



## CODE OF PRACTICE

FOR THE CARE AND  
HANDLING OF

# Veal Cattle

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## ***Introduction***

This Code of Practice represents a significant update to the previous Code (published in 1998). In updating the Code, the Code Development Committee has relied on research and practical experience of those responsible for the care of cattle. The revised Code aims to provide feasible and scientifically informed approaches to meeting the health and welfare needs of cattle that will contribute to a sustainable and internationally competitive Canadian veal industry.

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). The care and management provided by the person(s) responsible for the daily care of farm animals has a significant influence on their welfare. Veal production is highly specialized and those involved should consider the following key aspects of responsible animal care:

- shelter and comfort
- feed and water to maintain health and vigor
- the company of herd mates
- humane handling
- disease prevention and control
- veterinary care, diagnosis and treatment
- no unnecessary surgical alterations and pain control for necessary alterations
- emergency preparedness for fire, natural disaster and the disruption of feed supplies
- euthanasia.

Veal producers use a variety of husbandry and management systems to meet the needs of their cattle. 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. Since Requirements often state the necessary outcomes, the producer has flexibility to determine how the outcomes can be achieved using individual management and husbandry practices. 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.

Wherever possible, specific performance measures have been included in this Code. It is hoped that these will be useful to individual producers as they set goals and benchmark improvements in animal welfare as well as those developing an on-farm assessment program.

This Code pertains to dairy feeder calves (being raised for the dairy-beef market) during the starting period and cattle being raised for milk- and grain-fed veal, including on farms that specialize in pre-conditioned calves. Dairy feeder calves fall under the veal cattle Code of Practice until they are moved from young animal housing and management systems (that more closely resemble veal production rather than cow-calf operations

covered in the beef cattle Code) into housing and management systems intended for growing and finishing.<sup>1</sup> Consult the dairy cattle Code of Practice for information on the care of dairy calves, including bull calves, while on dairy farms.

The veal cattle Code includes important pre-transport considerations but does not address animal care during transport. Consult the [Code of Practice - Transportation](#) for information on animal care during transport. NFACC's website provides access to all currently available Codes ([www.nfacc.ca](http://www.nfacc.ca)).

In this Code, "cattle" refers to cattle of all ages. Where special provisions for animals under 6 months apply, the word "calves" has been used.

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<sup>1</sup> The timing at which this movement occurs varies across farms but would commonly take place in the period following weaning and does not necessarily involve movement to a different farm.

## ***Glossary***

Abomasal ulcer	damage to the lining and wall of the abomasum (i.e. fourth stomach) that extends deep into the abomasal muscle.
Ad libitum feeding	allowing animals to eat as much as they want when they want (free choice).
Aerosol	a mixture of fine solid particles or liquid droplets suspended in the air.
All-In/All-Out	a production system whereby animals are moved into and out of facilities and/or between production phases in distinct groups.
Analgesic	a drug that relieves pain.
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”.
Bloat	abnormal distension of the rumen as a result of accumulated gases that cannot escape.
Bursitis	swelling and inflammation of 1 or more of the small fluid-filled sacs that act as a cushion between a bone and other moving parts. Bursitis is typically seen as swellings near the carpal (knee) and tarsal (hock) limb joints.
Calves	male or female bovine animals under 6 months of age.
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).
Colostrum replacer	a preparation that contains a sufficient mass of immunoglobulins (Ig) along with the nutrients the neonatal calf requires to suitably replace the first feeding of colostrum (2). (Contrast with “Colostrum supplement.”)
Colostrum supplement	preparations with an immunoglobulin (Ig) concentration that is too low to completely replace colostrum. Supplements should be formulated to be fed in conjunction with colostrum to increase Ig concentration and provide nutrients that are inherently variable in colostrum (2). (Contrast with “Colostrum replacer.”)

Competent	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 transport, an animal with reduced capacity to withstand the stress of transportation but where transportation with special provisions will not lead to undue suffering. Animals may be compromised due to injury, fatigue, poor health, distress or any other cause.
Corrective action	action to eliminate the cause(s) of nonconformity or other undesirable situations and to prevent recurrence (3). 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.
Dairy feeder calves	a young, often male, calf that leaves the dairy farm to enter the red meat industry.
Dehorning	removal of the horns of an animal after the horn buds have attached to the skull. Horn bud attachment occurs between 2-3 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. Horn bud attachment occurs between 2-3 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.”)
Distress	an animal is in distress if it is likely to be suffering, i.e. is consciously experiencing a negative emotional state and is indicating this by obvious behavioural signs. Distress can occur during and following pain, severe or prolonged stress and ill health. Note: this definition may differ from how “distress” is used in some provincial animal welfare legislation.
Esophageal groove	a specialized part of the ruminant stomach composed of folds of muscular tissue that close forming a “tube” that directs milk or milk replacer past the rumen and directly into the abomasum (i.e. fourth stomach).
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 transport, 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 reestablish 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.”

Grain	seed from cereal crops or corn.
Grain-fed veal cattle	grain-fed veal is started with calves from dairy farms that are fed initially on a commercial milk replacer or whole milk diet before transitioning to a grain ration and finished to a live weight up to 341 kg (752 lbs). (Contrast with “Milk-fed veal cattle.”)
Hutch	any type of outdoor enclosure (purchased or made) used to rear 1-2 calves (some hutches are designed to house 4-5 calves).
Incidence	the number of new cases of a disease or condition over a specific period of time. (Contrast with “Prevalence.”)
Lairage	a place where cattle are temporarily held while awaiting slaughter.
Lameness	any alteration in an animal’s gait that appears to be caused by pain or discomfort. In cattle, 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/claws 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.
Lateral resting position	a resting position in which an animal lies on either side of the body with legs extended. This position uses more floor space than a sternal resting posture. (Contrast with “Sternal resting posture.”)
Local anesthetic	a drug that induces loss of feeling or sensation, especially the loss of pain sensation in the area to which it is applied.
Milk-fed veal cattle	milk-fed veal is started with calves from dairy farms that are raised primarily on a milk-based diet with some grain and/or fibre included in the ration and finished to a live weight up to 318 kg (700 lbs). (Contrast with “Grain-fed veal cattle.”)
Mitigate	make less severe or harmful (i.e. alleviate).
Moribund	an animal whose condition is in a state of terminal decline; in a state of dying.
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 (5). Also known as “downers.” Note: it is illegal to drag an animal.
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.
Outdoor enclosures	hutches and 3-sided barns.



Pathogen	a bacterium, virus or other microorganism that can cause disease.
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).
Pre-conditioned calves	weaned calves that have been started on grain (generally 81.6-136 kg [180-300 lb]).
Prevalence	the number of cases of a disease or condition (new and ongoing) at one point in time. (Contrast with "Incidence.")
Prophylactic	a measure or medication to prevent a disease from occurring.
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.
Ruminal drinking	when milk or milk replacer enters the rumen rather than the abomasum. Ruminal drinking occurs when the esophageal groove fails to close completely due to various factors.
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 and/or completed.
Stereotypies	abnormal behaviours that serve no apparent function and are performed in a repetitive, invariant way (6). Examples include tongue rolling, cross sucking, and manipulation of pen substrates with the tongue.
Sternal resting posture	resting upright on the chest with legs tucked under the body. (Contrast with "Lateral resting posture.")
Technical advice	advice provided by a professional working within their designated expertise (e.g. nutritionist).

Tethering	a method of keeping animals whereby a neck collar is attached to a length of a rope or chain, which is fixed to a hutch or stall.
Unconsciousness	the point at which an animal no longer has the ability to 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 transport, an animal deemed to be unable to withstand transportation without experiencing suffering.

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# 1. Roles and Responsibilities

Farm owners and managers have a primary responsibility for making cattle health and welfare a priority on the farm. Before personnel are assigned their duties, they need to be knowledgeable of the basic needs of cattle in all stages of production. While managers have a primary responsibility for ensuring personnel are trained, all those involved in animal care should be encouraged to identify areas where they would benefit from additional training.

Daily monitoring of cattle is an important component of animal care that facilitates prompt identification of changes in their health and welfare. Daily assessments of the general health and well-being of individual cattle can include monitoring of:

- cattle behaviour, especially at feeding
- feed and water intake, including access to feed and water
- signs of illness
- injuries
- signs of thermal discomfort.

## REQUIREMENTS

- **Managers must ensure that personnel receive training and supervision.**
- **Personnel working with cattle must have access to a copy of this Code of Practice and be familiar with, and provide, the basics of care as stated in this Code.**
- **Neonatal calves must be assessed at least twice daily for general health and well-being and all other cattle at least once daily.**

## RECOMMENDED PRACTICES

- a. develop and implement a written Cattle Welfare Policy outlining the farm's commitment to responsible and humane animal care (see sample provided in *Appendix A*)
- b. identify supervisors or managers that personnel can approach with questions or concerns about animal care
- c. supervise personnel until they demonstrate competence in their assigned duties and re-evaluate their abilities periodically.

## 2. Calf Selection and Care of Newly Arrived Calves

### 2.1 Sourcing Calves

The welfare of calves is a shared responsibility among producers, and is significantly influenced by the care they receive early in life. Early nutrition and management on the dairy farm, along with transport, affect calf health and welfare. Intermediate stops (e.g. auctions, assembly yards) exacerbate many of the stressors associated with transport given the additional handling, unloading and loading, social stresses of co-mingling and further exposure to infection (7).

Purchasing calves direct (from dairy farms or farms that specialize in pre-conditioned calves) rather than auctions is strongly encouraged. Direct purchasing is less stressful to calves and allows the buyer to establish criteria for calf selection (and the seller can be held accountable when the criteria are not met). The producer also knows the farm of origin, including the herd's health status (a benefit for the entire production chain).

Every effort should be made to ensure that calves are sourced from reputable sources. If buying from an auction or calf dealer, urge the operator to adopt best practices, communicate any concerns you have and, if corrective actions are not taken, identify other sources to buy from.

#### RECOMMENDED PRACTICES

- a. purchase calves directly from dairy farms that demonstrate compliance to the *Code of Practice for the Care and Handling of Dairy Cattle* rather than auctions
- b. source calves from locations that result in the shortest possible journey durations
- c. use health records of previous calves from the same source as the basis for future purchasing decisions
- d. when choosing an auction or calf dealer, ask for references of other customers who have worked with them to verify calf care and handling at the auction.

### 2.2 Assessing Calf Health at Purchasing

Multiple criteria should be used when selecting calves (see Appendix B – *Selecting Healthy Calves*). Calves must have a dry, healed navel and should be able to easily rise unassisted and appear alert and sturdy on their legs. Transporting calves when they are less than 7 days of age is not recommended. Refer to Section 7 – *Transportation*.

The ideal weight of calves varies by breed. Calves that are low weight for the breed are at greater risk of illness and mortality (8).

## REQUIREMENTS

- **A written standard operating procedure detailing strategies to minimize the likelihood of unhealthy calves being purchased must be developed, made available to personnel involved in purchasing and implemented.**
- **Calf purchasing decisions must be made by competent personnel (through training, experience and/or mentorship).**
- **Do not purchase calves with an obviously wet or unhealed navel or that are showing signs of illness, injury or weakness when assessed at the dairy farm or auction. Signs of illness are provided in Section 6.3 – *Sick or Injured Cattle*.**

## RECOMMENDED PRACTICES

- a. use multiple criteria to assess the health of each calf prior to purchase (see *Appendix B*)
- b. purchase calves of similar weights and that are at least 7 days old
- c. if purchasing calves that appear small/low weight for the breed, ensure the specialized care and feeding practices these calves typically need can be provided.

When buying calves directly from dairy farms, in addition to the above Recommended Practices:

- a. have a calf purchase agreement detailing colostrum and milk feeding practices, herd and calf health, weight range and other conditions for calf guarantee.

### 2.2.1 Colostrum

Intake of colostrum or good quality colostrum replacer is essential to calf survival during the neonatal period and can have lasting positive effects on health, digestion and nutrient absorption (9,10). Colostrum contains antibodies known as immunoglobulins (Ig) that protect calves from infections.

Calves' ability to absorb the immunoglobulins from colostrum is substantially reduced 6-8 hours after birth (11). Calves that do not receive enough colostrum as soon as possible in the first day of life face a higher risk of illness and mortality (12). Early colostrum feeding is, therefore, among the most important animal care obligations of the dairy farmer.

Feeding colostrum or a colostrum supplement for the first 2 weeks after calves arrive can be beneficial in terms of improved daily weight gain and reduced diarrhea (13). Additional information about colostrum management is provided in Appendix L – *Resources for Further Information*.

## RECOMMENDED PRACTICES

- a. implement, in consultation with the herd veterinarian, protocols for verifying calves' Ig concentration on arrival and additional care for calves found to have a low Ig status
- b. mark calves found to have a low Ig concentration for increased monitoring
- c. reconsider calf sourcing strategies if Ig concentrations of calves tend to be insufficient.

When buying calves directly from dairy farms, in addition to the above Recommended Practices:

- a. work with the dairy producer to verify that calves receive colostrum and daily milk intake in accordance with the *Code of Practice for the Care and Handling of Dairy Cattle*.

## 2.3 Managing Calves upon Arrival

The care of calves on the day of arrival is especially important for their comfort and future health and growth. Every effort should be made to ensure calves are thermally comfortable soon after they arrive. There are several options for caring for wet or cold stressed calves (e.g. heated barns, offering feed as soon as appropriate, providing ample dry bedding, provision of clean, dry calf coats). Refer also to Section 3.3.2 – *Temperature and Relative Humidity*.

Cleanliness of equipment and facilities is particularly important for neonatal calves given their vulnerability to disease. Refer to Section 4.5 – *Feeding and Watering Equipment* and 6.2.1 – *Cleaning and Disinfection*.

