important indicator of the success of heifer feeding strategies, particularly feed access.

Links to breed-specific heifer growth rate targets are provided in *Appendix K – Resources for Further Information*.

RECOMMENDED PRACTICES

a. group heifers of similar ages and weights to minimize competition and ensure the quantity fed is appropriate to heifer size
b. benchmark heifer body weight, wither and hip height, and average daily gains at key stages (e.g., after weaning, before breeding) and refine feeding strategies to achieve ideal targets
c. aim for average daily gains in post-weaned heifers of 0.6 kg (1.3 lbs) per day for small breeds and 0.9 kg (2 lbs) per day for large breeds (20).

3.2.2 Additional Considerations for Transition Cows

Transitioning cows have increased nutrient demands. Inadequate nutrition during this period can lead to both metabolic and infectious diseases (e.g., ketosis, fatty liver, milk fever). These health issues impact negatively on animal welfare and are associated with reduced milk production and reproductive performance and early culling (15).

Nutritional approaches to managing milk fever involve monitoring the nutrient balance in a dry cow ration, including the balance of cations (e.g., calcium) and anions (e.g., phosphorus, sulfur) in feed. Forages that are high in potassium (a cation) increase the risk of milk fever (15). Anions promote a more acidic metabolic state (lower blood pH) that is associated with a reduced incidence of milk fever (15).

The degree of reduced feed intake around calving is related to the severity of fatty liver immediately after calving making management practices that increase feed intake in transition cows critically important (15). However, increasing the energy density of the diets after calving (e.g., feeding additional grain, fat supplements) has not been shown to prevent fatty liver (15). Propylene glycol and rumen-protected choline have been shown to prevent fatty liver as well as ketosis (15).

RECOMMENDED PRACTICES

a. track the occurrence of ketosis, fatty liver, and milk fever and consult a nutritionist on specific strategies to reduce the occurrence
b. if the occurrence of milk fever is high: evaluate, with a nutritionist, the nutrient balance of feed to determine whether a change is needed (e.g., feeding lower potassium forages, addition of anionic products)
c. reduce the risk of sub-acute ruminal acidosis from higher concentrate diets by ensuring the diet contains sufficient effective fiber
d. 'dense up' the ration so that a lower dry matter intake of a high quality, palatable feed is possible, but avoid feeding large amounts of concentrates at one time
e. feed a diet that reduces the risk of feed sorting
f. monitor dry matter intake, rumen fill, and body temperature of transition cows
g. increase concentrate gradually according to appetite (e.g., 0.5–0.7 kg [1.1–1.5 lbs] per head per day).

3.3 Nutrition and Feeding Management for Calves

Calves are motivated to consume large volumes of milk (more than eight liters per day for Holsteins) (15). Calves especially benefit from higher milk intakes during the first four weeks of life when their ability to digest solid feed is limited (15). However, calves vary in their milk intakes and low vitality at birth is among the factors associated with reduced milk intakes (21,22).

Some commercial milk replacers have lower protein, fat, and digestible energy content than whole milk (15). Abrupt changes in diet and use of poor-quality milk/milk replacer are associated with health risks for calves, including diarrhea (15). Higher milk intakes are not associated with increased risk of diarrhea (15, 23).

Calves are at risk of cold stress at temperatures below approximately 10°C (50°F), requiring additional energy for maintenance, growth, and to generate body heat (15).

Links to breed-specific calf growth rate targets are provided in *Appendix K – Resources for Further Information*.

REQUIREMENTS

- **Calves must receive a diet that promotes satiety and maintains health, growth, and vigor.**
- **Neonatal calves must be offered a minimum total intake of 20% of birth weight (8 L for Holsteins) in whole milk (or the equivalent nutrient delivery via milk replacer).[2]**
- **The quantity of milk or milk replacer offered to calves at risk of cold stress must be increased.**

[2]The amount offered may be reduced for individual calves that are not consistently drinking at this level.

RECOMMENDED PRACTICES

a. provide calves whole milk (or the equivalent in milk replacer, mixed according to label instructions) ad libitum or at least twice daily
b. offer milk that is between 15–40°C
c. provide milk/milk replacer via a teat or provide a dry teat after milk feeding to satisfy the calf's motivation to suck (22)
d. offer calves at least 9 L of milk/milk replacer when ambient environmental temperatures are around 10°C and offer at least 10 L when temperatures are around 0°C
e. provide high quality calf starter (22–25% crude protein dry matter) within the first 7 days of age offering small handfuls at each feeding for the first few days (24)
f. aim to achieve average gains of 1 kg (2.2 lbs) per day and avoid a growth check in the days following birth (15,23)
g. manage group feeding systems to reduce competition between calves (e.g., increase the volume of milk fed, increase the ratio of teats to calves, use barriers between teats, group calves of similar drinking speed together) (15,23).

3.3.1 Weaning

Solid feed intake, which increases as calves get older, is an important criterion for when to wean (23). Signs of stress during weaning can be reduced by weaning gradually and by either adjusting weaning age according to each calf's solid feed intake or by weaning after eight weeks of age (23). Calves that are gradually weaned over at least ten days tend to consume more starter and have better weight gains during weaning and in the immediate post-weaning period compared to abruptly weaned calves and those weaned over four days (23,25). High preweaning dry matter intake and weight gains have been linked to improved milk production and reproductive outcomes (26).

REQUIREMENTS

- **Weaning must not be initiated until calves are at least 6 weeks of age and it must not be completed until they are at least 8 weeks of age (24).**
- **Calves must be gradually weaned over at least 5 days to minimize the risk of weight loss (23).**

RECOMMENDED PRACTICES

a. initiate weaning when calves are 8 weeks of age or older or when individual calves are consuming at least 3 lbs (1.4 kg) of starter daily for at least 3 consecutive days (23, 24)
b. wean calves over 10 days or more (23).

3.4 Pasture Feeding

Depending on the region and time of year, cattle may benefit from being fed at pasture. Grazed forage can be an excellent source of feed, particularly for heifers, provided the pasture is properly managed and the diet is supplemented (based on heifer growth rate and pasture quality) with grain, minerals, and/or other forage sources (28).

While high quality pasture, in sufficient quantity, can fulfill the nutrient requirements of early dry cows (at least four weeks prior to calving), pasture alone may not provide sufficient energy for some breeds in the close-up period (three weeks prior to calving) (28).

Offering supplemental grain to lactating cows fed at pasture helps ensure greater microbial protein synthesis and increased dry matter intake and is generally needed to maintain body condition (29).

RECOMMENDED PRACTICES

a. develop a feed program for pastured cattle in consultation with a nutritionist (e.g., when supplementation may be needed)
b. test the quality of forage throughout the growing season so that supplementation accurately corrects for seasonal variations in nutrient content (28).

3.5 Water

Daily water needs depend on many factors, including diet, ambient temperatures, metabolic activity (e.g., pregnant, lactating), and health status (e.g., scours). Water plays an important role in digestive processes—cattle with an insufficient supply of water will limit their solid feed intake. While water intake in young calves fed high volumes of milk tend to be modest, calves with good access to water from birth consume more milk, attain better pre-weaning weights, and may have enhanced ruminal development (and therefore improved nutrient availability for growth) (30).

Water quality affects water consumption (14). Cattle may limit their water intake to the point of dehydration if water contains compounds that diminish palatability (e.g., algae, manure, certain minerals in high concentration) (14). Maintaining clean waterers and periodically testing water quality helps ensure water is safe and palatable.

REQUIREMENTS

- **Watering systems must be clean, and cattle must have access to palatable, clean water in quantities to maintain normal hydration and health, taking into consideration factors such as environmental temperature and diet.**
- **Neither ice nor snow are suitable sources of water.**

RECOMMENDED PRACTICES

a. ensure waterers are at a height that is comfortable for all classes of cattle (e.g., 60–75 cm [24–30 in] for cows)
b. provide sufficient drinking space to minimize competition (e.g., 8.9 cm [3.5 in] per lactating cow)
c. check waterers at least once daily to ensure they are dispensing water at an ideal flow rate
d. situate watering points at walkthrough areas (e.g., cross-over alleys)
e. provide water with a depth of at least 10 cm (4 in) in water troughs
f. test water quality annually and at high-risk periods (i.e., spring, fall) or whenever problems such as reluctance to drink, poor performance, or reduced feed intake are observed.

4. Husbandry Practices

Husbandry practices are routinely carried out for reasons of management, animal welfare, and human safety (27). As outlined throughout this chapter, options for improving animal welfare in relation to these procedures include using the least invasive method; replacing the procedure with another management strategy; breeding cattle so that they do not require the procedure (e.g., polled genetics, high health traits); and/or providing effective pain control (27).

It is not acceptable to perform painful or stressful procedures or alterations on cattle for cosmetic reasons.

Phrases such as "in consultation with a veterinarian" or "with veterinary input" refer to one-time consultations or discussions as part of an ongoing VCPR. They are not intended to imply a consultation is needed each time the procedure/practice is carried out.

4.1 Handling, Moving, and Restraining Cattle

Human-animal interactions significantly impact cattle welfare and farm productivity (e.g., conception rates, annual milk yields, weight gains) (6). The main principles of low stress handling are accommodating the animal's natural behaviours and motivations, reducing noise and other stressors in the environment, and ensuring handlers interact calmly and patiently with cattle. Cattle that from a young age are consistently handled using low stress techniques experience less fear, are less likely to become injured, and will be easier to handle (6,31). Some research suggests that cattle may find yelling/shouting as aversive as electric prodding (33,34).

Proper restraint is important not only for human and animal safety but also facilitates correct application of procedures. Depending on the size of the animal and nature of the procedure, cattle may be safely restrained manually or using a halter, chute, or sedative.

Additional resources on humane handling are provided in *Appendix K – Resources for Further Information*.

REQUIREMENTS

- **Personnel must be knowledgeable in cattle behaviour and must only use low stress handling techniques.**
- **Handling aids must be purpose designed to safely move cattle.**
- **Electric prods must never be used for moving or handling cattle.**
- **Abusive handling is unacceptable. This includes but is not limited to kicking, beating, striking, tail twisting,[3] and dragging or forcefully pulling cattle by the tail, head, or neck.**
- **Cattle must be properly restrained to ensure animal safety during husbandry procedures.**

[3] Tail twisting is distinct from gently raising the tail to briefly immobilize an animal.

RECOMMENDED PRACTICES

a. understand the field of vision of cattle and apply the principles of flight zone and point of balance when moving cattle (31)
b. identify and promptly address barriers to cattle movement (e.g., unusual noises, shadows)
c. provide sufficient area and a well-lit path for cattle to move in the desired direction (31)
d. provide flooring with good traction (31)
e. move cattle at a slow walk and in small groups
f. train cattle to use restraint devices to ensure ease of entry and minimize the risk of injury
g. use a restraint that is ideal for the age of cattle and procedure being done
h. restrain cattle only for as long as needed to safely carry out the procedure.

4.1.1 Additional Considerations when Moving or Handling Down Cattle

All cattle, but particularly down cattle, need to be handled and moved in a calm, patient, and compassionate manner. Detailed guidelines on moving and lifting down cattle are provided in *Appendix K – Resources for Further Information*.

Where appropriate, lifting down animals can relieve the pressure on muscles and nerves and is an important strategy to prevent secondary injury associated with prolonged recumbency (35). Cows can only be lifted for a short time (minutes) (35).

Limited use of an electric prod may be necessary in rare cases to help confirm whether a down cow can rise. For example, it can help assess nerve damage—lack of response to the prod suggests nerve damage and therefore a poor prognosis. Use of a prod in this context must be done carefully and correctly, if at all.

REQUIREMENTS

- **Apparatus that are designed to lift, move, and support down cattle must be used according to the manufacturer's specifications.**
- **Hip lifters must only be used to lift an animal for a short duration to help it stand on its own. They must never be used to move down cattle.**
- **Down cattle must not be moved by hoisting by chain, dragging, or lifting without adequate body support.**
- **Personnel must not repeatedly encourage a down animal to rise if it has demonstrated it cannot get up or move.**
- **If an electric prod is used, it must be used with veterinary input and only applied on the rear flank and upper rear leg (twice at maximum) when absolutely necessary to determine if the animal can rise or needs to be euthanized.**

4.2 Surgical and Other Husbandry Procedures

Procedures that have the potential to cause pain must be performed in a way that minimises any pain and stress to the animal (27). For most surgical procedures, including minor procedures, research demonstrates an overall benefit of using both local anesthesia (to prevent acute pain) and a non-steroidal anti-inflammatory drug (to reduce post-surgical pain) (3). Pain control is best used pre-emptively (3).

The frequency of post-procedure monitoring depends on the nature of the procedure.

REQUIREMENTS

- **Cattle must be monitored after surgical procedures to ensure the site is healing and free from infection or abnormal bleeding.**

4.2.1 Animal Identification

Both freeze branding and hot-iron branding cause pain and distress in cattle (15,36). Branding is not commonly practised in the dairy industry and alternative means of identification are accepted by most export markets.

REQUIREMENTS

- **Cattle must be identified using an approved ear tag (as stipulated by applicable regulations) as the primary means of animal identification, and it must be applied carefully and correctly.**
- **Cattle must not be branded.**

RECOMMENDED PRACTICES

a. use non-toxic paints for temporary markers
b. adjust neck, tail, or leg bands to prevent any discomfort.

4.2.2 Disbudding and Dehorning

Disbudding and dehorning are done for the safety of cattle and their caregivers. All methods of disbudding and dehorning are painful at any age (15, 36). Animals are easier to handle, heal more quickly, and show lower declines in growth rate when the procedure is performed at younger ages (15, 36). Disbudding (removing the horn bud before it has attached to the skull) is less invasive than dehorning (horn removal after attachment) (15, 36). Horn bud development varies but they typically attach to the skull at approximately two months of age (37). Disbudding may need to be delayed in exceptional circumstances – mainly, for a sick calf or one whose buds are insufficiently developed at two months (to enable application to all horn producing cells thereby avoiding re-growth and the need for a repeat procedure).