### REQUIREMENTS

- A written standard operating procedure detailing protocols for the care of newly arrived calves must be developed, readily available and implemented.
- Upon arrival, calves must be provided access to water and individually assessed for general health and well-being.
- Prompt additional care must be provided to calves showing signs of illness, injury, heat or cold stress or dehydration on arrival. Signs of illness are provided in Section 6.3; signs of heat and cold stress are provided in Section 3.3.2; signs of dehydration are provided in *Appendix C*.
- Calves showing signs of dehydration on arrival must receive fluids.
- When used, management identification tags or collars must be light weight and safe.
- Refer also to the Requirements in Section 7.2 – *On Farm Loading and Unloading*.

### RECOMMENDED PRACTICES

- a. develop, in consultation with the herd veterinarian, a prophylactic plan for neonatal calves (e.g. electrolyte, mineral and vitamin mixes)
- b. schedule a field service technician to provide general advice on the management of the calves or schedule a visit by a veterinarian to advise of any tests/samples or additional treatment that may be needed
- c. ensure a sufficient number of trained staff are on-site to promptly unload and pen calves and provide care
- d. pen calves of similar size and age together
- e. avoid any unnecessary handling or stress within 24 hours after calf arrival.

# 3. Housing

## 3.1 Housing Systems

The facilities where cattle are kept contribute significantly to their health and welfare. Housing systems need to provide a comfortable environment for cattle through appropriate space allowance, ventilation and temperature. Routine maintenance of facilities can help prevent cattle from becoming injured and contribute to cattle health and welfare.

### REQUIREMENTS

- **Housing systems and their components must be designed, constructed and maintained in a manner that reduces the potential for injury and allows visual inspection of all cattle.**

### RECOMMENDED PRACTICES

- a. develop and follow a program for facility maintenance
- b. keep records of facility maintenance in a maintenance log
- c. consult an experienced agricultural engineer (or other technical advisor) and the herd veterinarian when building a new facility or renovating an existing one.

#### 3.1.1 Young Animal Housing

A key focus in the starting phase is maintaining calves' health given their vulnerability to disease in this period. Disease risk is influenced by many factors (e.g. diet, hygiene, ventilation), and there is little evidence of a consistent relationship between group housing and disease risk (6, 14). Housing calves individually can reduce the transmission of infectious diseases between calves by physical contact but does not necessarily reduce transmission of disease as a result of airborne exposure (e.g. respiratory disease) (6). Housing calves individually facilitates monitoring and therefore early identification and treatment of sick calves (15).

Rearing calves in pairs from arrival allows for effective monitoring and treatment of individual calves while also satisfying calves' motivation for social contact. When calves are paired early, they eat more solid feed and have greater weight gains than those housed individually (6).

Well managed hutches provide a good housing option for young calves especially when hutches permit social contact by virtue of their design/size or the way in which the hutches are arranged.

Individual stalls must be appropriate to the size of the calf to ensure calves can adopt sternal and lateral resting postures. The ability of cattle to adopt sternal and lateral resting postures is important for their comfort. Lateral lying or lying with the head resting on the ground is important for sleep (6).

## REQUIREMENTS

### Transition to Group Housing Methods - All Facilities

*Effective December 31, 2020, in all holdings:*

- **Group housing of calves must take place as young as possible and not later than 8 weeks of age. Time in stalls can only be extended in exceptional circumstances for individual calves on the advice of a herd veterinarian according to the herd health plan. Refer to Section 6.1 – *Herd Health Planning*.**

### Transition to Group Housing Methods - New or Renovated Facilities

*Effective July 1, 2018:*

- **all holdings which are newly built, substantially renovated, brought into use, or where existing stalls are modified:**
  - Calves must be housed in groups as young as possible and not later than 8 weeks of age. Time in stalls can only be extended in exceptional circumstances for individual calves on the advice of a herd veterinarian according to the herd health plan. Refer to Section 6.1 – *Herd Health Planning*.
  - If individual housing is used for the first 8 weeks, it must allow calves to turn completely around without assistance, groom, adopt sternal and lateral resting postures, easily stand up and lie down and have visual and physical contact with other cattle. This can be achieved through stall design, stall size and/or the timing of when calves are grouped.

### Tethering - Indoor Facilities

*Effective July 1, 2018:*

- **a facility that is newly built, substantially renovated, brought into use, or where existing stalls are modified those facilities must not be designed to permit tethering, and calves in those facilities must not be tethered.**

*Effective December 31, 2020:*

- **tethering of calves is prohibited.**

### Existing Stalls

- **Existing stalls where calves are currently housed untethered may be used for the lifetime of the stalls provided the stalls**
  - allow calves to groom, adopt a sternal resting posture, easily stand up and lie down and have visual contact with other cattle and
  - are used for a maximum of 8 weeks of age (as listed above) prior to group housing.



## Hutches and Other Outdoor Enclosures

- Calves in hutches and other outdoor enclosures must be able to easily stand up and lie down, turn completely around without assistance, groom, adopt sternal and lateral resting postures and have physical or visual contact with other cattle.
- Calves in hutches and other outdoor enclosures must be able to stand fully upright without touching the top of the enclosure.

### *Effective July 1, 2018:*

- calves in hutches and other outdoor enclosures must be grouped as young as possible and not later than 8 weeks of age. Individual housing in all outdoor enclosures must only be extended in exceptional circumstances for individual calves on the advice of the herd veterinarian according to the herd health plan. Consult Section 6.1 – *Herd Health Planning*.

### *Effective December 31, 2020:*

- calves in hutches and other outdoor enclosures must not be tethered.

## **RECOMMENDED PRACTICES**

- a. consider housing calves in pairs from arrival
- b. choose hutches large enough to house calves in a small group (e.g. 2-5 calves) from arrival or arrange hutches to permit visual and physical contact between calves from arrival.

### **3.1.2 Cattle in Groups**

Group housing generally provides cattle with more space (and therefore greater freedom of movement) and satisfies their strong motivation for social contact (6). Veal cattle can be well managed in small groups (2-10 animals) and large groups (more than 10 animals).

Group size and method of grouping influence disease risk (6, 16). Small groups are associated with lower risk of respiratory disease and calf mortality (6). Detecting, treating and monitoring sick cattle is generally easier with small groups especially in the starting period (14). Stable groups are associated with lower incidence of disease and higher daily gains compared to dynamic groups (where cattle are continuously introduced and removed) (16).

Grouping cattle of similar size, age and drinking speed helps reduce competition for feed. Additional information on managing competition for feed is provided in Section 4.1 – *Feeding Management*.

In grain-fed systems, calves are typically moved into groups shortly after weaning so that feed intake of individual calves can be monitored during weaning. This strategy also avoids exposing calves to adverse stresses of weaning and grouping concurrently.

## REQUIREMENTS

- **Cattle in groups must be able to easily stand up and lie down, turn around, groom, adopt sternal and lateral resting postures and rest on the enclosure floor at the same time.**

## RECOMMENDED PRACTICES

- a. keep unweaned calves in groups of fewer than 10 animals (6)
- b. avoid moving grain-fed veal calves into groups during weaning
- c. strive to maintain cattle in stable groups with individual animals sorted to promote cattle health and minimize competition
- d. where possible, manage groups in an “all-in, all-out” method to permit effective cleaning and disinfection.

### 3.2 Lighting

Appropriate lighting is important for proper monitoring and handling of cattle. Cattle prefer moving from darker to lighter areas and generally move through facilities more smoothly when shadows are minimal.

Cattle have a preference for light over darkness (17, 18) and need light for social contact (observing other cattle) and for orientation in stalls or pens (19). Although calves are able to discriminate objects in close range at light intensity of about 2 lux (equivalent to twilight) (20), they are more active and play with pen-mates more at high light intensity (e.g. 100 lux, equivalent to overcast daylight) and tend to rest more at low light intensity (e.g. 2 lux) (21).

## REQUIREMENTS

- **Cattle must receive a light period (for at least 8 hours) and a dark period every day.**
- **In barns without natural light, supplemental artificial lighting must be provided daily for at least 8 hours.**
- **Light intensity, whether natural or artificial, must permit housed cattle to navigate their surroundings, feed, rest and be monitored.**
- **Lighting (whether fixed or portable) must be available to enable detailed inspection of cattle at any time.**

## RECOMMENDED PRACTICES

- a. match the intensity/location of the lighting to the purpose for which the area is used
- b. ensure alleyways in which cattle are moved through are uniformly lit
- c. provide a light intensity of at least 100 lux during the light period.

### 3.3 Ventilation, Temperature and Relative Humidity

#### 3.3.1 Ventilation

Ventilation brings in fresh air and removes metabolic end products produced by cattle including heat, water, carbon dioxide, noxious gases from manure and urine (e.g. ammonia), and airborne microorganisms and dust. Stocking density (expressed as the air space per calf) is a major factor affecting the risk of respiratory disease. Maximizing the air space per calf is beneficial. A minimum air space of 10 m<sup>3</sup>/100 kg (353 ft<sup>3</sup>/220 lb) live weight has been recommended (19).

The ventilation rate (i.e. the number of air changes per hour) should be sufficient to avoid the build-up of relative humidity in cold conditions, heat and relative humidity in warm conditions and minimize the occurrence of respiratory disease. The incidence of respiratory diseases tends to be higher in calves reared in mechanically ventilated barns than in calves housed with natural ventilation or in outdoor enclosures (22). The advantage of hutches and other outdoor enclosures in providing good air quality depends on design and bedding management.

While a definitive threshold for ammonia concentration has not been established for cattle, it is recognized as an irritant to animals' eyes and respiratory tract, and can pose a health threat to cattle. An ammonia concentration of 25ppm corresponds to safety standards established for humans for continuous 8-hour exposure but is not necessarily pleasant for humans or animals (23, 24). When the smell of ammonia is aversive to a human observer, it is likely at a concentration of at least 17ppm (25) and measures should be taken to establish a comfortable environment for cattle and personnel. There are several tools for measuring ammonia concentration, including test strips, detection tubes and electronic devices.

#### REQUIREMENTS

- **Ventilation systems must be maintained in good working order.**
- **Air quality in facilities housing cattle must be maintained to provide cattle with fresh air, reduce the risk of heat stress and prevent the buildup of noxious gases, dust and moisture.**
- **Refer also to the Requirements in Section 6.3.1 – *Respiratory Illness*.**

#### RECOMMENDED PRACTICES

- a. maintain good indoor air quality in ventilated barns using the following air exchange rates (26, 27):
  - in cold weather, at least 0.28 m<sup>3</sup>/min/calf (10 ft<sup>3</sup>/min/calf) for calves less than 56.7kg (125 lbs)
  - in cold weather, at least 0.34 m<sup>3</sup>/min/calf (12 ft<sup>3</sup>/min/calf) for calves greater than 56.7kg (125 lbs)
  - in warm weather, 5 m<sup>3</sup>/min/calf (177 ft<sup>3</sup>/min/calf )
- b. calculate the air space per calf for each room and adjust stocking density or ventilation rate based on the occurrence of heat stress and respiratory disease
- c. lower the stocking density in anticipation of seasonal hot weather to reduce the demand placed on the ventilation system

- d. maintain some air flow in cold weather in mechanically ventilated barns (i.e. ventilation systems should not shut off at a low temperature threshold)
- e. ensure hutches offer ample natural ventilation through doors, windows and top vents
- f. remove manure and/or soiled bedding from facilities frequently
- g. maintain ammonia concentrations at cattle level below 17ppm.

### 3.3.2 Temperature and Relative Humidity

Maintaining appropriate temperature and relative humidity is important for limiting pathogen survival. High relative humidity tends to increase survival of aerosol respiratory pathogens. Measures that can be taken to reduce relative humidity include raising the air temperature, reducing stocking density, improving the ventilation rate and drainage (e.g. urine, water) and limiting activities that increase relative humidity (e.g. milk replacer preparation within the same air space as cattle).

#### *Low Ambient Temperatures*

Cattle exposed to temperatures below their lower critical temperature (i.e. the temperature at which individual cattle start to respond to cold) are not thermally comfortable and expend energy trying to stay warm. The lower critical temperature will be higher if an animal is wet or lying on damp bedding, exposed to air movement (wind or drafts), lying on concrete or has had reduced feed intake (e.g. during transportation, due to sickness).

**Table 1 – Temperatures at which cattle start to respond to cold (i.e. lower critical temperature) at different ages depending on air movement and bedding.**

	Exposed to 0.2 m/s air movement	Exposed to 2 m/s air movement	Provided with deep, dry straw bedding
Young calf on arrival	12°C	20°C	6°C or lower
Calf at 5 weeks of age	2°C	11°C	2°C or lower
Calf at 12 weeks of age	- 11°C	2°C	- 11°C or lower

*(Adapted from 28)*

Cattle that are dry, in good health and fed to adequate energy intake are better able to cope with cold weather (29). Young calves on arrival are especially vulnerable to cold stress in part due to reduced feed intake during transportation. If the temperature during the week after arrival is below 14°C (57.2°F), calves should be monitored more often to confirm they are consuming sufficient feed to prevent cold stress (30).

Signs of cold stress in cattle can include:

- shivering (cattle may stop shivering if severely cold stressed)
- huddling or crowding
- low core body temperature (normal body temperature for cattle is 38-39.3°C [100.4-102.7°F]; take action before body temperature falls to 37.5°C [99.5°F]).

Intervention is required before signs of hypothermia are observed, which include:

- low core body temperature
- cold mouth
- inability to get up
- no suckling reflex (in unweaned calves).

Provision of a dry insulated coat to young calves is effective in improving their insulation and resistance to cold (31). Although young calves with dry bedding may tolerate cold external temperatures, their extremities are vulnerable to frostbite unless the bedding is provided to a depth that permits nesting.

#### *High Ambient Temperatures*

Temperatures above 23°C (73.4°F) may cause heat stress in cattle when combined with high relative humidity, low air movement or direct sun (32). Signs of heat stress in cattle include:

- sweating
- increased respiration rate
- reduced feed intake
- increased water intake
- open mouth breathing
- increased body temperature.

Sick cattle, heavier cattle (closer to finishing) and cattle recently handled are less able to cope with high ambient temperatures (32).

#### **REQUIREMENTS**

- **Temperature control systems (e.g. fans, heaters, thermostats) must be maintained in good working order.**
- **Measures must be taken to mitigate heat and cold stress in cattle.**

#### **RECOMMENDED PRACTICES**

- a. avoid exposing cattle to drafts
- b. strive to maintain barn temperatures below 21°C (69.8°F) and relative humidity between 40-60% (25)
- c. allow recently washed pens or stalls to dry before placing calves
- d. design and locate outdoor enclosures to take advantage of prevailing winds in the summer and allow sunlight penetration in the winter.

Examples of measures to mitigate cold stress:

- a. increase the ambient temperature in heated barns
- b. provide insulated and/or heated flooring
- c. protect cattle from wind and moisture (e.g. wind break, addition of a screen to a 3-sided barn)
- d. provide straw bedding (which offers more insulation than other bedding types) and ensure the depth permits cattle to nest (6)
- e. adjust the feeding program (refer to Section 4.1.1 – *Cold Weather Feeding*)
- f. strive to prevent condensation
- g. provide calves with clean, dry insulating calf coats in addition to bedding.

Examples of measures to mitigate heat stress:

- a. provide shade through natural or artificial means (e.g. shade cloths, opaque hutches)
- b. modify hutches to have a reflective covering in the summer
- c. provide ample cool, clean water
- d. avoid handling or other stressors especially during the hottest times of the day
- e. increase air flow (e.g. position hutches to facilitate inter-hutch air flow, open barn or hutch vents fully, add more fans to indoor housing)
- f. install a sprinkler in front of the air inlet (note: only suitable if the ventilation system can maintain relative humidity below 60%)
- g. for milk-fed veal cattle (except young calves), reduce the quantity of milk fed in the evening and/or feed an electrolyte meal at night (allows for a reduction in body temperature in the evening and may be a suitable intervention after a few days of high ambient temperatures).

### **3.4 Flooring and Bedding**

The surfaces that animals stand, walk and lie on have important effects on their well-being because they influence animal comfort, movement, thermoregulation and health (6). Soft compressible flooring surfaces or solid flooring surfaces with special design features can offer animals good traction for locomotion and transitioning between lying and standing (6). Flooring can, either by design or the addition of bedding, provide support for animals' leg joints while lying (6).

The risk of bursitis and carpal joint swelling is lower on soft flooring (rubber slots, slats with rubber cover, or perforated rubber mats) than on hard flooring (concrete slats, perforated concrete) (6). Refer also to Section 6.3.3 – *Foot and Leg Health*.

Cattle, including young calves, consistently avoid wet bedding (6). Keeping bedded areas dry improves animal comfort, cleanliness and thermoregulation and reduces ammonia emissions, fly infestations, and pathogens associated with health issues (6).

All types of bedding offer advantages and disadvantages (6). Safe bedding types are those made of natural materials such as straw, sawdust, sand and wood shavings. Some processed materials (from recycled sources) may contain chemical contaminants that are unsafe if cattle ingest the material.

## REQUIREMENTS

- **Flooring must be designed and maintained to minimize slipping.**
- **Corrective action must be taken if the number of animals with bursitis exceeds 15% in 3 consecutive cycles when assessed at shipping or once during the 2 weeks before shipping. Examples of corrective actions are provided in Section 6.3.3 – *Foot and Leg Health*.**
- **A dry, bedded area must be continuously available to calves in hutches, calves up to 12 weeks of age in an unheated building and cattle reared on solid concrete flooring. Cattle access to bedded areas may only be prevented for occasional, brief management practices.**
- **Bedding must be safe and managed to provide comfort, insulation, dryness and traction.**
- **For cattle in groups, bedded areas must be large enough to allow all cattle to lie down at the same time in sternal and lateral resting postures.**

## RECOMMENDED PRACTICES

- a. inspect cattle in each stage of production for injuries associated with flooring or other aspects of facility design (e.g. hairless patches, lameness, swelling of the knee and hock) (6)
- b. choose flooring types that are non-slip but not overly abrasive (33, 34)
- c. avoid bare concrete slatted flooring and provide cattle with softer flooring types that afford good drainage (e.g. rubber coated flooring, perforated rubber mats, access to bedded areas) (6)
- d. ensure solid flooring is appropriately sloped to permit effective drainage (the slope of flooring in each pen or stall should not exceed 4cm/m (1.5 in/y))
- e. locate outdoor enclosures on gently sloping, well drained surfaces
- f. move hutches to a new area of the yard twice a year to help keep calves dry
- g. position waterers and buckets/troughs to limit wetting of the flooring or bedding
- h. in the summer, provide bedding that promotes thermal comfort and aids in controlling fly populations (e.g. wood shavings, sawdust, sand) (6)
- i. in the winter, provide straw bedding (which offers more insulation than other bedding types) and ensure the depth permits cattle to nest (6)
- j. clean out bedding before calves are placed (i.e. between groups).

### 3.5 Facilities for Sick or Injured Cattle

Sick or injured cattle sometimes benefit from being segregated in an area where they can be readily observed, recuperate without having to compete with pen mates for feed, water and lying areas, and receive additional care and treatment. Where appropriate, moving sick animals to dedicated areas can also reduce transmission of disease. Isolation is stressful to cattle; they should ideally be segregated such that they can see other cattle. Refer also to Section 6.3 – *Sick or Injured Cattle*.

## REQUIREMENTS

- **Farms must have the ability to segregate sick or injured cattle.**

## RECOMMENDED PRACTICES

- a. design facilities for sick or injured cattle that provide enhanced comfort conducive to recovery (e.g. bedding, rubber mat, supplemental heat, additional space)
- b. locate facilities for sick or injured cattle in an area that provides a draft-free environment, visual contact with other cattle and that facilitates frequent monitoring by personnel.

### 3.6 Emergency Planning

Emergencies may arise, and can compromise cattle welfare (e.g. power failure, barn fire, flooding, disruption of supplies). Pre-planning will assist producers respond in a timely and effective manner better providing for the welfare of cattle during the event of an emergency. Resources to support emergency planning are provided in Appendix D – *Sample Emergency Contact List* and Appendix L – *Resources for Further Information*.

## REQUIREMENTS

- **Emergency procedures, relevant to the farm's location and housing system(s), must be developed and communicated to personnel.**
- **For cattle that are reliant on electricity for ventilation or the provision of feed or water, alternative means of temperature regulation, ventilation, feeding and/or watering must be available and implemented in the event of a power failure, mechanical breakdown or other emergency situation.**
- **Alarms and fail-safe devices, including an on-farm alternate power supply, must be tested at least annually and corrected if a defect is identified.**

## RECOMMENDED PRACTICES

- a. consider emergency management protocols when designing or renovating facilities and seek advice on housing design as it relates to emergencies (e.g. rapid evacuation of livestock, installation of fire alarms that can be heard and responded to at any time, portable or other lighting for use during an emergency)
- b. consult a local fire department for specific advice on fire prevention particularly before renovating an existing facility or building a new facility
- c. have fire extinguisher(s) (Class A,B,C) available in all facilities. 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
- d. check automated or mechanical equipment essential for the health and well-being of cattle daily to ensure they are functional
- e. in mechanically ventilated barns, have a back-up ventilation system or generator to ensure air renewal in the event of a failure of the system along with an alarm system that will operate even if the principal electricity supply to it fails
- f. check back-up systems, including alarms, on a regular basis at an interval appropriate to the age and type of equipment and risks associated with failure of the system, and correct defects promptly.



## 4. Feed and Water

### 4.1 Feeding Management

Quality of ingredients, feed form, feeding frequency, method of delivery, quantity of feed offered and hygiene are all important elements of feeding management. Feed should be evaluated before it is fed for indicators of poor quality (e.g. off odour, mold in solid feeds, sedimentation in milk-based feeds). Proper feed storage helps prevent contamination, which can negatively impact calf health and performance.

Examples of general feeding strategies to improve health and welfare outcomes include:

- provide ample fresh, clean water
- provide feed ad libitum
- avoid long periods of fasting between feedings
- increase the frequency of milk meals
- offer fibrous feeds that increase chewing activity and/or the time it takes to consume the ration
- provide feed according to a consistent daily schedule
- implement strategies that encourage natural sucking behaviour
- implement strong protocols for sanitizing feeding and watering equipment.

Consult other sections of this chapter for more information on the above strategies.

Competition for feed can be an issue in group-housed cattle when feed is not provided ad libitum. Behavioural signs of inadequate feed access include displacements during feeding and, in cattle with access to solid feed, individual animals not chewing their feed at the bunk (35). Strategies to improve feed access include:

- reduce group size
- increase the quantity of feed offered
- increase feeding frequency
- provide feed ad libitum
- increase the per animal linear bunk or trough space or the number of teats available.

#### REQUIREMENTS

- **The ration must be in compliance with the Feeds Regulations.<sup>2</sup>**
- **Cattle must receive a ration that maintains health and vigor and promotes satiety.**
- **Feed must be provided in ways that prevent competition resulting in injury or limited access to feed by some animals in the group.**

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<sup>2</sup> The *Feeds Regulations* are accessible through the following link or by doing an Internet search for “Feeds regulations”  
<http://laws-lois.justice.gc.ca/eng/regulations/sor-83-593/index.html>

## RECOMMENDED PRACTICES

- a. ensure feed is kept dry and stored in a dry area
- b. store feed in a secure area (i.e. rodent and moisture proof)
- c. manage storage and provision of feeds in ways that maintain feed quality and minimize spoilage
- d. maintain a consistent daily feeding schedule
- e. ensure changes to the diet are accomplished gradually
- f. consult with the herd veterinarian on relationships between diet and health and regularly update the herd health plan to minimize dietary health and welfare issues (Refer also to Section 6.1 – *Herd Health Planning*).

### 4.1.1 Cold Weather Feeding

Cold weather increases the amount of energy required for growth, maintenance and thermoregulation (29). Cattle, and particularly neonatal calves, are less able to cope with cold temperatures if they are not fed sufficient energy to sustain growth (29).

Some calves can become vulnerable to cold stress at temperatures below approximately 10°C (50°F), requiring extra energy for maintenance and growth (36). Energy requirements in cold weather vary according to wind, bedding dryness, shelter design, animals' health status and other factors.

Resources on cold weather feeding are provided in Appendix L – *Resources for Further Information*. Refer also to Section 3.3.2 – *Temperature and Relative Humidity*.

## REQUIREMENTS

- **Additional feed must be provided to meet increased energy requirements of cattle facing cold stress.**

## RECOMMENDED PRACTICES

- a. develop a plan for cold weather feeding in consultation with a nutritionist or veterinarian (refer also to Section 6.1 – *Herd Health Planning*)
- b. gradually increase energy intake in anticipation of cold weather to ensure that growth and weight gain are maintained through winter.

## 4.2 Milk Feeding

Calf age, manufacturing process and ingredient quality are important factors when selecting milk replacers (37). Feeding according to labelling instructions or a feed program developed in consultation with qualified advisors helps ensure calves' nutritional needs are met and promotes animal health.

Providing calves with a quantity of milk or milk replacer that is similar to what they would naturally consume, promotes satiety (i.e. satisfaction, lack of hunger) and improves average daily gains (6). During the period immediately following arrival, there may be a need to gradually transition calves to higher milk intakes. Research has shown that calves benefit from higher milk intakes (an average of 8-12 L/day of whole milk or the

equivalent in milk replacer) especially during the first weeks of life when their ability to digest solid feed is limited (6). There is no evidence that feeding large amounts of whole milk causes diarrhea in calves (6).

Where feasible, offering milk or milk replacer through a teat can be beneficial and satisfies calves' motivation to suck (6). Feeding through a teat stimulates the esophageal groove reflex (thereby reducing the risk of ruminal drinking and its associated health issues) and enhances hormonal responses involved in digestion and satiety (6).

Increasing the frequency of milk meals (to more than 2 meals in a day) improves nutrient utilization and health (6). More frequent milk meals per day as well as teat feeding can reduce the risk of abomasal damage (6). The occurrence of non-nutritive sucking (e.g. sucking at pen substrates, cross-sucking) is also lower with increased milk meals and in calves provided opportunities to suck (e.g. nipple feeding or providing a dry or floating teat) (6). Refer also to Section 4.3.1 – *Fibre*.

## REQUIREMENTS

- **Cattle must receive a milk ration (until weaning, if applicable) that maintains health and vigor and promotes satiety.**
- **Personnel must assist newly arrived calves not accustomed to milk feeding by bucket, trough or nipple.**
- **Milk replacer must be fed according to the labelling instructions or feed program developed in consultation with a nutritionist or veterinarian.**
- **Cattle must be fed milk or milk replacer at least twice a day (except during weaning, if applicable).**

## RECOMMENDED PRACTICES

- a. develop a written feed program for each stage of production in consultation with a nutritionist or veterinarian
- b. ensure milk or milk replacer is fed according to a consistent schedule, temperature and concentration (38)
- c. consider, in consultation with a nutritionist or veterinarian, feeding higher quantities of milk or milk replacer in the starting period (an average of 8-12 L/day of whole milk or the equivalent in milk replacer)
- d. whenever possible, assess the occurrence of abomasal ulcers. When these are found to occur, adjust the feed program, in consultation with a nutritionist or veterinarian (refer also to Section 6.1 – *Herd Health Planning*)
- e. consider use of teat feeding particularly during the first 2 weeks after arrival
- f. ensure the number of nipples provided at the trough exceeds the number of cattle to ensure all calves are on a teat quickly after milk delivery (e.g. 10 nipples for a group of 7 calves)
- g. group calves of similar drinking speed together to ensure feed access to all cattle in a group.