Proper procedures are important to prevent re-growth, injury, and risk of infection (15). When using caustic paste, proper technique helps ensure the paste does not spread on the treated animal or herd mates (15).

For all methods of disbudding/dehorning, including cautery and caustic paste disbudding, a local anesthetic is necessary to reduce the pain during the procedure and an analgesic is necessary to control longer lasting pain (3, 36). Method of administration of the local anesthetic may be particularly important when caustic paste is used (3). The local effects of the paste may interfere with anesthesia given at the site (via a ring block) making it more effective to desensitize the nerve at some distance to the horn bud (via a cornual nerve block) (3).

Banding is not acceptable due to the increased pain, delayed healing, and higher failure rate associated with this dehorning method (38).

Breeding cows to polled (genetically hornless) sires results in polled calves and is strongly encouraged as a means of avoiding the need for disbudding/dehorning (15,27,36).

REQUIREMENTS

- **Horn bud removal must be done by 2 months of age (15,36). Only in exceptional circumstances can individual cattle be dehorned after 2 months of age.**
- **For bud/horn removal at any age, pain control must be provided in consultation with a veterinarian and include local anesthesia and systemic analgesia (3,36).**
- **Cattle must be monitored after bud/horn removal to ensure there are no signs of infection or abnormal bleeding.**
- **Banding is not an acceptable method of dehorning (38).**
- **If larger horns must be removed, bleeding must be controlled.**

RECOMMENDED PRACTICES

a. breed cows to polled (genetically hornless) sires to avoid the need for bud/horn removal (27,39)
b. select, in consultation with the herd veterinarian, a method that is most appropriate for the size of horn and/or age of animal
c. aim to disbud calves prior to 4 weeks of age (39)
d. avoid disbudding day-old calves as it may interfere with colostrum intake
e. avoid disbudding calves being weaned or grouped or that are sick
f. consider, in consultation with the herd veterinarian, the inclusion of a sedative to minimize animal stress and ease handling (15).

4.2.3 Castration

While not a routine practice in the dairy industry, castration is performed on some farms to prevent unwanted reproduction, reduce aggression towards humans and other cattle, and improve meat quality. All methods of castration cause pain and distress at any age (15,36). This response can be reduced by using sedatives, anesthetics, and analgesics (15). Animals are easier to handle, heal more quickly, and tend to have a decreased stress response when castrated at a younger age (15).

Factors to consider when selecting a method include the acute pain at the time of the procedure, post-procedure pain (and the extent to which that pain can be managed), rate of wound healing, and stress associated with restraint (36). Methods associated with faster wound healing and fewer complications are preferable, and research suggests that wound healing is fastest with surgical methods (36). The risk of incomplete castration is lowest after surgery, intermediate after the use of a rubber ring, and highest after the use of a Burdizzo/clamp (40).

REQUIREMENTS

- **If castrating calves, the procedure must be done as early as possible and pain control must be provided in consultation with a veterinarian and include local anesthesia and systemic analgesia (3,15).**
- **Cattle must be monitored after castration to ensure there are no signs of infection or abnormal bleeding.**

RECOMMENDED PRACTICES

a. consider, in consultation with the herd veterinarian, the inclusion of a sedative to minimize animal stress and ease handling (15)
b. avoid castrating at the time of weaning to reduce stress.

4.2.4 Tail Injuries

Tails can be broken through interaction with the environment (e.g., scrapers, gates), by being stepped on by other cattle, or through improper handling. Given the frequent activity of the tail, such injuries compromise cattle welfare. Docking may be deemed medically necessary by a veterinarian to treat a broken tail in specific, individual cases.

Tail docking causes some acute pain and brings the risk of post-operative infection and chronic pain due to neuromas (15,41,42).

Routine tail docking is not permitted. It provides no overall advantage in terms of cow cleanliness, udder health, or milk quality (15). Tail docked cattle may also experience greater discomfort from flies as they are not able to use the tail to control flies (15). Trimming the switch can improve cleanliness and worker comfort.

REQUIREMENTS

- **Cattle must not be tail docked unless deemed medically necessary for an individual animal in consultation with a veterinarian.**
- **When docking is deemed medically necessary, local anesthetic and/or systemic analgesia must be provided in consultation with a veterinarian.**

RECOMMENDED PRACTICES

a. investigate any tail injury, considering the age class affected and the location of the injury, to better understand and promptly address the underlying causes
b. trim tail switches 2–3 times per year.

4.2.5 Extra Teat Removal

Supernumerary teats (also referred to as extra or sprig teats) may be found as extensions of a primary teat, between the front and rear teats, or behind the rear teats. Supernumerary teats can interfere with milking and create another entry point for bacteria, thereby increasing the risk of infection.

From an animal welfare standpoint, removing extra teats for purely cosmetic reasons is not ethical or acceptable.

REQUIREMENTS

- **If removing extra teats, they must be removed as early as possible (e.g., at the same time as disbudding) and pain control must be provided.**

RECOMMENDED PRACTICES

a. provide a local anesthetic to desensitize the teat, in addition to systemic analgesia
b. consider, in consultation with the herd veterinarian, the inclusion of a sedative to minimize animal stress and ease handling (particularly if the procedure must be performed on an older animal).

4.3 Udder Hair Removal

Unclipped udders accumulate more dirt and make it more difficult to effectively clean the teat and sanitize milking equipment. Flame-clipping (a less time-consuming alternative to electric clipping) involves passing a cool flame under the udder to singe the hair off. Even though the flame is cool, proper technique is important to avoid burning the teat ends.

REQUIREMENTS

- **When flame-clipping udder hair, purpose designed equipment must be used.**

RECOMMENDED PRACTICES

a. remove hair from udders on a regular schedule
b. if using clippers, ensure blades are sharp.

4.4 Breeding

Breeding management and care of pregnant cows have an impact on the welfare and future performance of cows and calves as herd replacement animals. Stressful handling shortly after breeding may reduce conception rates (31).

RECOMMENDED PRACTICES

a. consult the herd veterinarian on herd reproductive performance and arrange for a veterinarian to perform reproductive examinations
b. match bull weight and stature to heifer/cow size and physical condition
c. ensure heifers/cows have achieved adequate stature and are in ideal body condition range prior to breeding (refer to *Section 3.1 – Body Condition Scoring*)
d. ensure diligent management of cows in heat that are mounting or displaying other behaviours that may cause injury to other cows (e.g., temporary separation)
e. for natural mating:
    - be vigilant about diseases transmitted by natural service
    - provide secure footing and adequate ceiling height for safe mounting and breeding behaviour.

4.5 Milking

Milking should not be a source of stress for cows. Stressors during milking (e.g., novel surroundings, improper handling, loud noise) may cause cows to temporarily "hold back" milk (through a stress induced response that inhibits milk ejection) (43,44). Better annual milk yields are attained on farms that use low stress handling techniques during milking (44).

Refer also to *Section 2.9 – Milking Systems.*

REQUIREMENTS

- **Lactating cows that are severely lame or down that require milking (to prevent mammary engorgement) must be milked where they are located.**

RECOMMENDED PRACTICES

a. monitor cow behaviour during milking and refine handling techniques or equipment if signs of discomfort, fearfulness, or restlessness are observed (27,44)
b. milk cows at regular fixed intervals (e.g., same time each day) ensuring lactating cows are not left un-milked or with overly full udders
c. achieve a complete milk-out at each milking without overmilking
d. avoid painful or stressful procedures (e.g., injections) during milking (43,44)
e. minimize the amount of time cows are standing in holding areas (e.g., maximum 1 hour) to limit time away from feed, water, and rest.

4.6 Dry-Off Management

Dry off needs to be performed properly to mitigate the potential welfare concerns associated with abrupt cessation of milking (35). Some research suggests that intermittent milking over a five-day period reduces milk leakage and time anticipating milking (35). Lower-producing cows (<15 kg/d) show less engorgement than higher-producing cows (> 25 kg/d) after dry-off (45). Reducing milk production of higher-producing cows prior to drying off helps prevent painful udder engorgement and reduce the risk of clinical mastitis (46). Decreasing milking frequency to once a day helps to lower milk production rapidly, without causing pain or discomfort (47).

Refer to *Section 6 – Preparations for Transportation* for information on preparing lactating cows for shipping. Additional guidance on dry-off is provided in *Appendix K – Resources for Further Information*.

REQUIREMENTS

- **Water must be available throughout the dry-off period.**

RECOMMENDED PRACTICES

a. dry off cows by gradually (i.e., over at least 5–7 days) reducing milking frequency and shifting to a lower energy and lower protein diet (47)
b. offer free-choice access to a lower energy and lower protein diet throughout the dry-off process (47)
c. move end-of-lactation cows out of the lactating herd and into a separate pen or stall, if possible (47).

5. Cattle Health

Good animal health is an integral component of good animal welfare. Health conditions usually cause pain and discomfort, which negatively impact an animal's well-being. Good animal welfare, therefore, requires good animal health, and prevention of disease (or treatment/care early in any disease course) is always best for the animals.

Phrases such as "in consultation with a veterinarian" or "with veterinary input" refer to one-time consultations or discussions as part of an ongoing VCPR. They are not intended to imply a consultation is needed each time the procedure/practice is carried out.

5.1 Herd Health Management

Herd health management contributes to animal welfare by providing strategies for disease prevention, rapid diagnosis, and effective treatment. Veterinarians play a key role in implementing changes to improve disease prevention and achieve herd health goals (48). Having a valid veterinarian-client-patient relationship facilitates collaborative decision-making between the producer and veterinarian and is a prerequisite for obtaining some classes of medications.

Having accurate and complete records helps ensure health outcomes are more accurately tracked (49,50). Research has also shown that producers who keep accurate and detailed health records achieve lower rates of disease (51).

Resources to support herd health management are provided in *Appendix K – Resources for Further Information*.

REQUIREMENTS

- **Producers must have a veterinarian-client-patient relationship with a licensed veterinarian.**
- **Producers must develop protocols for disease prevention and timely diagnosis and treatment of sick or injured cattle, in consultation with the herd veterinarian.**
- **Disease events, treatments, and mortalities (including cause, if known) must be recorded and records must be kept for at least 3 years to track trends in animal health.**
- **Health records must be reviewed with the herd veterinarian as part of ongoing herd health planning.**

RECOMMENDED PRACTICES

a. establish, in consultation with the herd veterinarian, realistic targets for improving herd health outcomes (e.g., lameness, mastitis)

b. ensure health protocols include specific treatment protocols, desired outcomes, contingencies, and criteria for when to consult a veterinarian

c. develop protocols in the following priority health management areas:
    - prevention and control of infectious diseases (see resources in Appendix K)
    - lameness prevention and hoof care
    - mastitis monitoring and control
    - parasite control
    - vaccinations
    - care of down cattle
    - calving management
    - calf health
d. review health protocols with the herd veterinarian at least annually or whenever there is a disease outbreak or significant change in health, housing, or management
e. ensure treatment records include cattle ID, treatment and reason for, date, and outcome (e.g., recovery, cull, mortality, adverse reaction).

5.1.1 Cattle Cleanliness

Proper bedding and manure management provide animals with a clean, dry, and comfortable environment and better traction when walking or lying down/standing up. The lowest incidence of mastitis and somatic cell counts occur in herds with clean cows and bedding (52).

Ensuring calves have clean, fresh bedding is among the most important strategies for promoting calf health, particularly prevention of diarrhea and navel infections (53,54).

REQUIREMENTS

- **Strategies to keep cattle clean must be implemented to minimize disease (e.g., mastitis, scours), maintain udder and hoof health, and promote cattle comfort.**

RECOMMENDED PRACTICES

a. flush and/or scrape alleyways and holding areas 2–3 times a day
b. clean individual stalls at every milking
c. use cow cleanliness scoring to assess environmental cleanliness and aim for 80% of animals in any group with a cleanliness score of 1 or 2 (out of 4) (see *Appendix C – Cow Cleanliness Scoring*)
d. provide a brush to cattle to help keep them clean.

5.1.2 Pest Control

Pests (e.g., insects, rodents) can introduce infectious disease into barns and may cause discomfort to cattle. While pests and insects cannot be fully eliminated, several prevention and management strategies can be implemented to mitigate pest pressure.

REQUIREMENTS

- **Housing areas must be as free as possible from pests.**

RECOMMENDED PRACTICES

a. consult a professional pest control specialist annually to review strategies and help assess the effectiveness of pest management strategies
b. store feed in rodent-proof facilities and containers
c. promptly remove spilled feeds, particularly wet feeds (e.g., milk, corn silage, haylage)
d. eliminate or reduce the number of places rodents can use for shelter (e.g., clutter, heavy vegetation around buildings)
e. locate and eliminate insect breeding areas (e.g., manure, wet or soiled bedding, standing water)
f. clean out bedding more frequently in the summer when insect pressure is higher (on a 2-week interval for hutches, for example) (55).

5.2 Genetics

There are complex interactions between genetics, husbandry, and environment; however, selection for high productivity has put additional demands on the cow, leading to an increased incidence of disease and higher rates of involuntary culling. Some consulting companies have developed genetic evaluations for several traits in dairy breeds, including functional traits (e.g., calving ability, somatic cell score, conformation traits).

RECOMMENDED PRACTICES

a. select bulls and cows for traits that contribute to animal health and welfare (e.g., calving ability, mastitis resistance, foot and leg conformation, polled).

5.3 Caring for Sick, Injured, or Compromised Animals

The likelihood of recovery for any sick or injured animal is greatly influenced by the timeliness and quality of nursing care they receive (35). Down cattle need particularly attentive nursing care, including protection from herd mates (or moving them to a safe place in a humane manner); provision of easy access to feed and water, and ensuring that their posture is changed to prevent secondary issues from being recumbent (35). The time and emotional strain associated with caring for a down animal may need to be weighed against the impact it may have on your ability to provide high quality care to other cattle.

Many health conditions cause pain and discomfort or necessitate treatments or procedures that may cause pain. Pain control is most effective when provided early in the course of a disease and prior to a procedure (3). For most surgical procedures, and many painful health conditions, research demonstrates an overall benefit of using both local anesthesia (to prevent acute pain) and a non-steroidal anti-inflammatory drug (to reduce longer lasting pain) (3).