### 4.2.2 Iron Deficiency Anemia

Milk-fed veal cattle are at risk of developing iron deficiency anemia. Management strategies include monitoring of hemoglobin, provision of solid feed and supplementation (e.g. addition of iron sulphate to milk replacer or administration of iron dextran).

The risk of iron deficiency is greater in cattle that receive only milk replacer than in cattle that receive solid feed with or without milk replacer (6). Cattle on a milk-only diet (without supplementation) show signs of iron deficiency anemia when the iron concentration in the milk replacer is less than or equal to 20 mg iron/kg DM (6). Signs of iron deficiency anemia include decreased growth, loss of appetite, fatigue, laboured breathing and increased incidence of disease (from impaired immunity) (6). Pale mucous membranes are a sign of severe anemia (6).

Groups of milk-fed cattle with an average blood hemoglobin concentration below 7.7g/dl (4.8 mmol/l) show signs of iron deficiency anemia (6). In any group of cattle, some will have a blood hemoglobin concentration lower than the group average, and this is an important consideration if setting thresholds for intervention based on a group average (6).

Milk-fed veal producers aim for thresholds above 7.7g/dl (4.8 mmol/l) throughout rearing with the exception of the final 2 weeks of production when a lower threshold is used for meat quality purposes.

#### REQUIREMENTS

- **Cattle must have access to feed of quality and quantity to fulfill their nutritional needs.**
- **In milk-fed veal systems, a written protocol outlining the frequency and timing of monitoring and hemoglobin thresholds for iron supplementation to prevent anemia must be developed, approved by a veterinarian and implemented.**
- **Individual veal cattle showing signs of anemia or found to have a blood hemoglobin concentration below 7.2 g/dl (4.5 mmol/l) must receive iron supplementation.**

#### RECOMMENDED PRACTICES

For milk-fed veal cattle:

- a. provide milk replacer with at least 40-50 mg iron/kg DM in the starting period
- b. provide solid feed in addition to milk replacer throughout the rearing period
- c. aim for blood hemoglobin concentrations of at least 9.7 g/dl (6.0 mmol/l) in calves up to 10 weeks of age
- d. monitor blood hemoglobin concentration throughout the rearing period
- e. if 25% of sampled cattle are found to be below 7.2 g/dl (4.5 mmol/l), sample the entire group or, depending on the veterinary advice outlined in the written protocol, provide supplementation to the entire group
- f. use records of blood hemoglobin concentrations of individual cattle to inform future strategies to prevent anemia.

### 4.2.3 Weaning

Calves in grain-fed production systems are weaned to support increased consumption of solid feed. Solid feed intake, an important criterion for when to wean, increases as calves get older. Calves that are gradually weaned and/or weaned when they are consuming appropriate amounts of solid feed tend not to experience weight loss and have higher energy intakes and better weight gains during weaning and in the immediate post-weaning period compared to calves that are abruptly weaned or weaned at a fixed age (6). Later weaning also takes advantage of the typically better developed digestive system in older calves (6).

Calves that are not coping with the transition to solid feed lose weight and show other signs of hunger such as more frequent vocalizations, increased cross-sucking (6) and lack of rumen fill (i.e. both sides of the abdomen appear sunken).

#### REQUIREMENTS

- **Weaning must not be initiated until calves are at least 4 weeks of age.**
- **Calves in grain-fed systems must be gradually weaned over at least 5 days to minimize the risk of weight loss.**
- **Calves must be monitored throughout the weaning process and promptly assisted if showing signs of not coping with the transition to solid feed.**

#### RECOMMENDED PRACTICES

- a. evaluate individual calves' suitability for weaning based on their health status, physical development and intake of solid feed
- b. wean calves gradually over a period of 10 days or more (6)
- c. manage weaning so that it is complete (i.e. no milk in a day) no earlier than 6 weeks of age
- d. monitor individual calves' solid feed intake and/or weight during weaning (some calves may need additional milk through the weaning process) and adjust milk feeding to reduce weaning stress.

### 4.3 Solid Feeds

Rumination has important behavioural and health benefits (6). Calves require a physically and functionally developed rumen to digest solid feed (6). When calves are fed only milk, the rumen does not develop its normal structure and function (6). Grain and fibrous feeds each play a role in different aspects of rumen development and function (6). Current practice in the milk-fed veal industry is to include solid feed in the ration, in addition to milk replacer.

Milk-fed veal cattle that cannot perform chewing and rumination are at risk of developing oral stereotypies (e.g. tongue rolling, manipulation of pen substrates) (6). Intake of solid feed will not be high during periods of high intake of milk replacer, but solid feed intake increases with age and rumen development.

## RECOMMENDED PRACTICES

- a. develop a written feed program for each stage of production in consultation with a nutritionist or veterinarian
- b. offer solid feeds that increase chewing activity and/or the time it takes to consume the ration, including for milk-fed veal cattle (see *Appendix E*).

### 4.3.1 Fibre

Cattle have a ruminant digestive system that evolved to use fibrous feeds (6). In some circumstances, offering fibrous feeds to young calves can improve feed efficiency, provide an improved rumen environment and reduce the occurrence of abnormal oral behaviour without impairing growth (6). The risk of developing oral stereotypies (e.g. tongue rolling, manipulation of pen fittings) and the quantities of fibre required to satisfy ad libitum intake increase with age (6). The effect of the provision of fibrous feed in the diet of cattle depends on the amount and physical properties of the fibrous feed (mainly, the size of particles and physical structure of the fibre) (6) (see *Appendix E* for examples). Fibre provided as long forage is more effective than non-forage feeds in stimulating chewing and rumination (6).

The addition of fibre to a grain diet can reduce the risk of ruminal acidosis and bloat (6). Fibre decreases the rate of fermentation and increases rumen motility, chewing duration and saliva production, which acts as a buffer to acidity in the rumen (6). Cattle with ruminal acidosis may go off feed, show large day-to-day variation in feed intake and/or their manure may appear grey.

In calves fed large volumes of milk replacer, coarse fibrous feed in the abomasum is thought to aggravate pre-existing damage to the lining of the abomasum and is a risk factor for abomasal ulcers (6). The risk of abomasal damage appears to be lower with hay compared to straw (6). See Section 4.2 – *Milk Feeding* for other risk factors for abomasal damage.

## REQUIREMENT

- **If a significant number of cattle are performing oral stereotypies or showing signs of ruminal acidosis, the feeding program must be adjusted in terms of provision of fibre and/or method of milk delivery to reduce these issues.**

## RECOMMENDED PRACTICES

- a. if appropriate (based on consultation with a nutritionist or veterinarian), offer fibrous feeds to calves from 2 weeks of age
- b. provide fibre as long forage or chopped to not less than 1 cm (0.39 in) particle length (6)
- c. feed fibre off the ground to prevent contamination
- d. whenever possible, assess the occurrence of abomasal ulcers. When these are found to occur, adjust the feed program, in consultation with a nutritionist or veterinarian (Refer also to Section 6.1 – *Herd Health Planning*).

### 4.3.2 Grain Ration

Grain-fed cattle that have continuous access to grain tend to eat more slowly (rather than binge) and chew more (35). They therefore swallow less grain whole and this results in improved digestion (35).

Feeding uniform, whole corn improves performance and reduces the risk of bloat and acidosis compared to ground corn (35). Ensuring that cattle do not consume fine feed particles that accumulate in the feed bunk also reduces the risk of bloat and acidosis (35).

#### RECOMMENDED PRACTICES

- a. wherever possible, feed cattle to ad libitum intake or in several small meals daily
- b. remove fine particles that accumulate in the bunk after consumption of whole grains
- c. ensure feed is continuously available in grain-fed systems.

### 4.4 Water

Water is the most important nutrient and is required in the greatest quantity of any nutrient (39). Water also plays an important role in the digestive process – cattle with an insufficient supply of water will limit their solid feed intake. Daily water needs depend on many factors including age, diet, environmental temperature and health status.

Methods to ensure water availability during freezing temperatures include electrical heaters, non-freezing water bowls, nipple waterers and frequent water feedings.

Water testing (chemical and bacterial analysis) is an important tool for ensuring that water is safe and palatable.

#### REQUIREMENTS

- **Cattle must have daily access to 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 as a sole source of water.**
- **Water quality must be tested at least annually to ensure its suitability for cattle and corrective action taken if an issue is identified.**

#### RECOMMENDED PRACTICES

- a. test water quality whenever problems such as poor performance, reluctance to drink or reduced feed consumption are observed and during high risk periods (i.e. spring, fall)
- b. promptly increase linear water trough space or add a drinking point if competition for water is observed in group-housed cattle, particularly those on a grain-based diet (35) and during high ambient temperatures.

## 4.5 Feeding and Watering Equipment

Feeding and watering equipment must be well maintained, free from sharp edges that might injure animals and should be constructed from materials that can be cleaned and disinfected. Implementing strict protocols for cleaning and disinfecting feeding equipment has a significant impact on calf health especially in the first 2 weeks after arrival.

Water quality is affected by how often watering systems are cleaned and flushed. Resources on cleaning and disinfecting feeding and watering equipment are provided in Appendix L – *Resources for Further Information*.

### REQUIREMENTS

- **Cleaning and disinfection procedures for feeding equipment must be developed and implemented.**
- **Feeding and watering equipment must be in good repair, functional and maintained free of manure and mold.**
- **Prior to calf arrival, milk-mixing and milk feeding equipment must be cleaned and disinfected.**

### RECOMMENDED PRACTICES

- a. clean milk distribution and mixing equipment daily or according to the manufacturer's recommendations
- b. clean bowls and troughs whenever biofilm begins to accumulate and at least weekly
- c. construct and locate watering systems so that they are protected from fouling and freezing
- d. keep water troughs, bowls and nipples clean and check them daily to ensure they are dispensing water properly.



# 5. Husbandry Practices

## 5.1 Stockmanship Skills Related to Animal Welfare

Good stockmanship improves animal health, welfare and productivity. Research in several farm animal species shows that attitudes and beliefs about animals and the importance of routine care influences the way people interact with animals and the diligence with which they carry out their tasks (40).

Training should be thought of as an ongoing process for anyone with responsibilities in animal care (owners, managers and staff).

### REQUIREMENTS

- **Managers must ensure that personnel receive training and supervision.**
- **On-farm husbandry practices must only be done by trained personnel who have the skills and abilities necessary to carry out their assigned duties.**

### RECOMMENDED PRACTICES

- a. hire personnel with positive attitudes and who exhibit empathy towards cattle
- b. participate in continuing education activities related to animal care and welfare (e.g. workshops in low-stress cattle handling techniques)
- c. keep records of training or certifications completed
- d. supervise personnel until they demonstrate competence in their assigned duties and re-evaluate their abilities periodically.

## 5.2 Handling and Moving Cattle

Cattle are herd animals that are easier to move together in small groups. Experienced handlers who understand cattle behaviour (e.g. herd instinct, flight zone) and how cattle react to noise, sudden movements, light contrast and shadows will be able to move cattle more smoothly. This will minimize stress and promote cattle welfare. Good handlers are relaxed, calm and allow time to carry out their work handling or moving cattle.

Research confirms that the way animals are handled has a major effect on their productivity and welfare (40). Veal cattle that are consistently handled using gentle handling techniques are easier to move, fall less often and show fewer fear responses (41). It is especially important to be patient when moving young calves as they can be uncoordinated and lack experience being handled.

## REQUIREMENTS

- **Animal handlers must be knowledgeable in cattle behaviour and quiet handling techniques either through training, experience or mentorship.**
- **Abusive handling is unacceptable. This includes but is not limited to kicking, beating, dragging or slamming gates on cattle.**
- **Electric prods must never be used on calves that are less than 3 months of age.**
- **Electric prods must not be used except when animal or human safety is at risk and as a last resort when all humane alternatives have failed and only when cattle have a clear path to move.**
- **Electric prods must never be used on sensitive areas (genitals, face or anal areas) or repeatedly on the same animal.**

## RECOMMENDED PRACTICES

- a. understand and apply the behavioural principles of low-stress handling such as flight zone, point of balance (see Appendix L – *Resources for Further Information*) and use of food rewards
- b. plan before moving cattle and walk the route looking for things that will distract them or cause them to balk
- c. move cattle quietly and calmly, in small groups and at a slow walk
- d. provide sufficient area and a clear, well-lit path for cattle to move in the desired direction
- e. use low-stress handling aids to help direct cattle (e.g. gates, boards)
- f. evaluate cattle handling and make improvements to facility design, flooring and handler techniques using the following recommended benchmarks (adapted from 42):
  - fewer than 5% of cattle balk
  - fewer than 1% of cattle slip
  - fewer than 1% of cattle fall (i.e. body touches floor).

### 5.3 Restraint

Cattle may be restrained manually or with the use of handling aids (e.g. halter, squeeze chute). The method of restraint chosen should be the least stressful for the animal and most effective method available for the procedure and size of the animal. Human and animal safety are also important factors.

## REQUIREMENTS

- **Farms must have the ability to safely restrain cattle.**
- **Cattle must only be restrained for as long as necessary to carry out the procedure.**
- **Restraint equipment must be kept in good repair.**
- **Corrective action must be taken if the equipment or method of restraint causes injury to cattle.**

## RECOMMENDED PRACTICES

- a. choose restraint equipment designed to minimize noise. High-pitched sounds are especially stressful to cattle (43)
- b. ensure restraint devices are used correctly and designed to avoid uncomfortable pressure points on the animal's body (43)
- c. have sufficient personnel to perform the procedure in a timely manner and any necessary tools ready before the animal is restrained.

### 5.4 Tail Docking

Tail docking is very rare in veal and dairy-beef production and is not an acceptable means of preventing tail injury and potential subsequent infection. Tail docking can be painful at any age and brings the risk of chronic pain due to neuromas and post-operative infection (11). Tail docked cattle may also experience greater discomfort from flies as they are not able to use the tail to control flies (11).

## REQUIREMENTS

- **Cattle must not be tail docked unless deemed medically necessary by a veterinarian for an individual animal. If deemed necessary, tail docking must only be performed by a veterinarian using pain control.**

## RECOMMENDED PRACTICES

- a. if tail injuries occur, promptly address the underlying causal factors (e.g. review design and construction of slatted flooring, reduce stocking density) (44)
- b. design new or renovated facilities to prevent tail injury.

### 5.5 Branding

Branding is not practised in veal production and is not common in the starting period in dairy-beef production. Branding causes pain and distress in cattle (11, 29).

## REQUIREMENTS

- **Cattle covered under this Code of Practice must not be branded. If additional identification is required for export, a method other than branding must be used.**

### 5.6 Disbudding, Dehorning and Castration

Disbudding, dehorning and castration are not practised in veal production. In dairy-beef production, the procedures are performed to prevent unwanted reproduction, reduce the risk of injuries from aggression and improve meat quality (castration) and reduce the risk of injury to personnel and other animals (disbudding and dehorning).

All methods of disbudding, dehorning and castration are painful at any age (11, 29). Local anesthetic reduces the pain during these procedures but does not provide post-operative pain relief (11, 29). The use of an analgesic is necessary to control longer lasting pain (11, 29).

Animals are easier to handle, heal more quickly and show lower declines in growth rate when disbudding, dehorning and castration are performed at younger ages (11, 29). Removal of the horn after the horn bud has attached to the skull (generally at 2-3 months of age) is more invasive than when done prior to horn bud attachment (29).

Disbudding, dehorning and castration require careful training to ensure they are done correctly and avoid injury or infection (11).

## **REQUIREMENTS**

- **Dehorning, disbudding and castration must only be performed after training with a veterinarian and by competent personnel using proper, well-maintained and sanitary equipment and accepted techniques.**
- **Disbudding, dehorning and castration must be done at as early an age as possible. At any age, pain control must be provided, in consultation with a veterinarian, including local anesthesia and systemic analgesia.**
- **If an animal older than 2 months of age must be dehorned, bleeding control must also be used.**
- **Appropriate restraint (chemical or physical) must be used when disbudding, dehorning or castrating cattle.**

## **RECOMMENDED PRACTICES**

- a. consider, in consultation with the herd veterinarian, the inclusion of a sedative as part of the protocol for disbudding, dehorning and castration. Sedatives reduce the amount of physical restraint (which can be stressful to cattle) needed
- b. monitor cattle after disbudding, dehorning and castration to ensure there are no signs of infection or abnormal bleeding.

# 6. Health Management

There is a critical relationship between animal health and welfare. Health issues can cause pain and discomfort, which negatively impact an animal's well-being. Good animal welfare, therefore, requires good animal health, and prevention of disease is always preferred to treatment.

## 6.1 Herd Health Planning

A herd health plan contributes to cattle welfare by providing strategies for disease and injury prevention, rapid detection and effective treatment.

Include the following in the herd health plan:

- protocols for calf selection and introduction to the farm
- protocols for the prevention, detection and treatment of diseases and injuries at all stages of production (e.g. vaccinations, changes to diet and housing, hygiene)
- specific targets/goals for herd health and welfare outcomes (e.g. mortality, occurrence of pneumonia)
- appropriate sources and uses of medication
- strategies for pest and insect control
- criteria for euthanasia
- staff training
- contact information for veterinarians and other advisors
- health and treatment records
- biosecurity measures.

Veterinarians and other advisors play a key role in helping producers attain herd health objectives. A valid, ongoing veterinary-client-patient relationship (VCPR)<sup>3</sup> helps ensure that the veterinarian will be familiar with the herd and farm management practices to assist proactively and in the event that a problem occurs. A VCPR also facilitates collaborative decision-making between the producer and veterinarian, and is necessary in order to obtain some classes of medications.

### REQUIREMENTS

- **Producers must have a valid, ongoing veterinary-client-patient relationship with a licensed veterinarian and an annual on-farm visit by the veterinarian to assess overall herd health and welfare.**
- **A written herd health plan must be developed and implemented with veterinary and technical advice, readily available and updated at least annually.**

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<sup>3</sup> The veterinarian-client-patient relationship is the basis for interaction among veterinarians, their clients and their clients' animals. Generally, a veterinarian-client-patient relationship has been established when the veterinarian has examined the animals or visited the farm; the veterinarian has assumed responsibility for making clinical judgments related to the health of the animals; and the client has indicated a willingness to follow the veterinarian's instructions. Although the specific regulations vary among provinces, in order for veterinarians to prescribe some classes of medications, a veterinarian-client-patient relationship must first be established.

- **Personnel must be trained in aspects of the herd health plan relevant to their assigned duties.**

## **RECOMMENDED PRACTICES**

- a. incorporate written best management practices in the herd health plan
- b. review the herd health plan whenever there is a significant change in health, housing or management or a disease outbreak
- c. participate in continuing education activities related to animal health and welfare or practical experience monitored by trained personnel.

### **6.1.1 Health and Treatment Records**

Health and treatment records are important for disease prevention and detection, food safety and consistency and continuity of treatment. They can also be used as a tool to assess the health and welfare of individual animals and overall herd health status.

Producers may find value in benchmarking health outcomes as a percent of the total herd to establish targets and monitor progress. For example, annual mortality is an important indicator of the general health of veal cattle (45). A reduction in annual mortality reflects an improvement in cattle health (45).

Sample health and treatment records are available in the *Verified Veal Program* (see Appendix L - *Resources for Further Information*).

## **REQUIREMENTS**

- **Detailed animal health and treatment records must be kept.**
- **Mortalities must be recorded.**

## **RECOMMENDED PRACTICES**

- a. ensure treatment records include a record of the animal(s) treated, date, reason for treatment, dosage, withdrawal time and outcomes of the treatment (e.g. recovery, cull, mortality, adverse reaction)
- b. review records periodically and use them to inform updates to the herd health plan and overall management (e.g. ventilation, facility design)
- c. in addition to on-farm health records, consider records of other health and welfare outcomes (e.g. slaughterhouse condemnations, production statistics such as average daily gain)
- d. if average annual mortality exceeds 6%, consult the herd veterinarian, investigate the causes and implement corrective strategies.

### **6.1.2 Medications**

Appropriate uses and sources of medications should be discussed with the herd veterinarian as part of the health plan (see Section 6.1 – *Herd Health Planning*). Some animal health products can be ineffective or even unsafe – this includes natural and herbal remedies and medications that are unlabeled, untested or unregulated. There is little research evidence to support the efficacy claims of homeopathic remedies (46).

Correct storage of medications is important to ensure their efficacy and safety. For more information, refer to the *Verified Veal Program* (listed in Appendix L – *Resources for Further Information*).

## REQUIREMENTS

- **Pharmaceuticals and vaccines must be administered according to the label or veterinary prescription.**

## RECOMMENDED PRACTICES

- a. adopt practices that promote prudent use of antibiotics in order to minimize the risk of antimicrobial resistance and preserve the efficacy of antibiotics used to treat cattle
- b. consider, where appropriate, alternatives to antibiotics when revising the health plan (e.g. management or housing changes, alternative products shown to be effective)
- c. check any stored animal health products before use to ensure they have not expired
- d. store animal health products according to labelling instructions or veterinary prescription
- e. minimize the risk of contamination related to injections (e.g. select a clean, dry area for the site of injection and clean the area with 70% alcohol, avoid multiple uses of the same needle)
- f. establish drug administration protocols (e.g. read label and withdrawal time, site and angle of injection, water distributor calibration and cleaning, medicated mixed feed protocols, disposal of drugs and administration material).

### 6.2 Disease Prevention

Good herd health management incorporates practices that are designed to optimize the health and welfare of cattle through nutrition, housing and management. Many issues can effectively be addressed through preventive strategies such as vaccinations, biosecurity and cleaning and disinfection.

## RECOMMENDED PRACTICES

- a. ensure the herd is vaccinated against diseases of concern to the animals on the farm and/or in the region
- b. strive to continuously improve herd health by taking the following steps in response to any illness, particularly a disease outbreak (47):
  - obtain a diagnosis
  - investigate the risk factors (e.g. hygiene, nutrition, management, environment) and analyze the health and treatment records
  - develop a manageable, effective action plan to prevent new cases
  - communicate the action plan to relevant personnel
  - evaluate the effectiveness of the action plan and refine if needed.

### 6.2.1 Cleaning and Disinfection

Effective cleaning and disinfection measures help minimize disease. Research on veal farms also suggests that the cleanliness of housing can account for 19% of the variability between units in daily weight gain and 22% of the variability between units in feed efficiency (48).

Effective procedures include removal of wastes (e.g. manure, soiled bedding), followed by washing and sanitizing (often with detergents to help remove organic debris) and, finally, disinfection to destroy disease-carrying organisms. Allowing cleaned pens and stalls to be unoccupied between uses (for a period of 5 days, for example), can also help reduce the spread of infection.

Refer also to Appendix L – *Resources for Further Information*.

#### REQUIREMENTS

- **Cleaning and disinfection procedures for all facilities housing cattle must be developed and implemented.**
- **Manure and other wastes must be managed in a manner that promotes cattle health and welfare.**
- **Treatment tools including esophageal feeders must be cleaned and disinfected after each use.**
- **Reusable syringes must be cleaned after each use.**
- **Refer also to the Requirements in Section 4.5 – *Feeding and Watering Equipment*.**

#### RECOMMENDED PRACTICES

- a. use disinfectants in accordance with the manufacturer's directions to ensure efficacy
- b. where possible, manage groups in an "all-in, all-out" method to permit effective cleaning and disinfection
- c. clean and disinfect facilities and equipment regularly
- d. move hutches to a new area of the yard at least twice a year and after a disease outbreak to reduce the risk of disease transmission.

### 6.2.2 Pest Control

Rats, mice and other pests can transmit diseases to cattle. In addition to being a disease vector, flies can also be a nuisance to cattle. Flies can become a problem in bedded areas when bedding is mixed with urine, manure, spilled milk, spilled grain or water (6).

Refer also to the Pest Control section of the *Verified Veal Program* (listed in Appendix L – *Resources for Further Information*).

#### REQUIREMENTS

- **Measures must be taken to control pests and insects.**



## RECOMMENDED PRACTICES

- a. eliminate or reduce the number of places rodents can use for shelter
- b. prevent clutter in and around buildings
- c. store feed in rodent-proof facilities and containers
- d. take steps to make facilities rodent proof
- e. locate and eliminate insect breeding areas (e.g. manure, wet or soiled bedding, standing water)
- f. minimize feed and water spillage by ensuring feeders and waterers are appropriately sized and positioned at a suitable height for cattle age
- g. clean out bedding more frequently in the summer (on a 2-week interval for hutches, for example) (49).

### 6.3 Sick or Injured Cattle

Early signs of illness can be subtle and require skill, experience and effort to recognize. The severity of conditions and risk of transmission can be reduced through early detection and treatment. Taking time to observe each animal as part of daily routines (and therefore being able to intervene early) can save significant time caring for an animal with an advanced condition.

Calves are more susceptible to illness any time there is a change in their environment or management (e.g. weather conditions, introduction of new animals, abrupt changes in feed or feed schedules). When there is any doubt about whether an animal is healthy or sick, the animal should be marked for further assessment and more frequent monitoring.

Some examples of signs of illness:

- droopy ears and/or sunken eyes
- discharge from the nose or eyes
- swollen, inflamed or infected navel
- laboured, rapid or shallow breathing
- shivering
- coughing
- bloat
- diarrhea
- behavioural changes (e.g. animal stands apart from the group, is slow to rise or is weak and/or depressed)
- reduced appetite (e.g. animal does not immediately get up to eat, does not finish a meal and/or daily feed intake is reduced).
- fever ( $\geq 39.5^{\circ}\text{C}$  [ $\geq 103^{\circ}\text{F}$ ]) or hypothermia ( $\leq 37.5^{\circ}\text{C}$  [ $\leq 99.5^{\circ}\text{F}$ ]).

Sick or injured animals often experience pain and discomfort (see Appendix F – *Signs of Pain*). Inclusion of pain control, fever relief and inflammation control (e.g. non-steroidal anti-inflammatory drugs [NSAIDs]) in a treatment plan, in consultation with the herd veterinarian, can improve welfare and may facilitate recovery.

Owners, veterinarians, and laboratories are required to immediately report an animal that is infected or suspected of being infected with a reportable disease to the appropriate federal or provincial authority.

## REQUIREMENTS

- The following Requirements also apply to the specific conditions in Sections 6.3.1 - 6.3.3.
- Personnel must be knowledgeable of normal cattle behaviour and signs of illness, injury and disease.
- Neonatal calves must be assessed at least twice daily for signs of illness, injury and disease and all other cattle at least once daily.
- Sick, injured, or diseased cattle must receive prompt treatment and nursing care, or be euthanized without delay. The treatment must be appropriate for the condition.
- For cattle that are not responding to treatment(s) according to the herd health plan producers must, without delay, obtain veterinary advice or euthanize the animal.