Animal owners are required by law to immediately report the suspicion of a reportable disease (ideally first to the herd veterinarian). Reportable diseases are listed in provincial and federal health acts.

Refer also to *Section 2.3.3 – Areas for Sick or Injured Cattle*.

REQUIREMENTS

- **Personnel must be knowledgeable of normal cattle behaviour to be able to detect signs of injury and disease.**
- **Cattle that are sick, injured, or recovering must be monitored at least twice a day.**
- **Cattle that are sick, injured, lame, suffering, or in pain must be provided prompt medical care, suitable for the condition.**
- **Cattle that are in pain (from a condition or procedure) must be provided prompt pain control, as appropriate, in accordance with farm protocols developed in consultation with the herd veterinarian.**
- **Down cattle must have easy access to feed and water and protection from predators, extreme weather (cold, rainfall, direct sunlight), and potential injury from herd mates.**
- **Cattle must be promptly euthanized if they have a condition that compromises their welfare (e.g., causes pain, suffering, body condition <2, or poor or no mobility) and**
  - **they do not have a reasonable prospect of improvement, or**
  - **are not responding to treatment(s) within an appropriate timeframe, or**
  - **treatment is not a humane option.**
- **Refer also to the Requirements in Sections 4.1 and 4.1.2 on humane handling.**

RECOMMENDED PRACTICES

a. establish a system to identify cattle that need to be monitored more frequently due to injury, illness, or other reason
b. monitor body temperatures of animals that are sick or being treated
c. track changes in weight and/or body condition of sick animals especially calves

d. turn down cattle or roll them from side-to-side at least every 3 hours or float them for 6–8 hours to relieve the areas that are bearing weight

e. ensure lactating animals that are convalescing are milked at least every 12 hours to relieve udder pressure and reduce the risk of mastitis (35).

5.4 Calving Management

Delivery without complication is the norm in cattle. When a difficult calving (dystocia) occurs, providing timely, high-quality intervention greatly improves outcomes for the cow and calf (8). Dystocia is associated with increased risk of metritis and other reproductive problems, and it is the most important cause of perinatal calf mortality (8). The most important risk factors for dystocia include pre-calving body condition score ≥3.5, first-parity cows, age-at-first calving <24 months, long gestation length (>285 days), and heavier calves (8).

The quality of calving management and supervision significantly influences the occurrence of perinatal mortality—mainly, ensuring cows are not moved during stage 1 of parturition and intervening early in stage 2, if needed (8).

Refer also to *Sections 2.3.1 – Calving Areas* and *5.4 – Calf Health*.

REQUIREMENTS

- **Reasonable steps must be taken to ensure cattle are in the calving area prior to the anticipated calving date.**
- **Cattle close to calving must be monitored daily, at intervals suitable to individual cattle needs, including for risk factors of dystocia.**
- **Prompt assistance must be provided to cattle showing signs of dystocia.**

RECOMMENDED PRACTICES

a. develop, in consultation with the veterinarian, calving management protocols (e.g., pre-calving movement, calving location, supervision, intervention, and post-calving management)

b. ensure heifers have achieved 55–65% of mature body weight at breeding (or are at least 24 months of age at calving) (8)

c. ensure cows, especially first parity cows, are at ideal body condition score at calving (2.75–3.25 out of 5) (7,9)

d. monitor cattle close to calving every 4 hours and ensure they are checked in the evening and are among the first to be checked in the morning

e. use cameras to enable stress-free, frequent monitoring of close-up or calving cattle

f. use automatic sensors to help predict the calving date (e.g., rumination, activity, or body temperature sensors) (8)

g. ensure cattle are not moved to calving areas during stage 1 of parturition (e.g., dilation of the cervix with signs of contractions) (8)

h. when cows are first observed in stage 2 of parturition (feet or amniotic sac are present at the vulva), assess for signs of difficulty and provide timely assistance if needed (e.g., abnormal amniotic fluid; tongue, head or feet of the calf are swollen or cold) (8)
i. strive to monitor cows in stage 2 of parturition every 15–30 minutes to confirm delivery is progressing and check for any signs of poor vigor in the calf (8)
j. consult the herd veterinarian assisting a difficult calving and discuss strategies to improve on-farm technique (56,57)
k. consider, in consultation with the herd veterinarian, providing an NSAID to cows that had a dystocia (3)
l. clean and disinfect tools/equipment used to assist a calving after each use.

5.5 Calf Health

Calf management in the first days and weeks after birth is integral to setting calves up for success (58). In any calf rearing stage, prompt intervention upon the earliest signs of poor vitality or illness greatly improves calf survival, treatment success, and later productivity (8, 59).

All calves, but especially those born from a dystocia, benefit from attentive care. Calves born from a dystocia are at increased risk of mortality (in the perinatal and later stages) and later health issues (e.g., respiratory disease and diarrhea) (8).

Fluid therapy (i.e., replacement of lost water and electrolytes) greatly improves outcomes for scouring calves (60). In addition, continuing to offer normal amounts of milk/milk replacer to scouring calves does not prolong or worsen diarrhea and it prevents weight loss, provides the nutrients necessary for intestinal healing, and supports overall recovery (60,61). Tube feeding milk/milk replacer to calves that are not drinking brings serious health risks and is not recommended.

A guide to assessing calf health is provided in Appendix D.

REQUIREMENTS

- **Calves that are sick, injured, in pain, or suffering must be provided prompt medical care, suitable for the condition, or be euthanized. Refer also to Section 7 – Euthanasia.**
- **If calf mortality exceeds 10%, corrective actions must be implemented to improve calving management and calf health in consultation with the herd veterinarian (65).**

RECOMMENDED PRACTICES

a. consult the herd veterinarian on calf health management as part of routine farm visits (58,64)
b. aim to keep calf mortality below 6% (65)
c. wherever feasible, designate specific staff member(s) to specialize in calf care
d. monitor calf body temperature for two weeks following birth (normal range is 38.5–39.5°C)

e. monitor drinking speed and milk intake in young calves (reductions in these are often an early indicator of illness)

f. upon the earliest signs of diarrhea, provide fluids (in addition to milk/milk replacer) to replace lost water and electrolytes and promote calf survival (60).

Key strategies for newborn calves:

g. assess calf vitality as soon as possible after birth (ideally within the first hour) so that timely assistance can be provided if needed (8)

h. provide additional care or supportive therapy to twins, calves showing poor vitality, and those born from a dystocia (e.g., electrolytes, additional colostrum feedings, dry the hair coat and provide additional thermal support)

i. consider, in consultation with the herd veterinarian, providing an NSAID to calves born from a dystocia (this therapy reduces pain from the delivery and may improve other welfare outcomes) (3).

5.5.1 Colostrum

Colostrum contains antibodies known as immunoglobulins (Ig) that protect calves from infections. Calves' ability to defend against infections is directly related to the amount, quality (at least 50mg/ml Ig), and timing of colostrum intake (15). Calves' ability to absorb the immunoglobulins from colostrum is substantially reduced six to eight hours after birth (15). The amount needed depends on the quality of the colostrum. The result of adequate colostrum intake at birth is a high concentration of circulating immunoglobulin in the blood of the calf (i.e., successful passive transfer of immunity) (15).

An abrupt transition from colostrum to milk can compromise gut development (66). Calves fed colostrum, transition milk, or a blend of milk and colostrum for the first few days of life have better gut health and development compared to calves that transition to milk after the first colostrum meal (66). Extended colostrum feeding (for the first 2 weeks of life, as an example) has been shown to increase average daily gain, reduce diarrhea (and associated antimicrobial treatments), and improve survival in calves with diarrhea (67,68).

Additional resources on colostrum management are provided in *Appendix K – Resources for Further Information*.

REQUIREMENTS

- **Male and female calves must receive at least four liters of good quality colostrum within 12 hours of birth, with the first meal occurring as soon as possible, and no more than six hours after birth (15).**

RECOMMENDED PRACTICES

a. provide supplemental colostrum feeding at birth even when calves are allowed to suckle from the cow (15)
b. check the quality of colostrum with a colostrometer or refractometer (15)
c. measure immunoglobulin status in a sample of male and female calves, and aim for at least 90% of tested calves with a serum total protein concentration of ≥5.2 g/dL (69)
d. follow strict hygiene practices when collecting, storing, and feeding colostrum (bacterial contamination impedes Ig absorption) (15)
e. consider feeding male and female calves colostrum, transition milk, or a blend of colostrum and milk for an extended period (e.g., at least 3 days), particularly for unthrifty or low birth weight calves.

5.6 Preventing and Treating Mastitis

Mastitis is a locally painful bacterial infection. Depending on its severity, it can cause systemic illness and associated fever, dehydration, and reduced mobility (70). Both local and systemic infection are associated with reduced milk yield and feed intake (71). Mastitis is spread from an infected cow's udders and teat skin to uninfected cows during milking (contagious mastitis) or via bacteria in manure present in the cow's environment that invades the teat ends (environmental mastitis).

Cows with subclinical infections show no overt signs but can still infect other cows. Management of mastitis therefore includes routine somatic cell count testing to identify subclinical cases (threshold of 200,000 cells/ml) in addition to tracking clinical cases. Signs of clinical mastitis include udder abnormalities (e.g., swelling, heat, hardness, redness) and changes in milk (e.g., watery appearance, flakes, clots) (70).

There is a strong body of evidence supporting the use of a non-steroidal anti-inflammatory drug (NSAID) for severe mastitis to reduce inflammation and other indicators of pain (3). Severe cases are those with abnormal milk, with or without udder changes, but with signs of systemic illness such as fever, elevated heart or respiratory rate, dehydration, or decreased rumination (3).

In addition to providing a clean environment, teat sealants can be an important strategy to protect dry cows from mastitis (refer to additional resources in Appendix K).

REQUIREMENTS

- **Cows with mastitis must receive prompt care, be euthanized, or be culled if fit for transport. Refer to Section 6 – Preparations for Transportation.**
- **Systemic analgesia must be provided in cases of severe mastitis, in consultation with the herd veterinarian.**

RECOMMENDED PRACTICES

a. consult with the herd veterinarian to develop a mastitis monitoring and control program using individual cow somatic cell counting and strategic milk culturing
b. review records of mastitis cases to identify herd-specific risk factors
c. maintain bulk tank milk somatic cell count below 200,000 cells/ml (72)
d. strive for a monthly mastitis incidence of ≤2/100 cows (i.e., <24% of cows affected/year) (73)
e. strive to eradicate *S. agalactiae* from the herd

To prevent contagious mastitis infections:

f. dip each teat of all cows as soon as possible after removal from the milking unit using an approved teat dip
g. ensure the dip covers the area of the teat skin that had contact with the teat cup liner
h. ensure infected cows are milked last or separately from uninfected cows (if this is not possible: disinfect the milking unit between uses)
i. ensure flies are controlled

To prevent environmental mastitis infections:

j. thoroughly clean and dry teats before milking paying close attention to the teat end
k. add clean, dry bedding to facilities frequently
l. keep alleyways, crossovers, and walkways free of manure and mud
m. feed a ration that prevents stress on the immune system of fresh cows.

5.7 Promoting Optimal Foot and Leg Health

Lameness is a painful condition that results in reduced mobility, dry matter intake, and milk production as well as impaired reproduction and early culling (74). Prompt recognition, diagnosis, and early treatment not only minimize the welfare concerns surrounding lameness but also increase the likelihood of recovery and allows cows to produce to their full potential (74).

Education and training are needed to consistently identify injuries and lameness (74). Knowing the actual prevalence of lameness and injuries has been shown to motivate improvements (74). Establishing clear targets for improvement is an effective way to focus the farm's efforts towards a goal and track continuous improvement over time. Targets can be set by individual farms or industry wide including through an assurance program.[5]

How cows are housed and managed has a significant impact on the occurrence of lameness and leg injuries and making targeted, manageable improvements that enhance cow comfort and increase resting time can

[5] Industry targets are currently established in proAction®. See the zone thresholds in www.dairyfarmers.ca/Media/Files/proaction/proaction-notice_of_change-animal_care-sep2020-final-en.pdf

effectively reduce rates of lameness and injuries (e.g., increase bedding quantity, change the stall base, groove crossover alleys) (74).

Research consistently demonstrates that having cows on pasture for even a short period of time significantly reduces the occurrence of lameness and injuries (5,74). Pasture access can also result in an improvement in gait (in as little as 4 weeks, as an example) particularly if given during the day when cows are more active and motivated to graze (5).

Cattle are considered lame at a gait score of 3 or higher (on the 1–5 scale used in free stalls) and when they have 2 or more signs of lameness using the scoring tool for tie stalls (refer to *Appendix E – Gait Scoring System for Dairy Cows)*.

REQUIREMENTS

- **Personnel must be knowledgeable in normal gait and signs of leg injuries to be able to promptly detect and address early lameness or leg injuries.**
- **Cattle must be routinely observed for gait abnormalities or other signs of lameness or leg injuries to ensure early diagnosis and treatment.**
- **Lame cows must receive prompt care and/or treatment or be euthanized.**
- **Producers must have targets for lameness and leg injuries and take corrective action when the targets are not achieved.**
- **Refer to Appendix E – Gait Scoring System for Dairy Cows.**

RECOMMENDED PRACTICES

a. participate in gait scoring training and other professional development on lameness prevention
b. review treatment and hoof trimming records at least annually with the herd veterinarian and other advisors
c. aim to keep lameness ≤10%
d. aim to keep leg injuries ≤10%
e. design and maintain the most comfortable environment possible for cows to maximize resting times (e.g., wide stalls, reduced time standing waiting to be milked, prevent overcrowding) (5,74)
f. provide generous amounts of clean, dry bedding (the more the better and at least 5 cm) to help prevent lameness and promote healing of injuries (5,74)
g. minimize exposure to wet, hard, or slippery floors to ensure cows can move comfortably in indoor environments (74)
h. ensure alleyways are cleaned daily
i. aim to examine and treat cows within 48 hours of when lameness is first detected (74)

j. give cows with mild lameness routine daytime access to pasture or deep bedded areas to promote healing (5,74)

k. balance the ration to prevent sub-clinical rumen acidosis and associated laminitis

l. avoid feeding large amounts of concentrate in a single feeding to reduce the risk of laminitis

Strategies specific to reducing the occurrence of infectious lameness:

m. maintain a clean, dry environment to promote cow cleanliness especially cleanliness of the legs (74)

n. ensure frequent footbathing (at least once a week, as a guide) (74)

o. ensure footbaths are at least 3 meters long to get ample submersion of each of the cow's feet (74)

p. replace the footbath solution according to the manufacturer's recommendations and clean the footbath between the solution changes.

5.7.1 Hoof Trimming

Preventative hoof trimming (aiming to maintain correct weight bearing and minimize and prevent lesion development) is a key component of preventing lameness (74). Overgrown hooves are a risk factor for lameness but the ideal frequency of preventative hoof trimming depends on many factors (74).

Therapeutic trimming can lead to high recovery from lameness; however, recovery is dependent on the severity of the lameness with better outcomes reported in lower severity cases (74). Early identification of lameness is, therefore, critically important for improving outcomes (74).

Improper disinfection of hoof trimming equipment is among the many risk factors for digital dermatitis, and specific disinfectants are needed to kill the associated bacteria (which can survive for several hours on trimming equipment) (74).

REQUIREMENTS

- **Feet and claws must be inspected, and hooves trimmed, as required to promote a normal gait and minimize lameness.**
- **Infectious hoof lesions must be treated to control the infection.**
- **Therapeutic hoof trimming must include strategies to relieve pain and pressure on the injured area and promote healing (e.g., a trim that effectively relieves pressure, a hoof block, and/or analgesia).**
- **If an invasive hoof trim is needed, pain control must be provided.**

RECOMMENDED PRACTICES

a. examine hooves regularly and trim at least twice a year (chronically lame cows may benefit from more frequent checks) (75)

b. avoid therapeutic hoof trimming in early lactation

c. ensure personnel responsible for hoof trimming are certified and/or affiliated with a professional association
d. ensure strict biosecurity protocols for hoof trimming particularly cleaning and disinfection of tools between farms and after treating cattle with contagious hoof conditions
e. ensure accurate and complete hoof trimming records are kept (e.g., cattle ID, date, lesion, treatment)
f. monitor outcomes following hoof trimming and refine techniques or identify other hoof trimmers if outcomes are suboptimal.

6. Preparations for Transportation

Humane transportation of dairy cattle is important for their welfare and is expected by the dairy industry and consumers alike. Marketing healthy, sound calves and cows is an important achievement for the dairy producer—all producers should strive to consistently achieve this. Cattle that are in good health and condition prior to transportation have better outcomes during transportation.

The federal requirements for animal transportation are covered under the *Health of Animals Regulations, Part XII*.[6] They are enforced by the Canadian Food Inspection Agency (CFIA) with the assistance of other federal, provincial, and territorial authorities. Some provinces also have additional regulations related to animal transportation. Anyone with responsibilities during any part of the transportation process (i.e., loading, confinement, transporting, or unloading) must be familiar with, and follow, all applicable animal transport requirements.

The scope of the dairy cattle Code of Practice ends at the farm gate and therefore includes pre-transportation Requirements and Recommended Practices. Refer to the transportation Code of Practice for information about animal care during transport.[7]

6.1 Pre-Transport Decision Making

6.1.1 Fitness for Transport (General and Cull Cows)

An animal's fitness for transport must be assessed by considering the following risk factors that could impact on their capacity to handle loading, confinement, transporting, and unloading: (2)

- the current condition of the animal and any pre-existing weakness, disease, or injury
- the space requirements for the animal
- compatibility with other animals
- animal handling and restraint methods
- the expected time without feed, water, and rest
- the expected duration of transport (including intermediate stops, auction markets, and how far they may be transported after the auction(s))
- the foreseeable delays during transport and at the destination
- the foreseeable weather and other conditions of the journey (e.g., sharp inclines, swaying of the conveyance), and
- the type and condition of the conveyance and loading equipment.

If in doubt, assume the longest trip when assessing an animal's fitness. Producers have a primary responsibility

[6] The *Health of Animals Regulations* are accessible through the following link (accessed September 24, 2020): www.laws-lois.justice.gc.ca/eng/regulations/c.r.c., c. 296/

[7] The *Livestock and Poultry Transportation Code of Practice* is available at www.nfacc.ca/codes-of-practice/transportation

for determining if an animal is fit for the expected duration of the trip. While the carrier or the driver should not be relied upon to determine whether an animal is compromised or unfit, they have the right and responsibility to refuse to load an animal that they recognize as unfit.

Many culled dairy cows are assessed as compromised at auction and slaughter, and research demonstrates that gait score, body condition, and udder health tend to deteriorate the longer an animal is transported or in the auction-slaughter system (35). Prior to loading, screening for lameness, adequate body condition, and risk of udder engorgement are particularly important (35). Transportation off the farm is not a solution for a lame or very thin animal. These cattle need on-farm treatment, additional feeding, and/or convalescence before they can be removed from the herd (refer to *Section 3 – Feed and Water* and *Section 5 – Cattle Health*). Euthanasia may be the most humane option for some animals with a condition impacting their fitness (refer to *Section 7 – Euthanasia*).

A checklist to help evaluate cull cows prior to transport is provided in Appendix K.

REQUIREMENTS

- **Every animal's fitness for transport must be checked before they are loaded (2).**
- **Producers must take into account risk factors that impact on the animal's capacity to withstand loading, transport, and unloading (e.g., the expected total transport time) (2).**
- **Unfit animals must not be transported except for veterinary care on the advice of a veterinarian and with special provisions (2).[8] Refer to the regulatory guidance in *Appendix F – Transport Decision Tree*.**
- **Compromised animals must only be transported with special provisions and directly to the nearest suitable place where they can receive care or be promptly slaughtered (not through an auction or assembly yard) (2).[7] Refer to the regulatory guidance in *Appendix F – Transport Decision Tree*.**

RECOMMENDED PRACTICES

a. increase the frequency of health monitoring as the shipping date approaches to ensure early detection of a condition that may warrant early shipping or treatment before cattle become compromised
b. if in doubt about whether an animal can withstand the same transport challenges as a healthy, fit animal, assume the animal is compromised (and transport with special provisions) or consult a veterinarian (76)
c. when consulting a veterinarian about an animal's fitness for transport, use pictures or videos of the animal to facilitate the consultation
d. identify local options for slaughter or use mobile slaughter (if available) for cull dairy cows to eliminate or reduce time in transit

[8] The *Health of Animals Regulations* require that compromised or unfit animals are individually loaded and unloaded without having to negotiate ramps inside the conveyance, are isolated during transport (compromised animals may be segregated with one familiar animal), and other measures as necessary to prevent suffering or injury (e.g., mitigate pain, protection from cold, prevent dehydration).

e. consider on-farm emergency slaughter where permitted and appropriate for the animal's condition (e.g., injury preventing transportation but no systemic illness, as assessed by a veterinarian).

6.1.2 Additional Considerations for Calves

The care calves receive on the dairy farm greatly impacts their fitness for transportation and later health and welfare outcomes. Calves that at the time of shipping are bright and alert, have consumed sufficient, high quality colostrum, are heavier, and have a healed navel have lower risk of mortality and illness and better growth rates in the weeks following transportation (62,77,78,79).

Calves are unfit if they have an infected navel or signs of a fever, dehydration, or exhaustion (all other conditions are listed in *Appendix F – Transport Decision Tree*). Signs of fever include: (76)

- body temperature >39.5°C
- hot to the touch, particularly in hairless areas
- red tinge to the skin
- panting
- lethargic, weak, or dull/depressed

A resource to support assessing a calf's fitness for transportation is provided in *Appendix G – Make Sure Your Calf is Fit for Transport*.

REQUIREMENTS

- **Each calf's fitness for transport must be checked prior to loading (2).**
- **Calves must only be shipped if they are free from signs of disease, have a normal body temperature, and a healed or uninfected navel. Refer to other regulatory guidance in *Appendix F – Transport Decision Tree*.**
- **Calves that are 8 days of age or less must only be transported with special provisions and directly to their final destination (not through an auction or assembly yard) (2).[9]**

RECOMMENDED PRACTICES

a. check the body temperature of calves to confirm they have a normal body temperature (38.5–39.5°C)
b. palpate the navel to ensure it is dry and free of signs of infection (e.g., pink/red, swelling, heat, pain indicators, discharge)
c. ship calves that are at least 45 kg (100 lbs) and avoid shipping calves that are ≤27 kg (60 lbs)

[9] The *Health of Animals Regulations* require that calves that are 8 days of age or less are individually loaded and unloaded without having to negotiate ramps inside the conveyance; have sufficient space to allow the animal to lie down without lying on top of another animal; are segregated from older animals (other than their dam); and that other measures are taken as necessary to prevent suffering, injury, or death.

d. aim to ship all calves (i.e., including those older than 8 days) directly to the nearest calf grower to avoid auctions and associated increased disease risk, handling events, and time away from a comfortable pen

e. when marketing calves directly to growers: establish a calf purchase agreement detailing colostrum and milk feeding practices, herd and calf health status, weight range, and other conditions for calf guarantee

f. wherever feasible for the facilities: consider keeping calves later and marketing them directly as pre-conditioned calves (i.e., weaned, vaccinated, and 80–136 kg [177–300 lb]).

6.1.3 Preparing Cattle for Transportation

Preparing cattle for transport starts long before the trip begins. For mature cattle, management factors such as opportunities for exercise, lameness prevention, and nutrition have a collective impact on fitness for transport. Drying cows off, resting them in a comfortable pen, and feeding them to put weight on has the potential to both improve cow welfare and to add value to cull dairy cows prior to transport (35). While cows do not have to be dried off before transport, they must reach their final destination (or a suitable place where they can be milked) before becoming engorged (76). Refer also to *Section 4.6 – Dry-Off Management*.

Strategies that help prepare calves for transport include good calving management; timely intake of sufficient, high quality colostrum; provision of ample milk/milk replacer; and keeping calf facilities clean and well bedded (64,77).

Maximum intervals of time cattle may be without feed, water, and rest during transportation are outlined in the *Health of Animals Regulations*. The interval without feed and water begins when animals are last fed and watered on the farm. For unweaned calves and other compromised animals (see Appendix F), this interval must not exceed 12 hours (2). For fit cattle, the interval without feed and water must not exceed 36 hours (2).

REQUIREMENTS

- **Lactating cows must reach their final destination (or a suitable place where they can be milked) before becoming engorged (76).**
- **If a lactating cow's final destination is not pre-determined, steps must be taken to reduce the risk of udder engorgement.**

RECOMMENDED PRACTICES

a. ensure good communication between personnel who care for cattle to be shipped and those that will make the decision to ship

b. ensure good communication with the transporter especially at the time of loading

c. provide unweaned calves at least half of that day's ration of milk prior to transportation

d. gradually dry off all lactating cattle prior to shipping (starting 5–7 days prior to the shipping date wherever possible)

e. milk out lactating cows immediately before shipping if the cow is still producing milk on the day of transport

f. if shipping a lactating cow, aim to ensure they are producing <20 litres/day.

6.1.4 Arranging Transportation

Producers have a responsibility to ensure that the transporter they hire is trained and qualified. Producers arranging for transport should also be aware of additional services that may be required under the *Health of Animals Regulations* during transit (e.g., feed, water, rest, milking).

REQUIREMENTS

- **Personnel involved in loading, unloading, or transporting cattle must have the necessary knowledge and skills to conduct these activities in compliance with the *Health of Animals Regulations (2)*.**

RECOMMENDED PRACTICES

a. schedule transportation such that delays are avoided due to severe weather, road construction, or ferry cancellations

b. ensure all required documentation is completed prior to loading to avoid delays at inspection stations, other checkpoints, or for cattle leaving the country

c. ensure the following information is discussed and agreed upon with the transporter:
   - number of cattle to be shipped
   - type of cattle (e.g., yearling heifers, mature cows, bulls, calves)
   - time and point of loading
   - destination
   - special requirements, if any, of the animals being transported
   - special protection from extremely hot or cold weather for all cattle, especially calves

d. hire transporters that are formally trained and have extensive experience in transporting dairy cattle.

6.2 Loading and Unloading

Using calm, low stress handling techniques and well-designed handling systems facilitate animal movement and reduce stress and injury. Round crowd pens and curved single file chutes work better than straight ones. Curved cattle chutes are better for handling cattle because they take advantage of the natural tendency of cattle to go back to where they came from (80).

Cattle may be considered incompatible for transport based on factors such as their size, weight, temperament, or age. Steps must be taken to ensure incompatible cattle are not transported together. Strategies include avoiding groupings of cattle that will lead to fighting and injury and segregating individual or groups of calves from older animals (other than their dam).

REQUIREMENTS

- **Ramps, gangways, chutes, and steps must be designed, constructed, maintained, and used in a way that prevents the animal from tripping, slipping, or falling (2).**
- **The slope of ramps used to load or unload animals onto/from the conveyance must not exceed 25 degrees (2).**
- **Cattle that are incompatible by nature must be segregated (2).**
- **Requirements in Section 4.1 – Handling, Moving, and Restraining Cattle apply.**

RECOMMENDED PRACTICES

a. use curved chutes with solid sides
b. ensure loading facilities are uniform in appearance, designed to minimize noise, and uniformly lit (address any sharp contrasts and shadows)
c. during hot weather, avoid loading during the hottest part of the day
d. provide overhead cover in loading/unloading areas to protect cattle from wet conditions
e. minimize handling and non-essential procedures on the day of loading or arrival to avoid exposing animals to stressors in addition to transport.

7. Euthanasia

Euthanasia is necessary when a calf, cow, or bull is not responding to treatment; medical care to alleviate pain and suffering is not feasible; or there is no reasonable prospect for recovery. Euthanasia may also be necessary for disease control or in a situation where there is a potential for animal suffering arising from lack of marketing options.