## RECOMMENDED PRACTICES

- a. establish a system to identify cattle that should be monitored more frequently due to injury, illness or other reason
- b. segregate sick, injured or diseased cattle when it is advantageous for treatment, recovery, animal comfort or limiting disease transmission. Isolation is stressful to cattle; they should ideally be segregated such that they can see other cattle (refer to Section 3.5 – *Facilities for Sick or Injured Cattle*).

### 6.3.1 Respiratory Illness

Early detection is a key factor in the successful treatment of respiratory illness. Signs of respiratory illness include elevated respiration rate, fever, nasal discharge, coughing, depression (often mild) and loss of appetite (50). Because these signs can be subtle, attentive observation of individual calves is essential and data provided at slaughter may provide valuable information on actual occurrence (50).

Respiratory disease can be closely linked to air quality, housing, management and the environment. For more information, see Section 3.3.1 – *Ventilation*.

Strategies to reduce the risk of respiratory illness (50, 51):

- vaccinate
- avoid overcrowding
- minimize co-mingling of different groups, especially animals of different ages
- maintain good indoor air quality at all times through effective ventilation and frequent removal of manure
- replace wet and/or soiled bedding frequently.

## REQUIREMENTS

- Stocking density, ventilation and bedding must be managed in a manner that provides air quality that is not harmful to cattle and all reasonable steps must be taken to reduce the risk of respiratory disease.

## RECOMMENDED PRACTICES

- a. work with the herd veterinarian to identify the causes of pneumonia and include, in the herd health plan, strategies to reduce the incidence
- b. strive to obtain data from the slaughterplant on the occurrence of lung lesions and strive to continually reduce the occurrence
- c. consider prevention of respiratory disease when designing new facilities.

### 6.3.2 Diarrhea

Diarrhea is a major cause of mortality in young calves (52). Fluid therapy (i.e. replacement of lost water and electrolytes) greatly improves their chance of survival (52). If bottle feeding is unsuccessful, fluid therapy can be provided subcutaneously or intravenously following veterinary advice and training.

As long as scouring calves continue to drink milk, it is important to continue offering it (52). Continued milk feeding prevents weight loss and provides the energy and nutrients that support recovery and growth (52). Tube feeding milk to calves that have gone off milk brings serious health risks and is not recommended.

Some research suggests there are benefits to including an approved non-steroidal anti-inflammatory drug (NSAID) as part of an overall therapy plan for scouring calves (53, 54). However, especially in dehydrated calves, the use of NSAIDs brings a risk of toxicity (55); therefore, this therapy should be considered in consultation with the herd veterinarian.

## RECOMMENDED PRACTICES

- a. provide fluid therapy upon the earliest signs of diarrhea or dehydration (see Appendix C – *Assessing Dehydration in Calves*)
- b. work with the herd veterinarian to identify the causes of diarrhea and include, in the herd health plan, strategies to reduce the incidence (e.g. biosecurity procedures, nutrition, water quality, management).

### 6.3.3 Foot and Leg Health

Foot and leg health problems are painful and restrict the normal behaviour of cattle (33). There are multiple causes of foot and leg health problems in cattle, including injury, infection and nutrition. Slippery flooring, concrete flooring and lack of bedding have been linked to foot and leg injuries in cattle.

A common cause of infectious arthritis is *Mycoplasma bovis* which is also associated with bovine respiratory disease (29). Preventive measures for bovine respiratory disease (see Section 6.3.1) may help to reduce lameness caused by arthritis (29).

The prevalence of bursitis can be high in some veal cattle herds (34). Risk factors include concrete and wooden slatted flooring (the prevalence is highest in cattle on concrete flooring), age of cattle (animals closer to slaughter appear to be more at risk) and insufficient space allowance (34). Providing cattle with enough space to adopt different resting postures (i.e. sternal and lateral) may reduce the risk of bursitis (34) and improves animal comfort.

Strategies to reduce the prevalence of bursitis include (34):

- avoid concrete and slatted wooden flooring
- provide bedding, bedded areas or rubber mats
- increase space allowance.

Laminitis can also affect cattle. Depending on the severity, affected animals may exhibit signs of mild discomfort or severe pain. Some studies suggest a link between excessive consumption of grain, ruminal acidosis and laminitis.

## REQUIREMENTS

- **Corrective action must be taken if the number of animals with bursitis exceeds 15% in 3 consecutive cycles when assessed at shipping or once during the 2 weeks before shipping.**

## RECOMMENDED PRACTICES

- a. choose flooring types that are non-slip but not overly abrasive (33, 34)
- b. avoid bare concrete slatted flooring and provide cattle with softer flooring types that afford good drainage (e.g. rubber coated flooring, perforated rubber mats, access to bedded areas) (6)
- c. inspect cattle in each stage of production for injuries associated with flooring or other aspects of facility design (e.g. hairless patches, lameness, swelling of the knee and hock) (6)
- d. monitor and record the prevalence of lameness in each stage of production and aim to continually reduce its occurrence
- e. aim for less than 10% prevalence of bursitis in finished veal (assessed at shipping or once during the 2 weeks before shipping) (based on data in 34).

# 7. Transportation

The federal requirements for animal transport are covered under the *Health of Animals Regulations (Part XII)*.<sup>4</sup> They are enforced by the Canadian Food Inspection Agency (CFIA) with the assistance of other federal, provincial and territorial authorities. Some provinces have additional regulations related to animal transport.

Those responsible for loading, transporting or unloading animals must be familiar with, and follow, Canada's animal transport requirements. If you do not comply with the regulations, you could be fined or prosecuted. If your actions or neglect are considered animal abuse, you could also be charged and convicted under the *Criminal Code of Canada* and/or provincial legislation.

Transportation begins with the decision to transport an animal. The producer is responsible for ensuring animals are fit for the intended journey, selecting the type of transport and selecting a carrier that follows Canada's animal transport requirements.

The scope of the veal cattle Code of Practice is on farm. Refer to the [Code of Practice – Transportation](#) for information on animal care during transport.

## 7.1 Pre-Transport Decision-Making and Fitness for Transport

It is the responsibility of the party that is shipping, loading or transporting animals (or causing animals to be shipped, loaded or transported) to ensure that all animals are fit for the intended journey. When assessing fitness for transport, those responsible need to be aware of how long the animals may be in transit including intermediate stops, such as auction markets or assembly yards. If in doubt, assume the longest travel that might occur. Those arranging transport also need to know whether the transporter needs to provide additional services during transit (e.g. feed, water, rest).

Animals that are to be shipped must be deemed fit for transport. While producers have a primary responsibility to ensure that animals are fit for the expected journey, the carrier and driver have the right and legal responsibility to refuse to load an animal that they deem unfit. For animals that cannot be transported in their current condition, transport must be delayed until the animal is fit for the trip, and appropriate care and/or treatment provided, or the animal may be euthanized.

Special care, appropriate for the condition, must be taken if transporting compromised animals (versus unfit animals, which must not be transported). Some examples of special provisions (56):

- transport locally and directly to the nearest suitable place to receive care or be humanely slaughtered or euthanized
- load the compromised animal last and unload first
- segregate the compromised animal from all other animals, or pen with one familiar animal
- provide additional bedding.

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<sup>4</sup> The *Health of Animals Regulations* are accessible through the link below or by doing an Internet search for "Health of animals regulations" [www.laws-lois.justice.gc.ca/eng/regulations/C.R.C.,\\_c.\\_296/page-37.html#h-70](http://www.laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._296/page-37.html#h-70)

### *Specific Considerations for Neonatal Calves*

Neonatal calves are not able to cope well with transport especially long journeys or journeys involving intermediate stops. They can be weak, have difficulty walking, are susceptible to extremes of cold and heat and vulnerable to disease. Young calves also have modest energy reserves; therefore, the time of their last feeding must be considered when arranging transport.

#### **REQUIREMENTS**

- **Before loading, each animal's fitness for transport must be individually assessed and evaluated within the context of each journey (e.g. weather conditions, anticipated total journey duration and intermediate stops such as auction markets).**
- **Unfit animals must not be transported except for diagnosis or treatment on the advice of a veterinarian. Refer to Appendix G – *Transport Decision Tree*.**
- **Compromised animals, if transported, may only be transported with special provisions directly to the nearest suitable place where they can receive care and attention, be promptly slaughtered or euthanized (not through an auction or assembly yard). Refer to Appendix G – *Transport Decision Tree*.**
- **Refer also to the Requirements in Section 2.2 – *Assessing Calf Health at Purchasing*.**

#### **RECOMMENDED PRACTICES**

- a. identify conditions early so that animals can be treated or shipped as appropriate before the condition worsens and the animal becomes unfit for transport
- b. consult a veterinarian if uncertain about an animal's fitness for transport and/or appropriate special provisions (56)
- c. clearly identify and provide documentation for animals that are fit for transport but show signs of a previous disease or injury or a current health condition at the time of loading (e.g. a veterinary note explaining the condition and declaration of treatment[s] given).

#### **7.1.1 Preparing Animals for Transport**

Preparation for transport starts long before the journey begins. Factors such as nutrition and health management have a collective impact on fitness for transport, and should be considered as a whole.

#### **REQUIREMENTS**

- **Producers must be familiar with and follow federal and provincial transport regulations.**
- **On-farm preparations for transport must take into account the requirements for feed, water and rest as described in the Health of Animals Regulations.**

#### **RECOMMENDED PRACTICES**

- a. have a record of when cattle were last fed prior to loading
- b. provide continuous access to water until the time of loading
- c. ensure cattle have a dry hair coat prior to transport.

### 7.1.1 Arranging Transport

Producers are responsible for selecting a carrier that follows Canada's animal transport requirements and that is trained and knowledgeable in animal care.

Trip planning and scheduling should include consideration of possible delays along the route or at the destination, which can affect cattle welfare particularly in adverse environmental conditions.

#### REQUIREMENTS

- **Make arrangements in consultation with the transporter and other relevant parties that aim to avoid long delays in transit or lairage.**

#### RECOMMENDED PRACTICES

- a. follow these guidelines when selecting a carrier:
  - ask for references of other shippers and receivers that have used that carrier
  - ensure the carrier has appropriate experience relative to journey duration (e.g. short vs. long distance hauls) and the species and class of animals being transported
  - use drivers that are professionally trained or certified in the care and handling of cattle
- b. ensure all documentation is completed to avoid delays at inspections stations or other checkpoints, including for cattle leaving the province or country
- c. ensure loading facilities are compatible with the type of trailer used by the transporter
- d. ensure the following information is discussed and agreed upon between the transporter and shipper:
  - number of animals to be shipped
  - class of cattle (e.g. young calves, finished veal) and estimated weight (to properly determine loading density)
  - time and point of loading (especially during extremely hot and humid temperatures to avoid loading during the hottest hours of the day)
  - destination
  - special requirements, if any, of the animals being transported (e.g. when the animals last received feed, water)
  - special protection from extremes of temperature (cold or hot), especially for young calves.

### 7.2 On Farm Loading and Unloading

Loading and unloading can be the most stressful aspects of transport. Any efforts to reduce animal stress during these times can improve welfare. Good handling and properly designed handling systems facilitate animal movement and reduce stress and injury. The risk of slips and falls should be reduced because they are stressful to cattle and lead to injury and carcass bruising (57, 58). Refer also to Section 5.2 – *Handling and Moving Cattle*.

## REQUIREMENTS

- Loading and unloading of cattle must be overseen by a competent handler.
- Personnel involved in loading and unloading must be trained and knowledgeable in the provincial and federal regulations for the movement and transport of animals.
- The requirements for loading and unloading procedures and equipment as described in the Health of Animals Regulations must be complied with.
- Handling of cattle during loading and unloading must comply with the Requirements in Section 5.2 – *Handling and Moving Cattle*. Producers who use a livestock transporter must inform the carrier that they must comply with the requirements in Section 5.2.

## RECOMMENDED PRACTICES

- a. confirm that the truck/trailer is clean and bedded with straw, wood shavings or other bedding material appropriate for the weather and class of cattle being transported
- b. ensure farm roads and loading areas are accessible in all kinds of weather
- c. ensure loading and unloading areas are well lit, designed to minimize noise and provide flooring that is non-slip, uniform in appearance and free from puddles and ice (57)
- d. protect cattle during loading and unloading from sun and heat by providing shade and ventilation
- e. protect cattle during loading and unloading from wet conditions by providing overhead cover
- f. use solid sided loading/unloading ramps that are high enough to protect cattle from wind and prevent cattle from falling
- g. ensure there is no gap between the end of the ramp and the truck/trailer
- h. use ramps designed to reduce slips and falls. Examples of recommended design features:
  - stair-step design with a maximum rise of 10 cm (3.9 in) and tread length between 30-60 cm (11.8-23.6 in); grooves in the treads, 2.5 cm (0.98 in) deep, enhance traction (59)
  - ramps with cleats spaced so that the hoof fits easily between them. For cattle, 20 cm (7.9 in) of space between cleats is recommended (59)
  - use appropriately sloped ramps that limit slips, falls and balking (for cattle, the maximum recommended angle is 20° for ramps [57]; for unloading neonatal calves, an angle below 12° is recommended [60])
- i. design loading and unloading areas with straight or gently curved raceways to avoid cattle having to make sharp turns around corners.



## 8. Euthanasia

Euthanasia is defined as the “ending of the life of an individual animal in a way that minimizes or eliminates pain and distress” (4). Euthanasia is necessary when medical care to alleviate pain and suffering is not feasible, the animal is not responding favourably to treatment or there is no reasonable prospect for recovery. Euthanasia may also be necessary to ensure human safety, or for regulatory requirements associated with disease control.

Personnel who have received training on all aspects of euthanasia have greater confidence to make timely decisions on when to euthanize an animal and the skills to perform the procedure competently.