Producers, farm workers, and veterinarians who perform euthanasia should be aware that they may be at risk of emotional stress and should take measures to mitigate this risk (81). The impacts on mental health may be more significant for those who have been directly involved in the care of the animals or when several animals need to be euthanized. Where feasible, it may be beneficial to arrange for euthanasia to be performed by someone other than the person who cared for the animal(s).

7.1 Decision Making and Criteria for Euthanasia

Personnel who are responsible for euthanizing cattle play an important role in their welfare. The successful application of any method depends on many factors, particularly the experience, training, and compassion of the individual carrying out the procedure (81).

Timeliness of euthanasia is also critically important to avoid prolonged suffering (4). When someone has worked tirelessly to improve an animal's condition, it can be hard to accept that the animal is not improving (4). However, it is important to recognize when euthanasia is the most humane and responsible course of action in the best interest of an animal.

While down cattle need to be individually evaluated, generally, the longer an animal remains recumbent the less likely they are to recover (35). Cows that are recumbent for more than 24 hours have a poor prognosis, and recovery may be influenced more by secondary damage from being down than by the original primary condition (35). A sample euthanasia decision tree is provided in Appendix H.

The likelihood of recovery for any animal, including down cattle, is influenced by the quality of nursing care (35) (refer to *Section 5.2 – Caring for Sick, Injured, or Compromised Animals)*.

REQUIREMENTS

- **Cattle must be promptly euthanized if they have a condition that compromises their welfare (e.g., causes pain, suffering, body condition <2, or poor or no mobility) and**
  - **they do not have a reasonable prospect of improvement, or**
  - **are not responding to treatment(s) within an appropriate timeframe, or**
  - **treatment is not a humane option.**
- **Personnel who perform euthanasia must be trained and competent in the farm's procedures.**

RECOMMENDED PRACTICES

a. work with a veterinarian to develop and implement a euthanasia plan to facilitate timely and humane euthanasia
b. participate in ongoing euthanasia training (e.g., workshops, online videos, peer or veterinary demonstration on farm)
c. strongly consider euthanasia for any animal down for a prolonged period (e.g., >24 h) (35)
d. strongly consider euthanasia for any down animal that is:
    - not eating
    - not alert
    - not showing daily improvement
    - not willing/able to lay in a sternal position, or that
    - has pressure sores or any other complication.

7.2 Methods

Euthanasia must be quick, cause minimal stress and pain, and result in rapid loss of consciousness followed by death without the animal regaining consciousness (81). Methods that meet these criteria are outlined in *Table 7.1*. Additional guidance on these acceptable methods is provided in *Appendices I – Anatomical Landmarks for Euthanasia* and *Appendix J – Secondary Steps to Cause Death*.

Proper storage and maintenance of equipment is essential to ensure the equipment functions effectively, particularly with captive bolt guns (4). Humane handling is also an important component of euthanasia (4) (refer to Sections 4.1 and 4.1.1).

Table 7.1 Acceptable Euthanasia Methods for Cattle (adapted from 4,82,83)

Method	Suitable for	Equipment and Procedure
Gunshot with a rifle or shotgun	Calves less than 181 kg (400 lb)	Applied to the correct frontal landmark (see Appendix I) Examples of appropriate firearms: • Rifles: a .22 long rifle fired from a short distance is acceptable (i.e. 0.60–0.90 m [2–3 feet]) • A .22 magnum or larger calibre is recommended • Shotguns: a .410 shotgun with a 7.6 cm (3 in) magnum load with bird shot or slug fired a short distance or a 12 or 20 gauge shotgun with slugs or bird shot no. 2, 4 or 6.
	Cattle more than 181 kg (400 lb)	• Requires a minimum of 1356 J (1000 ft-lb) of muzzle energy. Examples of appropriate firearms: • Rifles: a .22 magnum or larger calibre centre fire rifle (.223, .270, 303, 30-30) is required • Shotguns: a 12 or 20 gauge shotgun with slugs or bird shot no. 2, 4 or 6.

		Note: A standard .22 calibre long rifle only produces 119–138 joules (116–135 ft-lb) of muzzle energy and is not sufficient for this class of cattle.
Penetrating captive bolt and secondary step to cause death	All weight and age classes	• Applied to the correct frontal landmark (see Appendix I) • Penetrating captive bolt devices with velocities ranging from at least 55–58m/s are most effective • Restrain if necessary
Drugs approved for euthanasia	All weight and age classes	• Must be administered by a veterinarian. Safe disposal of the carcass is required when barbiturates are used.
Secondary steps can ONLY be performed on an animal that is confirmed to be unconscious. Acceptable secondary steps include: • bleeding out • pithing • rapid intravenous injection of a concentrated solution of potassium chloride or magnesium sulfate • a second shot (penetrating captive bolt or gunshot) when the above primary adjunctive methods are not available (85)		

Methods not listed in Table 7.1 are not acceptable. Manual blunt force trauma is not an acceptable method of euthanasia as it does not consistently cause immediate loss of consciousness in cattle, including young calves (4,84,85).

REQUIREMENTS

- **An acceptable method for euthanizing cattle must be used. Refer to Table 7.1.**
- **The method of euthanasia must be quick, cause minimal stress and pain, and result in rapid loss of consciousness followed by death without the animal regaining consciousness.**
- **Manual blunt force trauma is not an acceptable means of euthanasia, including for calves at any age (4,84,85).**
- **Every farm must have the ability to euthanize animals (i.e., readily available tools or ready access to such tools or services).**
- **Equipment necessary for euthanasia (including a secondary step, if applicable) must be used, stored, and maintained according to the manufacturer's instructions to ensure proper function.**
- **Handling and moving of cattle prior to euthanasia must only occur if needed.**
- **When restraint is necessary to facilitate effective euthanasia, the safest, least stressful method must be used, and euthanasia must be performed without delay following restraint.**

RECOMMENDED PRACTICES

a. consult with a veterinarian when selecting acceptable method(s) of euthanasia

b. consider, in consultation with the herd veterinarian, sedation as a means of humane restraint for euthanasia.

7.3 Confirming Loss of Consciousness and Death

Multiple indicators should be used when evaluating consciousness. Signs of consciousness include:

- rhythmic breathing
- eye movement
- animal blinks when the surface of the eye is touched (corneal reflex)
- presence of jaw tone (resistance is felt as the animal's jaw is opened wide; the jaw is not relaxed)
- vocalization
- animal attempts to rise or lift its head.

Animals euthanized by gunshot or penetrating captive bolt device should immediately collapse upon the application of the euthanasia method as a further indicator of unconsciousness. Convulsions (i.e., uncoordinated kicking of the legs, body rigidity) following the application of any euthanasia method are not a sign of consciousness.

Death does not occur immediately; it is the result of respiratory and cardiac failure, which can take several minutes (82). Lack of movement is not an indicator of death. The following indicators should be used to confirm death in the 5 minutes after the application of the euthanasia method:

- no blinking when the eyeball is touched
- lack of heartbeat (best evaluated with a stethoscope placed over the left lower chest area of the animal), and
- lack of respiration (breathing may be slow and erratic in an unconscious animal).

Carcasses must be disposed of in accordance with provincial regulations.

REQUIREMENTS

- **Cattle must be inspected for signs of consciousness immediately after the application of the euthanasia method.**
- **Immediately perform a repeat procedure (or an alternate) if the first attempt does not render the animal unconscious or if there are signs that the animal is regaining consciousness.**
- **Before moving or leaving the animal, death must be confirmed.**

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Appendix A: Sample Cattle Welfare Policy

[Your Farm/Company]
Employee Animal Care Code of Conduct

Our commitment to our animals

[Our company/farm] is committed to responsible farm animal care and handling. That means animals in our care deserve to be healthy, safe and well cared for.

Our commitment to our customers

Working with animals is important work that we take seriously. We are proud of the work that we do, and we strictly enforce responsible farm animal care and handling among employees and service providers at our facility.

Every person who handles or comes into contact with an animal is required to support our core objective of responsible farm animal care and handling. The demonstration of that support is through the review and signing of this Code of Conduct agreement on a **[quarterly/annual]** basis.

Our commitment to our employees

Your job is valuable and important to our animals, and our business. When you report an incident involving possible mistreatment, illness or injury involving one of our animals, we will take it seriously. We will document your concern. We will follow up to resolve the animal's situation, and/or provide additional training among employees.

Our employees' commitment to us

Every one of our employees is required to handle and treat animals with respect and in accordance with [farm/company] policies and rules as well as the federal, provincial and municipal regulations under which we operate.

Any employee who is responsible for, observes or receives any information that alleges an animal on our property or in our care is being mistreated, mishandled or treated or handled in a way that is contrary to our animal care policy/guidelines must report that information to **[NAME OF POINT PERSON]** immediately so that the situation can be corrected. **[PROVIDE CONTACT INFO]**.

Failure to adhere to this agreement is cause for dismissal. **[Farm/company]** reserves the right to refer animal-abusers to law enforcement for prosecution.

I _____ understand and acknowledge that willful neglect, mishandling or abuse of animals by any [name of company] employee or witnessing it and not reporting it is subject to discipline including immediate termination of employment, and that offenders may also be subject to prosecution under applicable laws.

_____ _____
Signature of Employee *Date*

_____
Name (Please Print)

_____ _____
Signature of Employer *Date*

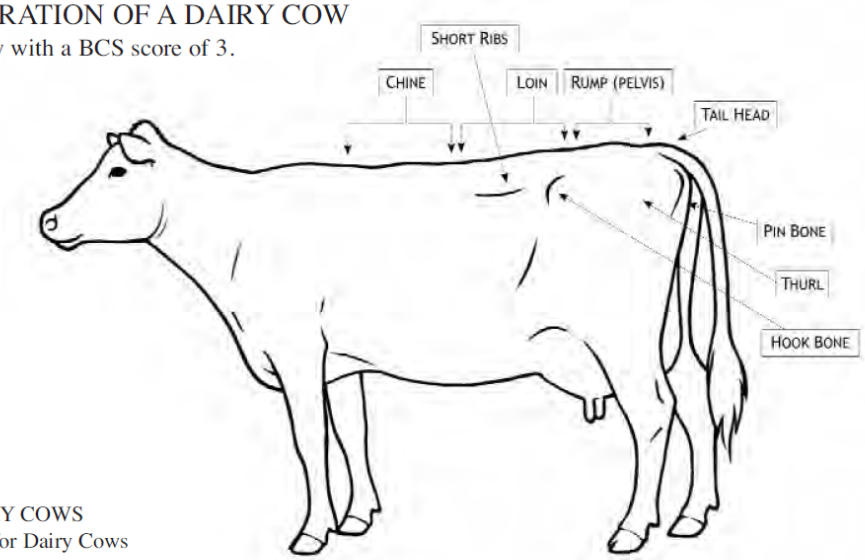
_____ _____
Name *Title*

Important Note: Seek advice from your legal counsel and human resources department if appropriate to ensure any agreement meets relevant labour laws and union contracts.

Appendix B: Body Condition Scoring Chart

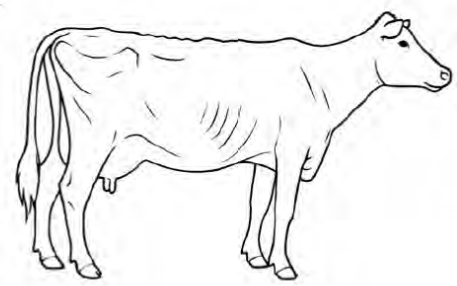
Body Condition Scoring Chart

LABELLED ILLUSTRATION OF A DAIRY COW
Illustration of a Dairy Cow with a BCS score of 3.



BODY CONDITION SCORES FOR DAIRY COWS
Overview of all the body condition scores for Dairy Cows

BCS 1:



SHORT RIBS:
- Ends sharp to touch
- Loin prominent, shelf-like appearance
- Obvious scalloping over top and ends

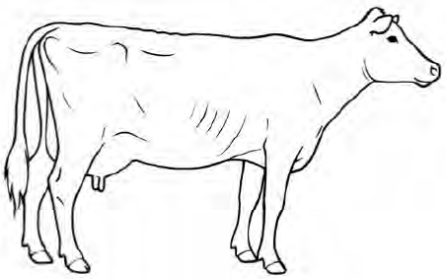
BACKBONE:
- Vertebrae prominent in chine, loin and rump area
- Individual bones easily visible

HOOK AND PIN BONES:
- Sharply defined, very angular in appearance
- No discernable fat pad

THURL (area over pelvis):
- Severe "V shaped" depression without fat cover

TAIL HEAD:
- Sunken and hollow on either side of tail head with obvious folds of skin
- Ligaments connecting pin bones to spine are sharply defined
- Vulva prominent.