Cattle, having evolved as prey animals, may hide signs of pain or suffering, and this may affect assessment of their condition when making a decision about euthanasia. It is the responsibility of the producer to ensure euthanasia is carried out by competent personnel without delay and using an acceptable method. Veterinarians play an important role developing on-farm euthanasia protocols and providing training. They may also be called upon to perform euthanasia or assist in determining the best course of action.

### 8.1 Euthanasia Timelines and Protocols

It is important to euthanize without delay cattle that:

- fail to respond to treatment(s) and recovery protocols, or
- show signs of chronic, severe or debilitating pain or distress, or
- are unable to stand or walk, or
- show marked weight loss/loss of body condition, or
- are unfit for transport (or are likely to be condemned) and it has been decided that treatment will not be provided.

Having a written euthanasia protocol can improve confidence when making decisions about euthanasia and help ensure the procedure is carried out in a timely manner and consistently according to on-farm protocols.

Suggested elements of a euthanasia protocol include:

- personnel who are responsible for euthanasia
- training provided to ensure those responsible are competent
- access to acceptable equipment to carry out the procedure (e.g. devices, materials for restraint)
- a schedule for maintenance of equipment
- criteria to guide euthanasia decisions (See Appendix H – *Sample Euthanasia Decision Tree*).

## REQUIREMENTS

- If cattle are suffering from pain or illness and do not have a reasonable prospect of improvement, fail to respond to treatment or convalescence, or if further treatment will not be provided they must be euthanized without delay.
- All farms must have a written euthanasia protocol developed with input from the herd veterinarian detailing the criteria for when to euthanize an animal and the appropriate method(s) for each phase of production.
- The euthanasia protocol must be kept in a known location and personnel must be familiar with the protocol, including individual(s) designated to perform euthanasia.

### 8.2 Methods of Euthanasia

Euthanasia must be quick, cause minimal stress and pain, and result in immediate loss of consciousness followed by death without the animal regaining consciousness. Humane handling (Section 5.2) and restraint (Section 5.3) are also important components of euthanasia (61).

When choosing a euthanasia method (from Appendix I – *Methods of Euthanasia*), consider (62, 63):

- ability to restrain the animal for proper application of the procedure
- emotional comfort for the person performing the procedure and any bystanders
- skill of the personnel performing the procedure
- biosecurity and potential spread of disease
- carcass disposal
- potential need for brain tissue for diagnostic purposes
- human safety and the safety of near-by animals.

Every effort should be made to ensure human safety, particularly when performing euthanasia by gunshot or captive bolt device. The use of any firearm brings the risk of ricochet; an accidental application of a captive bolt device can cause significant injury to humans.

Proper storage and maintenance of equipment is essential to ensure the equipment functions effectively, particularly with captive bolt guns.

## REQUIREMENTS

- An acceptable method of euthanasia must be used. Refer to Appendix I – *Methods of Euthanasia*.
- The method of euthanasia must be quick, cause minimal stress and pain and result in immediate loss of consciousness followed by death without the animal regaining consciousness.
- Every farm must have the equipment necessary for euthanasia or have ready access to such equipment.
- Personnel performing euthanasia must have the required skills, knowledge, abilities and be competent to perform the procedure.

- Equipment necessary for euthanasia, such as firearms or captive bolt devices, must be used and maintained according to the manufacturer's instructions to ensure proper function.
- Unnecessary handling and moving of cattle prior to euthanasia must not occur. Animals must not be dragged, prodded or forced to move prior to euthanasia.
- When restraint is necessary, the safest, least stressful method available to facilitate effective euthanasia must be used and euthanasia must be performed without delay following restraint.

## RECOMMENDED PRACTICES

- a. consider, in consultation with the herd veterinarian, sedation as a means of humane restraint as part of the euthanasia protocol. Some sedatives can be dispensed by a veterinarian for on-farm use at low cost.

### 8.3 Confirmation of Unconsciousness and Death

Death does not occur immediately – it is the result of respiratory and cardiac failure, which can take several minutes (62). It is essential that cattle being euthanized are rendered unconscious immediately and remain unconscious until death occurs.

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.

All of the above indicators must be absent before an animal can be considered unconscious. Animals euthanized by gunshot or captive bolt device should immediately collapse upon the application of the euthanasia method as a further indicator of unconsciousness. Convulsions (uncoordinated kicking of the legs, body rigidity) following the application of any euthanasia method are not a sign of consciousness.

## REQUIREMENTS

- Cattle must be inspected for signs of consciousness immediately after the application of the euthanasia method.
- If any sign of consciousness is observed, the euthanasia procedure must be repeated immediately. Be prepared to perform a repeat procedure (or an alternate) should the first attempt not render the animal immediately unconscious.
- Before moving or leaving the animal, the following 2 indicators must be used to confirm death:
  - absence of a heartbeat for at least 5 minutes and
  - lack of breathing for at least 5 minutes
- Carcass disposal must be in accordance with federal, provincial/territorial and municipal regulations.

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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

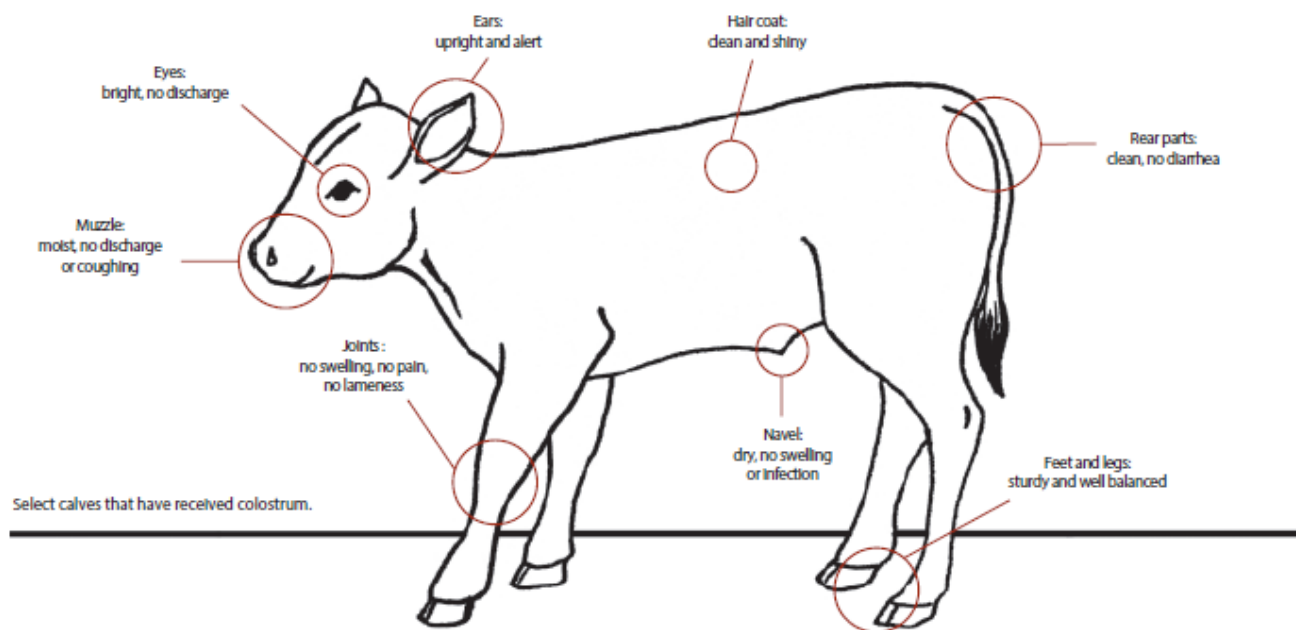
**Important Note: Seek advice from your legal counsel and human resources department if appropriate to ensure any agreement meets relevant labour laws and union contracts.**

Used with permission from Farm & Food Care Ontario

<http://www.farmfoodcareon.org/wp-content/uploads/2016/06/Animal-Care-Code-of-Conduct-2016.pdf>



## *Appendix B: Selecting Healthy Calves*



Adapted from "Marketing Healthy Calves" and used with the kind permission of the Fédération des producteurs de bovins du Québec.

DRAFT for PUL

## *Appendix C: Assessing Dehydration in Calves*

<b>% Dehydration</b>	<b>Attitude</b>	<b>Appearance</b>	<b>Intervention</b>
<5%	Stands without assistance, strong suckle reflex	No clinical signs	None
6-7%	Standing with arched back with good suckle reflex	Slight sinking of eyes, mild increase in skin elasticity, moist mucous membranes	Oral electrolyte fluids
8-9%	Mild depression, sternal recumbency, poor suckle response	Moderately sunken eyes, significant increase in skin elasticity, tacky mucus membranes	Call veterinarian: Requires IV fluid therapy <sup>1</sup>
10-12%	Profound depression with absent suckle response and lying in lateral recumbency	Eyes deeply sunken, permanent skin tent, dry mucus membranes	Call veterinarian immediately: Requires IV fluid therapy <sup>1</sup>

<sup>1</sup> Fluid therapy should only be administered intravenously or subcutaneously by a veterinarian or a producer following veterinary advice and training.

## *Appendix D: Sample Emergency Contact List*

### EMERGENCY CONTACT LIST

**Use 911 for any emergencies**

Your farm address: \_\_\_\_\_

Farm staff emergency contacts:

Contact 1: \_\_\_\_\_

Office phone: \_\_\_\_\_

Home phone: \_\_\_\_\_

Cell phone: \_\_\_\_\_

Contact 2: \_\_\_\_\_

Office phone: \_\_\_\_\_

Home phone: \_\_\_\_\_

Cell phone: \_\_\_\_\_

Veterinarian: \_\_\_\_\_

After hours veterinary contact: \_\_\_\_\_

Local police contact (for non-911 emergencies): \_\_\_\_\_

Provincial Ministry of Agriculture: \_\_\_\_\_

Canadian Food Inspection Agency: \_\_\_\_\_

Internet service provider: \_\_\_\_\_

Insurance company: \_\_\_\_\_

Hospital: \_\_\_\_\_

Hospital address: \_\_\_\_\_

Near-by slaughter plant: \_\_\_\_\_

## Appendix E: Examples of Fibre Sources and their Relative Abilities to Stimulate Chewing

The table below lists examples of solid feed and their physically effective fibre<sup>a</sup> properties to stimulate chewing.

Fibre source	Physical form	NDF% <sup>b,c</sup>	pef <sup>b</sup>	peNDF <sup>b</sup>	Chewing duration (minutes/kg DM) <sup>d,e</sup>
<b>Forage</b>					
Hay	Long	54	1.00	54	62
	Chopped	54	0.95	51	44
	Pellets				37
Straw	Long	73	1.00	73	160
	Chopped	84	1.00	84	56
	Pellets				18
	Ground	75			18
Corn/Maize silage	Chopped	68	0.90	61	66
	Ground	60	0.80	35	
Corn/Maize cob silage	Chopped				
	Ground	87	0.40	35	
<b>Non-forage</b>					
Dried beet pulp		46	0.40	18	58
Barley	Rolled	18	0.70	13	11
	Pellets		0.40		
	Ground		0.40		15
Corn/Maize	Rolled		0.60		
	Ground	10	0.40	4	5
Concentrates	Pellets		0.30		12
Soybean hulls		67	0.49	27	8
Whole cottonseed		50	0.90	45	

**NDF (Neutral Detergent Fibre)**

**pef (physical effectiveness factor to stimulate chewing, range 0 to 1)**

<sup>a</sup> “Physically effective NDF (peNDF) can be defined as the fraction of the feed that stimulates chewing activity and would be expressed as a product of NDF concentration and a physical effectiveness factor determined by total chewing response.” (Grant R.J. [1997] Interactions among forages and nonforage fiber sources. *Journal of Dairy Science*, 80:1438-1446.)

<sup>b</sup> Adapted from Mertens D.R. (1997) Creating a system for meeting the fiber requirements of dairy cows. *Journal of Dairy Science*, 80:1463-1481. & Mertens D.R. (2002) Measuring fiber and its effectiveness in ruminant diets. In: *Proceedings of the Plains Nutritional Council* (pp 40–66) Texas A&M Publication AREC 02-20.

<sup>c</sup> Adapted from National Research Council (2000) Nutrient requirements of beef cattle. seventh revised edition, 2000 update. Washington, D.C., National Academy Press.

<sup>d</sup> Adapted from Sudweeks et al. (1981) Assessing minimum amounts and form of roughages in ruminant diets: Roughage value index system. *Journal of Animal Science*, 53:1406-1411.




<sup>e</sup> Adapted from Moon et al. (2002) Chewing activities of selected roughages and concentrates by dairy steers. *Asian-Australasian Journal of Animal Sciences*, 15:968-973.

## *Appendix F: Signs of Pain*

Sign	Explanation
Guarding	The animal alters its posture to avoid moving or causing contact to a body part, or to avoid the handling of that body area.
Abnormal appearance	Obvious lack of grooming, changed posture with head held low.
Altered behaviour	Behaviour may be depressed with reduced interest in their surroundings; animals may remain immobile, or be reluctant to stand or move even when disturbed. They may also exhibit restlessness (e.g. lying down and getting up, shifting weight, circling, or pacing) or disturbed sleeping patterns. May grunt and grind their teeth. Severe pain often results in rapid, shallow respiration. Abdominal discomfort can be indicated by behaviour ranging from mild kicking at the abdomen to rolling and thrashing. Animals in pain may also show altered social interactions with others in their group.
Vocalization	An animal may vocalize when approached or handled or when a specific body area is touched or palpated. It may also vocalize when moving to avoid being handled. Bellowing can occur if the pain is severe.
Mutilation	Animals may lick, scratch, or rub a painful area.
Sweating	Excessive sweating is often associated with some types of pain (e.g. laminitis, colic).
Inappetence	Animals in pain frequently stop eating and drinking, or markedly reduce their intake, resulting in rapid weight loss.