BCS 2



SHORT RIBS:
- Ends not as prominent as BCS 1, but can be felt
- Edges easily felt, with slight fat cover, and slightly more rounded appearance
- Overhanging shelf effect less apparent

BACKBONE:
- Vertebrae in chine, loin and rump area, less visually distinct
- Easily feel individual vertebrae

HOOK AND PIN BONES:
- Bones still prominent, angular
- No fat pad palpable

THURL (area over pelvis):
- Less severe "V shaped" depression
- Little tissue cover

TAIL HEAD:
- Both sides of the tail head are sunken and hollow
- Sharply defined ligaments connecting pin bones to spine

Body Condition Scoring Chart

BODY CONDITION SCORES FOR DAIRY COWS
Overview of all the body condition scores for Dairy Cows

BCS 3

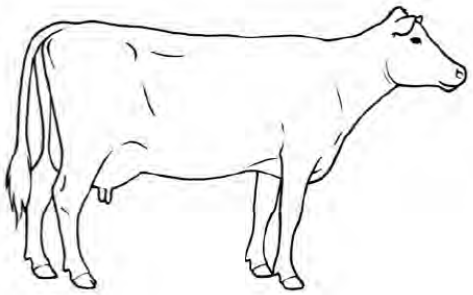
SHORT RIBS:
- Ends can be felt with moderate pressure
- Ribs appear smooth without noticeable scalloping
- Overhanging shelf effect much less apparent

BACKBONE:
- Vertebrae in chine, loin and rump area appear rounded
- Backbone visible, but individual vertebrae not distinct

HOOK AND PIN BONES:
- Visible, but smooth, with rounded appearance
- Fat pad palpable

THURL (area over pelvis):
- Forms "U shaped" depression

TAIL HEAD:
- Both sides of tail head somewhat hollow, but skin folds not distinct
- Ligaments connecting pin bones to spine are rounded in appearance



BCS 4

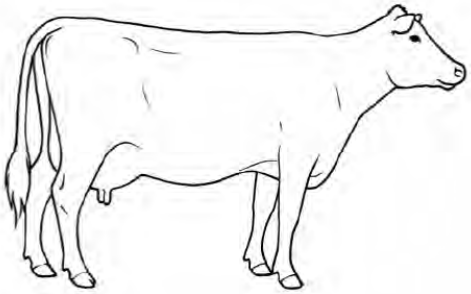
SHORT RIBS:
- Individual rib ends not visible, only felt with firm pressure
- Overhanging shelf effect slight, barely visible

BACKBONE:
- Vertebrae in chine rounded, smooth
- Loin and rump areas appear flat

HOOK AND PIN BONES:
- Rounded, with obvious fat covering

THURL (area over pelvis):
- Area between hooks and pins almost flat
- Pelvic bone only felt with firm pressure

TAIL HEAD:
- Sides of tail head not hollow, no skin folds
- Some fat deposit palpable



BCS 5

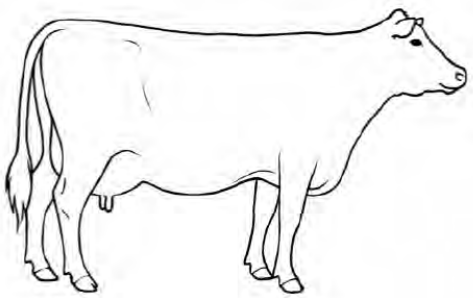
SHORT RIBS:
- Ends can't be seen or felt
- No overhanging shelf effect

BACKBONE:
- Vertebrae in chine, loin and rump not visible
- Difficult to feel individual vertebrae

HOOK AND PIN BONES:
- Very round, buried (almost disappearing) in fat tissue

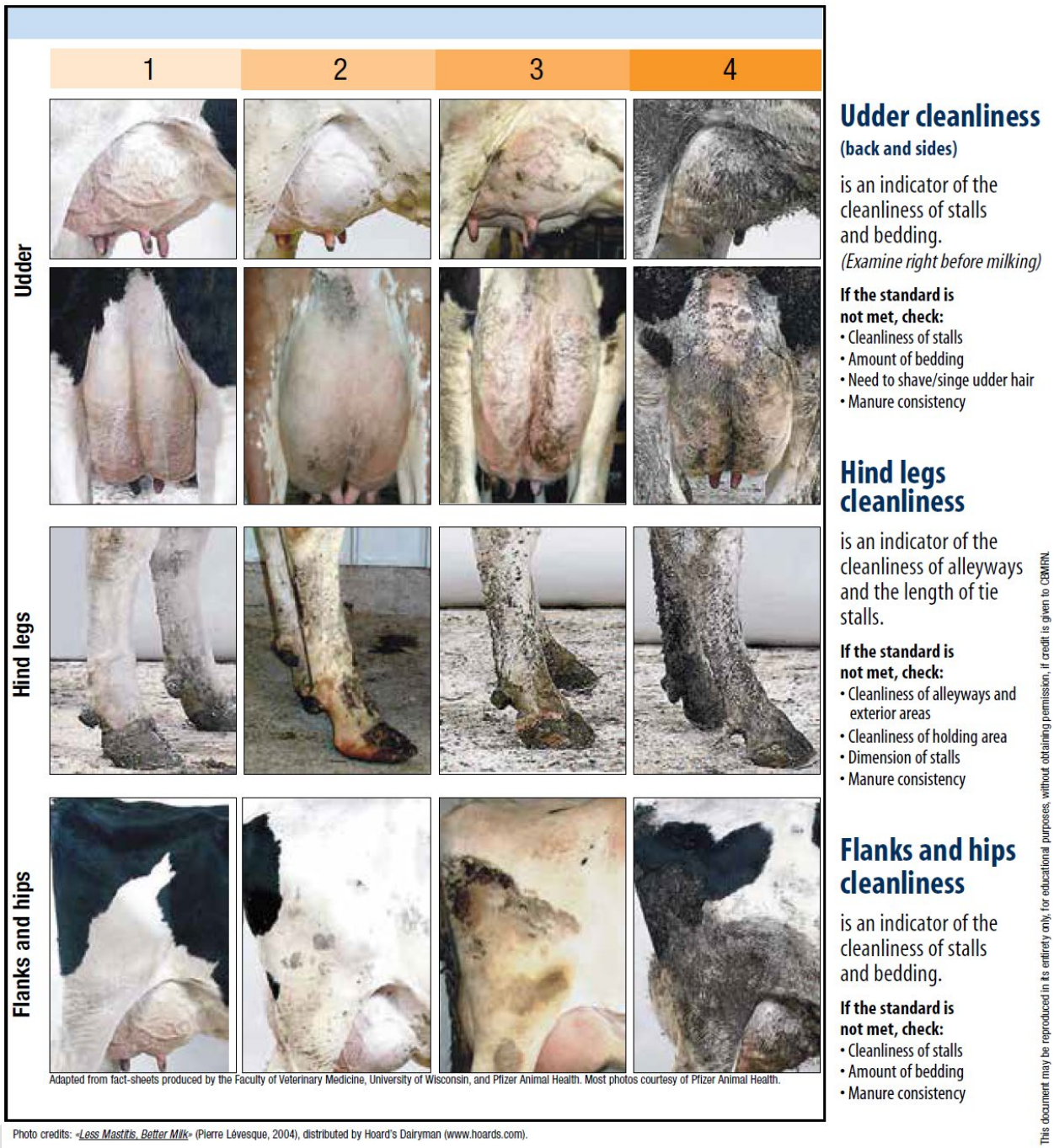
THURL (area over pelvis):
- Appears flat
- Filled in between the hooks and pins

TAIL HEAD:
- Hollow filled in
- Areas on both sides of tail head buried in fat tissue



Adapted from What's the Score? Body Condition Scoring for Livestock CD-ROM
CD 400/40-1_with permission of Alberta Agriculture and Rural Development. www.agriculture.alberta.ca
Copies of the CD can be ordered on-line at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex9622

Appendix C: Cow Cleanliness Scoring



Source: Canadian Bovine Mastitis and Milk Quality Research Network.

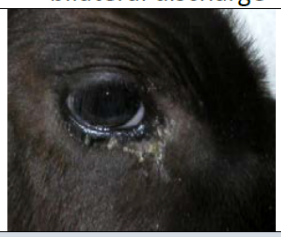
Appendix D: Calf Health Scoring Chart and Criteria

Calf Health Scoring Chart

Farm Name: _____ **Date:** _____

Treat for Respiratory Disease when 2 of 4 categories score greater than 1.
Treat for Otitis when Ear score greater than 1.
Treat for Scours when Fecal score greater than 1.
If Navel or Joint scores greater than 1, discuss treatment options with your veterinarian

Animal ID	Age	Nose	Eye	Ear	Cough	Temperature	# Resp. Cat. ≥ 2	Fecal	Navel	Joint

Calf Health Scoring Criteria			
0	**1**	**2**	**3**
Nose Score – nasal discharge			
Normal serous discharge	Small amount of unilateral cloudy discharge	Bilateral cloudy or excessive mucus discharge	Copious bilateral mucopurulent discharge
			
Eye Score - discharge			
Normal – no discharge	Small amount of ocular discharge	Moderate amount of bilateral discharge	Heavy ocular discharge
			
Ear Score			
Normal	Ear flick or head shake	Slight unilateral droop	Head tilt or bilateral droop
			
Cough Score			
None	Induce single cough	Induced repeated or occasional spontaneous coughs	Repeated spontaneous coughs
Temperature Score			
100-100.9°F or 37.8-38.2°C	101-101.9°F or 38.3-38.8°C	102-102.9°F or 38.9-39.4°C	>103°F or >39.4°C
Fecal Score			
Normal	Semi-formed, pasty	Loose, but stays on top of bedding	Water, sifts through bedding
Navel Score			
Normal	Slightly enlarged, not warm or painful	Slightly enlarged, with slight pain, heat or moisture	Enlarged with pain, heat or malodorous discharge
Joint Score			
Normal	Slight swelling, not warm or painful	Swelling with pain or heat	Swelling with severe pain, heat or dislocation

Appendix D is used with permission from University of Wisconsin-Madison, School of Veterinary Medicine

Appendix E: Gait Scoring System for Dairy Cows

Table E.1 is for scoring cows in free stall barns; see next page for scoring cows in tie stall barns.

Table E.1 Gait Scoring Cows in Free Stall Barns

Score	Description	Behavioural Criteria
1 Sound	Smooth and fluid movement	• Flat back when standing and walking • All legs bear weight equally • Joints flex freely • Head carriage remains steady as the animal moves
2	Ability to move freely not diminished	• Flat or mildly arched back when standing and walking • All legs bear weight equally • Joints slightly stiff • Head carriage remains steady
3	Capable of locomotion but ability to move freely is compromised	• Flat or mildly arched back when standing, but obviously arched when walking • Slight limp can be discerned in one limb • Joints show signs of stiffness but do not impede freedom of movement • Head carriage remains steady
4	Ability to move freely is obviously diminished	• Obvious arched back when standing and walking • Reluctant to bear weight on at least one limb but still uses that limb in locomotion • Strides are hesitant and deliberate and joints are stiff • Head bobs slightly as animal moves in accordance with the sore hoof making contact with the ground
5 Severely Lame	Ability to move is severely restricted Must be vigorously encouraged to stand and/or move	• Extreme arched back when standing and walking • Inability to bear weight on one or more limbs • Obvious joint stiffness characterized by lack of joint flexion with very hesitant and deliberate strides • One or more strides obviously shortened • Head obviously bobs as sore hoof makes contact with the ground
source: University of British Columbia Animal Welfare Program		

Taken from Alberta's Humane Handling of Dairy Cattle - Standards for the Transportation of Cull Animals, original source: University of British Columbia Animal Welfare Program.

Table E.2 Lameness Scoring Cows in Tie Stall Barns

Behaviour Indicator	Description
Standing Post (voluntary movements)	
EDGE	Placement of one or more hooves on the edge of the stall while standing stationary. Standing on the edge of a step when stationary, typically to relieve pressure on one part of the claw (Figure 1). This does not refer to when both hind hooves are in the gutter or when cow briefly places her hoof on the edge during a movement/step.
WEIGHT SHIFT	Regular, **repeated** shifting of weight from one hoof to another. Repeated shifting is defined as lifting each hind hoof at least twice off the ground (L-R-L-R or vice versa). The hoof must be lifted and returned to the same location and does not include stepping forward or backward
REST (UNEVEN WEIGHT)	Repeated resting of one foot more than the other as indicated by the cow **raising** a part or the entire hoof off the ground. This does NOT include raising of the hoof to lick or during kicking (Figure 2).
Cow moved from side to side	
UNEVEN MOVEMENT	Uneven weight bearing between hooves when the cow was encouraged to move from side to side. This is demonstrated by greater **rapid movement** of one hoof relative to the other, or by an evident **reluctance to bear weight** on a particular foot.

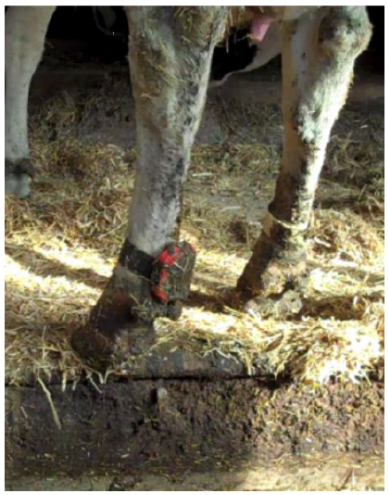


Figure 1: Example of EDGE

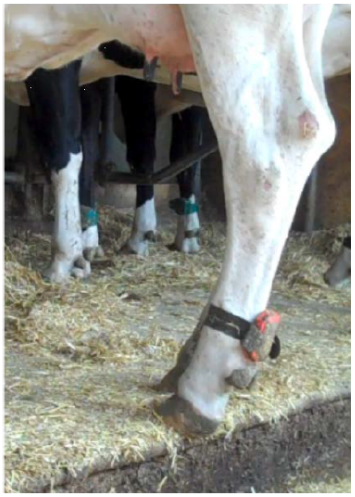
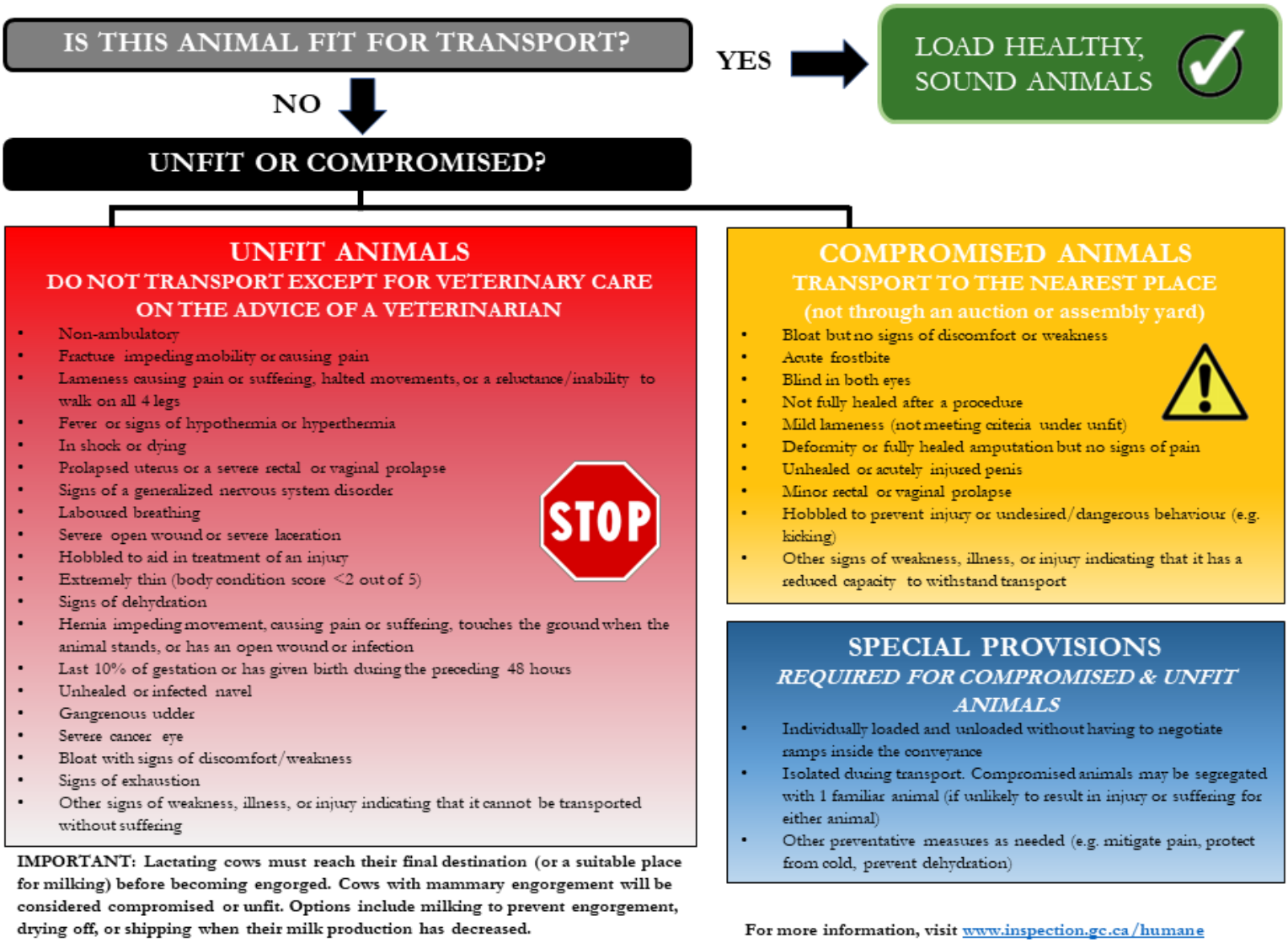


Figure 2: Example of REST

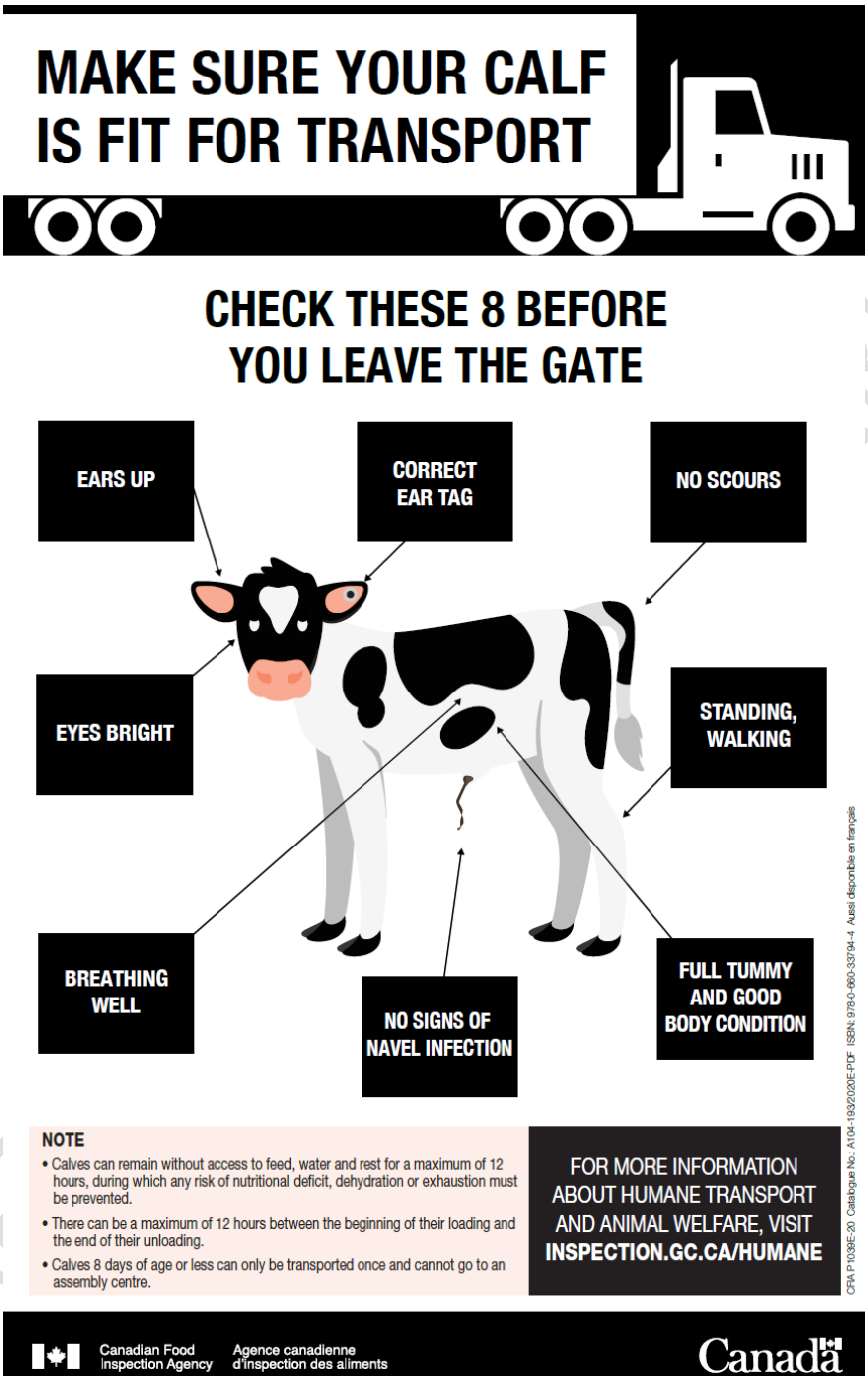
Appendix F: Transport Decision Tree



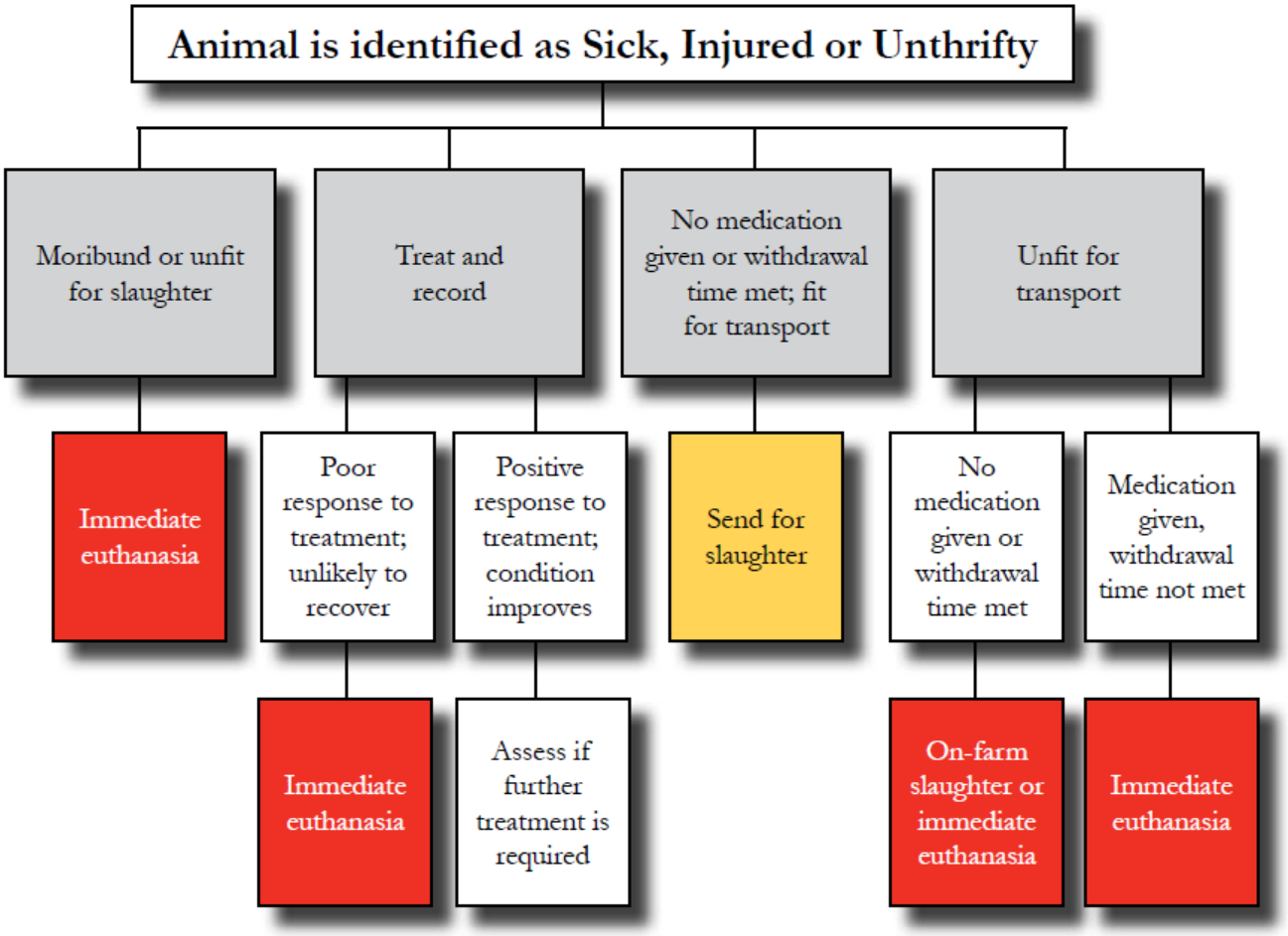
IMPORTANT: Lactating cows must reach their final destination (or a suitable place for milking) before becoming engorged. Cows with mammary engorgement will be considered compromised or unfit. Options include milking to prevent engorgement, drying off, or shipping when their milk production has decreased.

For more information, visit www.inspection.gc.ca/humane

Appendix G: Make Sure Your Calf is Fit for Transport



Appendix H: Sample Euthanasia Decision Tree



Appendix I: Anatomical Landmarks for Euthanasia

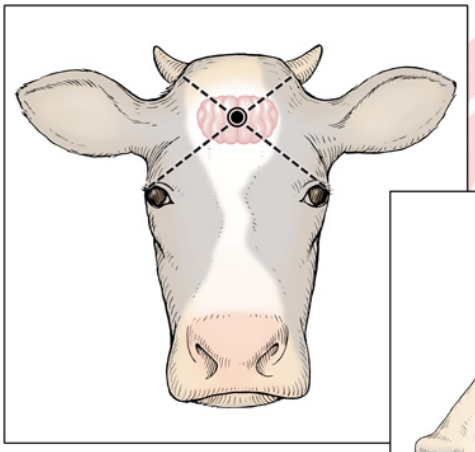


Figure 1

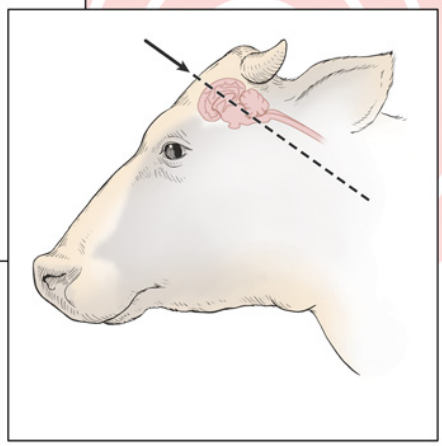


Figure 2

Not Between the Eyes! - but above the eyes as illustrated.

Images reprinted with permission: J.K. Shearer and A. Ramirez, College of Veterinary Medicine, Iowa State University *www.vetmed.iastate.edu/HumaneEuthanasia* (2013).

Proper positioning of the firearm or penetrating captive bolt is necessary to achieve the desired results.

Figures 1: In mature cattle, the correct target is in the middle of the forehead at the intersection of 2 imaginary lines drawn from the outside corner of each eye to the opposite horn or equivalent site in hornless animals. NOT between the eyes or at the poll.

Figure 2: The firearm or captive bolt should be angled so the projectile follows the angle of the neck or spine. Ensure the aim is perpendicular to the skull but tilted slightly to direct the shot to the lower brain.

Figure 3

Image source: Code of Practice for the Care and Handling of Veal Cattle (2017). Lacombe AB: National Farm Animal Care Council.

Figure 3: In young calves, the correct target is in the middle of the forehead at the intersection of 2 imaginary lines drawn from the outside corner of each eye to the opposite horn or equivalent site in polled or dehorned animals. Because the forebrain of calves is underdeveloped (compared to older cattle) it is beneficial to direct the projectile towards the base of the skull.

When using a firearm: For all weight and age classes, the firearm must never be held in direct contact with the head. Shotguns loaded with appropriate bird shot or slugs are appropriate from a distance of 1-2 metres or yards.[1]

When using a captive bolt gun: For all weight and age classes, the device must be held in contact with the head using proper landmarks (figures 1,2,3). Restraint may be necessary to ensure proper application of the captive bolt gun. A rope halter is typically sufficient to restrain the head. Alternatively, sedation may be used (in consultation with the herd veterinarian) as a means of humane restraint.

[1] American Association of Bovine Practitioners. (n.d.) Practical Euthanasia of Cattle: Considerations for the Producer, Livestock Market Operator, Livestock Transporter, and Veterinarian. Available http://www.aabp.org/resources/AABP_Guidelines/Practical_Euthanasia_of_Cattle-September_2013.pdf

Appendix J: Secondary Steps to Cause Death

Bleeding out (exsanguination)

Bleeding out can only be performed on an unconscious animal using a very sharp knife with a rigid blade at least 15 cm (6 in) in length.[1] For cattle, including calves, it is better to use a chest stick rather than a neck cut where possible.[2]

Figure J.1

Figure J.1. **Bleeding out of an unconscious animal (previously stunned with captive bolt device or gunshot):** Insert a sharp, single-sided blade, at least 15 cm (6 in) long into the neck below the neck bones and behind the jaw. Draw the blade forward to sever the major blood vessels (jugular vein and carotid artery) of the neck and the windpipe (trachea). Blood should begin to flow freely, and death occurs within minutes.

Pithing

Pithing is the process of mechanically destroying the brain of an unconscious animal to prevent return to consciousness.[1] Pithing is performed by inserting a rod or cane (approximately 1 m [3 ft] long x 5–10 mm [0.2–0.4 in] in diameter) through the hole in the skull created by the penetrating captive bolt device (Figure 3).[3] Pithing rods are commercially available (e.g., www.pithingrods.com). The carcass is no longer safe for consumption due to possible contamination.1 Producers are also advised to confirm that pithing will not affect dead stock removal.

Figure J.2

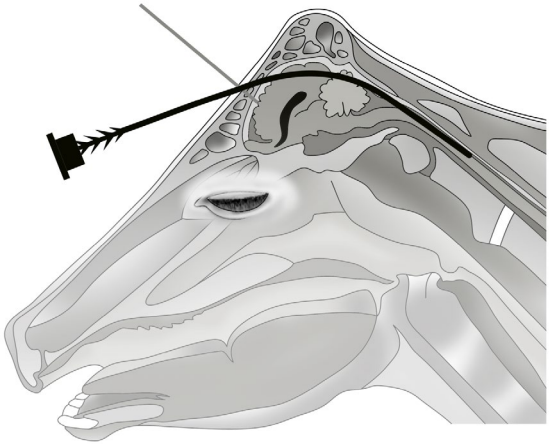


Figure J.3

Figure J.3. Pithing of a previously stunned animal. The line perpendicular to the animal's forehead shows the location for application of the captive bolt device. The curved pithing rod (shown only partially inserted) is inserted into the hole in the skull created by stunning with a penetrating captive bolt device. The rod is then manipulated, moving back and forth in approximately 5 cm (2 in) increments destroying the brain tissue and travelling through the brain to the top of the spinal cord, ensuring death.

Rapid Intravenous Injection

Rapid intravenous injection of a saturated solution of potassium chloride or magnesium sulfate induces death by cardiac arrest. These drugs must only be administered to an unconscious animal. The injection of 120–250 ml of a saturated solution of potassium chloride is typically sufficient to cause death.[4] Prepare at least 3–4 60-ml syringes with solution (equipped with 14 or 16 gauge needles) prior to rendering the animal fully unconscious so the injection may be made as soon as possible once the animal is rendered fully unconscious.[4] Any available vein may be used; the handler should be positioned out of the reach of legs which may injure the operator during periods of involuntary movement.[4] Once the needle is in the vein, the injection should be delivered by rapid intravenous injection.[4] Death will usually occur within a couple of minutes.[4]

Biosecurity Considerations:

Disposal of blood is an important consideration when bleeding out is used as a secondary step for humane euthanasia; strategies include:

- Use sawdust, wood shavings, straw, or other absorbent material to contain the blood and dispose of the material as required by provincial regulations for deadstock disposal
- If infectious disease is suspected, non-porous surfaces (e.g., floors, walls, equipment) should be cleaned and disinfected after bleeding out
- If infectious disease is suspected and the surface is soil, gravel, sand, or similar material, remove the top 20 cm (7.9 in) of material where the blood spill occurred and dispose of it as required by provincial regulations for deadstock disposal. Allow the area to dry before allowing contact with other animals.

[1] American Veterinary Medical Association (2020) *AVMA Guidelines for the Euthanasia of Animals: 2020 Edition.* Available at: https://www.avma.org/KB/Policies/Documents/euthanasia.pdf

[2]Anil, M. H., McKinstry, J. L., Gregory, N. G., Wotton, S. B. & Symonds, H. 1995. Welfare of calves: 2. Increase in vertebral artery blood flow following exsanguination by neck sticking and evaluation of chest sticking as an alternative slaughter method. *Meat Science*. 41, 113-123.

[3] Appelt M. & Sperry J. (2007) Stunning and killing cattle humanely and reliably in emergency situations – A comparison between a stunning-only and a stunning and pithing protocol. *Canadian Veterinary Journal* 48:529-534.

[4]Shearer J.K. & Ramirez A. (2013) Procedures for Humane Euthanasia – Euthanasia of Sick, Injured and/or Debilitated Livestock. Available at: www.vetmed.iastate.edu/sites/default/files/vdpam/Extension/Dairy/Programs/Humane%20Euthanasia/Download%20Files/EuthanasiaBrochure20130128.pdf

Appendix K: Resources for Further Information

PRODUCER MENTAL HEALTH SUPPORTS

- Canadian Mental Health Association www.cmha.ca/
- The Do More Agriculture Foundation www.domore.ag/
- Au coeur des familles agricoles (ACFA). La maison ACFA www.acfareseaux.qc.ca/fr/maison-acfa

HOUSING

Heifers and Cows

- Valacta (2014) The Barn: A source of comfort. Practical guide to evaluating and improving comfort in the barn. Available www.valacta.com/en-CA/gpc/_media/Document/guide-confort-ang-v3-version-finale-2015-02-02.pdf

Calves

- University of Wisconsin-Madison (2021) Two heads are better than one: starter guide to pairing dairy calves. Available at: www.animalwelfare.cals.wisc.edu/calf_pairing Accessed September 16, 2021.
- Cantor M.C, Neave H.W. & Costa J.H.C. (2020) Effectively raising pair-housed calves: Common questions from transitioning farmers. Progressive Dairy. Available at: www.progressivedairy.com/topics/calves-heifers/effectively-raising-pair-housed-calves-common-questions-from-transitioning-farmers Accessed: August 31, 2021.

Ventilation

- Calfcare.ca (n.d.) Ventilation. Available www.calfcare.ca/housing/ventilation/
- House H. (n.d.) Positive pressure air tube ventilation for calf housing. Ontario Ministry of Food and Rural Affairs, Agdex #420/721. Available www.ontario.ca/page/positive-pressure-air-tube-ventilation-calf-housing
- Nordlund K. Practical considerations for ventilating calf barns in winter. American Association of Bovine Practitioners, 40th Annual Conference, September 18, 2007. Vancouver, BC, Canada. Available www.fyi.extension.wisc.edu/heifermgmt/files/2015/02/Practical_ventilating_calf_barns.pdf

Emergency Planning

- Government of British Columbia (n.d.) Emergency Planning Workbook for B.C. Dairy Producers. Available at: www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/farm-management/emergency-management/dairy_emergency_management_guide.pdf Accessed September 17, 2021.
- Ontario Ministry of Agriculture, Food and Rural Affairs (n.d.) Barn fires – a concern for Ontario farmers. Questions and answers to barn fires and fires in farm structures. Available www.omafra.gov.on.ca/english/engineer/facts/barn_fire.htm
- Ontario Ministry of Agriculture, Food and Rural Affairs (2011) Reducing the risk of fire on your farm. Publication 837. Available www.omafra.gov.on.ca/english/engineer/barnfire/toc.pdf
- Ontario Ministry of Agriculture, Food and Rural Affairs (2016) Electrical Systems in Barns. Available: www.farmfoodcareon.org/wp-content/uploads/2016/04/Electrical-Systems-in-Barns.pdf

- The Alberta Environmental Farm Plan Company (2008) Rural Emergency Plan. Available www.ruralemergencyplan.com

FEED AND WATER

Assessing Rumen Fill

- Elanco Animal Health (2018) Rumen fill scoring. Available www.assets.ctfassets.net/hbmrjcnqrldd/3ojkfzpvygs4owGMUIGGi/5aa34b5f184b4ae89b02ae2cb5e4b4c2/Elanco_Rumen_Fill_Scores_A4_2018.pdf
- Agriculture and Horticulture Development Board (n.d.) Rumen fill score card. Available: www.projectblue.blob.core.windows.net/media/Default/Dairy/Publications/RumenScorecard2881_200702_WEB.pdf

Calf Feeding and Weaning

- Steele M. & Lallemand Animal Nutrition (2019) Health gut, healthy calf, productive future. (online video). Available: www.youtube.com/watch?v=zFftJ6fw55w
- Milk Products (2009) Milk replacer versus whole milk: effects on calf performance. Available: www.milkproductsinc.com/assets/frontlines/87/frontline.pdf
- Lactanet (2021) Growth chart by breed. Available at: www.lactanet.ca/en/growth-chart-by-breed
- Bovine Alliance of Management and Nutrition (2008) Guide to calf milk replacers: types, use and quality. Available: www.aphis.usda.gov/animal_health/nahms/dairy/downloads/bamn/BAMN08_GuideMilkRepl.pdf
- Quigley J. (2007) Added CMR feeding in cold weather. Calf note #121. CalfNotes.com Available www.calfnotes.com/pdffiles/CN121.pdf

Water Quality

- Olkowski A.A. (2009) Livestock Water Quality: A Field Guide for Cattle, Horses, Poultry and Swine. Available www5.agr.gc.ca/resources/prod/doc/terr/pdf/lwq_guide_e.pdf

HUSBANDRY PRACTICES

Handling and Restraint

- Farm and Food Care Ontario (n.d.) Handling cattle: Work smarter not harder. Available: www.farmfoodcareon.org/wp-content/uploads/2016/04/CattleHandlingYouth.pdf.
- Grandin T. (Revised 2015) Understanding Flight Zone and Point of Balance for Low Stress Handling of Cattle, Sheep, and Pigs. Available: www.grandin.com/behaviour/principles/flight.zone.html
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- Gill R. & Machen R. (n.d.) Cattle handling pointers. Texas A&M AgriLife Extension. Available www.effectivestockmanship.com/PDFs/Cattle-Handling-Pointers.pdf
- University of Minnesota Stockmanship. (website – online articles and videos) www.dairyknow.umn.edu/topics/stockmanship/

Dry-Off Management

- Mastitis Network and Dairy Farmers of Canada (2020) Drying off cull dairy cattle at high production and in emergency situations. Available www.dairyresearch.ca/pdf/EN_Drying_off_PLC_Aug62020FINAL.pdf.

HEALTH MANAGEMENT

General

- Farmers Assuring Responsible Management (n.d.) Herd health plan template. Available www.nationaldairyfarm.com/wp-content/uploads/2018/11/Blank-Herd-Health-Plan.pdf Accessed on January 14, 2020.
- Dairy Farmers of Canada. Animal care and health factsheets (various topics) Available at: www.dairyfarmers.ca/proaction/resources/animal-care Accessed on September 22, 2021.

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- Dairy Farmers of Canada (2017) Lameness information document. Available www.dairyresearch.ca/pdf/EN_PLC_boiterie_fin.pdf
- University of Minnesota. Lameness (website – online articles, presentations, and videos). Available www.dairyknow.umn.edu/topics/lameness/
- University of Wisconsin-Madison (Website) Lifestep Lameness Module. Available: www.thedairylandinitiative.vetmed.wisc.edu/home/lifestep-lameness-module/

Respiratory Health

- Nordlund K. (n.d.) Housing factors to optimize respiratory health of calves in naturally ventilated calf barns in winter. Available www.vetmed.wisc.edu/dms/fapm/fapmtools/8calf/Calf_Barn_Ventilation_Text.pdf

Calf Health

- Charlton, S.J. (2009). Calf Rearing Guide. Copies can be ordered through Context Bookshop: www.contextbookshop.com/books/calf-rearing-guide-practical-easy-to-use
- Grober Nutrition. (2020) What three things should you consider for your colostrum program? Available: www.grobernutrition.com/grofacts/what-three-things-should-you-consider-for-your-colostrum-program/
- Quigley J. (2009) Prolonged colostrum feeding and calf health. Calf note #138. CalfNotes.com Available www.calfnotes.com/pdffiles/CN138.pdf

Calving

- Animal Health Ireland. (2011) Calving and Care of the Newborn Calf. Available www.online.flippingbook.com/view/703745/

Down Cattle

- Ontario Association of Bovine Practitioners (2019). Considerations for developing a down cattle protocol. Available www.oabp.ca/wp-content/uploads/2019/11/Considerations-for-developing-a-down-cattle-protocol-November-6-2019.pdf
- Ontario Association of Bovine Practitioners (2019) Quick guide: down cattle management. Available www.oabp.ca/wp-content/uploads/2019/11/Down-Cattle-Quick-Guide-August-12-2019.pdf

Federally Reportable Diseases

- Canadian Food Inspection Agency (last modified 2020-08-07) Terrestrial animal diseases Available www.inspection.gc.ca/animals/terrestrial-animals/diseases/eng/1300388388234/1300388449143

TRANSPORTATION

- Dairy Farmers of Canada. Animal Care: Cull Cow Resources. Available www.dairyfarmers.ca/proaction/resources/animal-care
- Grandin T. (2008) Engineering and design of holding yards, loading ramps and handling facilities for land and sea transport of cattle. *Veterinaria Italiana*, 44(1):235-245. Available: www.researchgate.net/publication/43202698_Engineering_and_design_of_holding_yards_loading_ramps_and_handling_facilities_for_land_and_sea_transport_of_livestock.
- Canadian Food Inspection Agency (last updated 2020-11-10) Health of Animals Regulations: Part XII: Transport of Animals-Regulatory Amendment Interpretive Guidance for Regulated Parties. Available www.inspection.gc.ca/animal-health/humane-transport/health-of-animals-regulations-part-xii/eng/1582126008181/1582126616914
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- Ontario Ministry of Agriculture and Food, and Ministry of Rural Affairs (n.d.) Ontario Livestock Manifest. Available: www.farmfoodcareon.org/wp-content/uploads/2016/04/OntarioCattleTransportationManifest.pdf
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