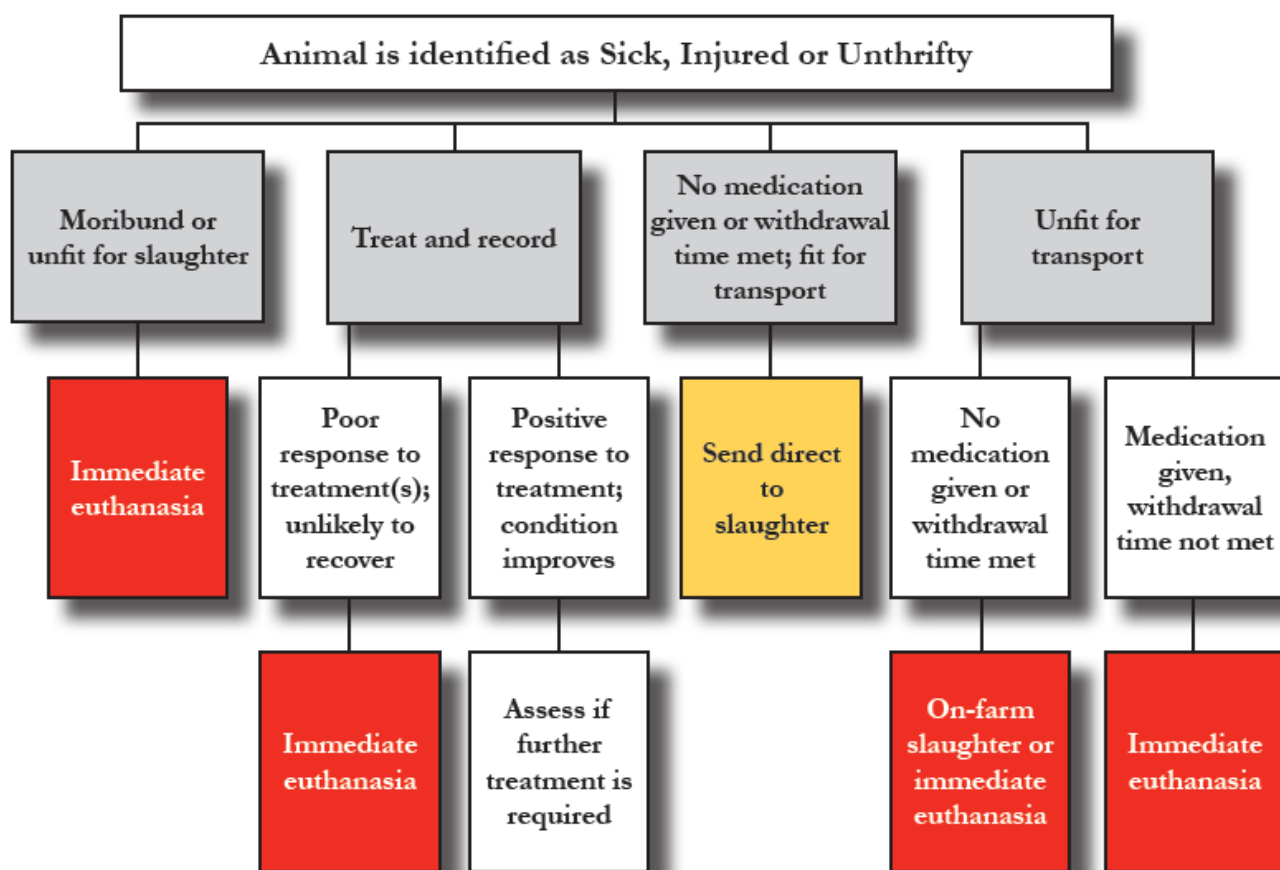
Adapted from Recognition and Alleviation of Pain in Laboratory Animals. National Research Council (US) Committee on Recognition and Alleviation of Pain in Laboratory Animals. 2009. Washington (DC): National Academies Press (US) (<http://www.nap.edu/>); National Academy of Sciences. Available at: <http://www.ncbi.nlm.nih.gov/books/NBK32656/>

## Appendix G: Transport Decision Tree

 <p><b>FIT ANIMALS</b> <b>TRANSPORT</b></p>	<p>An animal deemed to be able to withstand the stress of transportation without experiencing suffering and that is expected to arrive at its final destination in good condition.</p> <p>If unsure of an animal's condition, contact a veterinarian.</p>
 <p><b>COMPROMISED ANIMALS</b></p> <p><b>TRANSPORT WITH SPECIAL PROVISIONS DIRECT TO FINAL DESTINATION</b> <b>(not to an auction or assembly yard)</b></p> <p><b>Examples of compromised conditions:</b></p> <ul style="list-style-type: none"> <li>• Slight lameness*</li> <li>• Contracted flexor tendons (calf walks as if on its "tippy toes")</li> <li>• Limb deformity (not painful)</li> <li>• Acute penis injury (without significant bleeding)</li> <li>• Acute frostbite</li> <li>• Blindness in both eyes</li> <li>• Bloat (but not weak, in pain or down) (treatment on farm is recommended vs. transport)</li> <li>• Open wound (depending on the severity, the animal may be unfit)</li> <li>• Not fully healed after a procedure (e.g. castration, dehorning)</li> <li>• Rectal prolapse (without necrosis or infection)</li> <li>• Single, minor abscess (no fever, weakness or impeded movement)</li> <li>• Pneumonia (without fever) (treatment on farm is recommended vs. transport)</li> </ul> <p><i>*Slight lameness: The animal has imperfect locomotion, a slight limp; the lame leg may not be immediately identifiable and the animal is able to bear weight on all feet.</i></p> <p><i>Rationale: Even a slight lameness can deteriorate quickly in transit especially when the animal negotiates ramps during loading and unloading. This animal is at risk of becoming severely lame or non-ambulatory during transport.</i></p> <p><b>Some examples of special provisions</b></p> <ul style="list-style-type: none"> <li>• Transport locally and directly to the nearest suitable place to receive care or be humanely slaughtered or euthanized</li> <li>• Load last and unload first</li> <li>• Segregate from all other animals or pen with one familiar animal</li> <li>• Additional bedding</li> </ul>	 <p><b>UNFIT ANIMALS</b></p> <p><b>DO NOT TRANSPORT</b></p> <p><b>Other than for veterinary diagnosis or treatment on the advice of a veterinarian</b></p> <p><b>Examples of unfit conditions:</b></p> <ul style="list-style-type: none"> <li>• Lameness other than slight**</li> <li>• Non-ambulatory***</li> <li>• Fractured jaw, limb, pelvis or any fracture that hampers mobility or causes pain</li> <li>• Rupture of the pre-pubic tendon</li> <li>• Weak or lethargic</li> <li>• Bloat (signs of pain, weakness, difficulty breathing or non-ambulatory)</li> <li>• Severe wound (deep or gaping, profuse bleeding or exposed bone)</li> <li>• Emaciated</li> <li>• Listeriosis (listeria)</li> <li>• In shock or dying</li> <li>• Suffering from exhaustion or dehydration</li> <li>• Suspected or confirmed nervous system disorder</li> <li>• Fever (<math>\geq 39.5^{\circ}\text{C}</math> [<math>\geq 103^{\circ}\text{F}</math>])</li> <li>• Hernia that impedes movement; touches the ground when the animal stands; is painful on palpation; and/or includes an open wound, ulceration or obvious infection</li> <li>• Arthritis involving multiple joints</li> <li>• Multiple abscesses or single, large abscess with potential systemic effects (fever, weak) or impedes movement</li> <li>• Urethral blockage</li> <li>• Pneumonia (unresponsive and/or fever, difficulty breathing, weakness, dehydration or respiratory distress)</li> </ul> <p><i>**Lameness other than slight: The animal is reluctant to walk, and exhibits halted movement or demonstrates one of the following: obvious arched back and head bob; obvious limp with uneven weight bearing; not bearing any weight on one leg which is immediately identifiable; or the animal must be strongly encouraged to move (Health of Animals Regulations 138[2a]).</i></p> <p><i>***Non-ambulatory: Unable to rise or stand without assistance or move without being dragged or carried, regardless of age or size. Note: it is illegal to drag an animal</i></p>

Signs of pain are described in *Appendix F*.

## Appendix H: Sample Euthanasia Decision Tree



Examples of questions to guide decision-making on whether to treat or euthanize an animal:

- will the animal endure a painful and lengthy recovery?
- will the animal be likely to return to normal function post recovery?
- can the required care be provided during the convalescence period?
- is the animal likely to suffer chronic pain or immobility following recovery?
- will weather extremes create inhumane conditions for the animal during and/or after recovery?

## Appendix I: Methods of Euthanasia

**Table 2: Acceptable Euthanasia Methods for Cattle: (adapted from 1,2,3)**

Method	Suitable for	Equipment and Procedure
Gunshot	Calves less than 180kg (400 lb)	<ul style="list-style-type: none"> <li>Examples of appropriate firearms:</li> <li>Rifles: a .22 long rifle fired from a short distance is acceptable (i.e. 0.60-0.90 m [2-3 feet]).</li> <li>A .22 magnum or larger calibre is recommended.</li> <li>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.</li> </ul>
	Bovine more than 180 kg (400 lb)	<ul style="list-style-type: none"> <li>Requires a minimum of 1356 J (1000 ft-lb) of muzzle energy.</li> <li>Examples of appropriate firearms:</li> <li>Rifles: a .22 magnum or larger calibre centre fire rifle (.223, .270, 303, 30-30) is required.</li> <li>Shotguns: a 12 or 20 gauge shotgun with slugs or bird shot no. 2, 4 or 6.</li> <li>Note: A standard .22 calibre long rifle only produces 119-138 joules (116-135 ft-lb) of muzzle energy and is not sufficient for cattle.</li> </ul>
Penetrating captive bolt and secondary step to cause death	All weight and age classes	<ul style="list-style-type: none"> <li>Penetrating captive bolt guns with velocities ranging from 55 – 58m/s are most effective.</li> <li>Restrain if necessary.</li> <li>A secondary step is required as the penetrating bolt device is designed only to stun the animal (See <i>Appendix K</i>.)</li> </ul>
Non-penetrating captive bolt and bleeding out	Young calves only	<ul style="list-style-type: none"> <li>Restrain if necessary.</li> <li>Bleeding out step required after animal is confirmed to be unconscious. (See <i>Appendix K</i>.)</li> </ul>
Drugs approved for euthanasia	All weight and age classes	<ul style="list-style-type: none"> <li>Must be administered by a veterinarian. Safe disposal of the carcass is required when barbiturates are used.</li> </ul>

Secondary steps can **ONLY** be performed on an animal that is confirmed to be unconscious. Secondary steps must be chosen in consultation with the herd veterinarian, outlined in the euthanasia protocol and only performed following veterinary advice and training. Acceptable secondary steps include:

- bleeding out (see *Appendix K*)
- pithing (see *Appendix K*)
- cardiac puncture
- rapid intravenous injection of a concentrated solution of potassium chloride or magnesium sulfate

**All methods not listed in Table 2 are considered unacceptable methods of euthanasia. Blunt force trauma to the head by means of anything other than a captive bolt gun is unacceptable (1,4,5).** With the exception of a captive bolt gun, blunt force trauma does not consistently cause immediate loss of consciousness in cattle, including young calves (1,4,5).

- American Veterinary Medical Association (2013) *AVMA Guidelines for the Euthanasia of Animals: 2013 Edition*. Available at: <https://www.avma.org/KB/Policies/Documents/euthanasia.pdf> Accessed: April 20, 2015.
- Shearer J.K. & Ramirez A. (last updated January 28, 2013) *Procedures for Humane Euthanasia – Euthanasia of Sick, Injured and/or Debilitated Livestock*. Available at: <http://vetmed.iastate.edu/sites/default/files/vdpam/Extension/Dairy/Programs/Humane%20Euthanasia/Download%20Files/EuthanasiaBrochure20130128.pdf> Accessed April 20, 2015
- Woods J., Shearer J.K & Hill J (2010) Recommended On-Farm Euthanasia Practices in Grandin T. (ed.) *Improving Animal Welfare: A Practical Approach*. CAB International, Oxfordshire, UK.
- Humane Slaughter Association (2007) *Humane Dispatch and Disposal of Infant Calves: Technical Note No. 2*. Available <http://www.hsa.org.uk/downloads/technical-notes/TN2-calves-human-dispatch-disposal-HSA.pdf> Accessed May 17, 2015.
- American Association of Bovine Practitioners (2013) *Practical Euthanasia of Cattle* Available [http://www.aabp.org/resources/AABP\\_Guidelines/Practical\\_Euthanasia\\_of\\_Cattle-September\\_2013.pdf](http://www.aabp.org/resources/AABP_Guidelines/Practical_Euthanasia_of_Cattle-September_2013.pdf) Accessed May 17, 2015.



## *Appendix J: Anatomical Landmarks for Euthanasia*

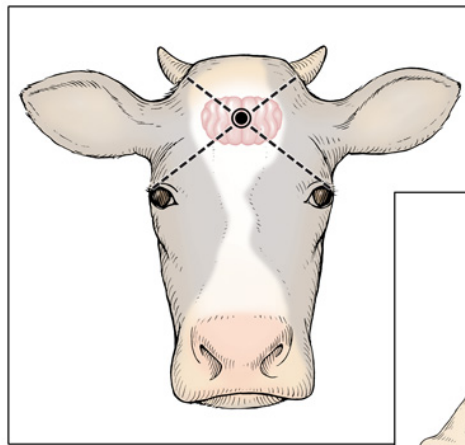


Figure 1

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

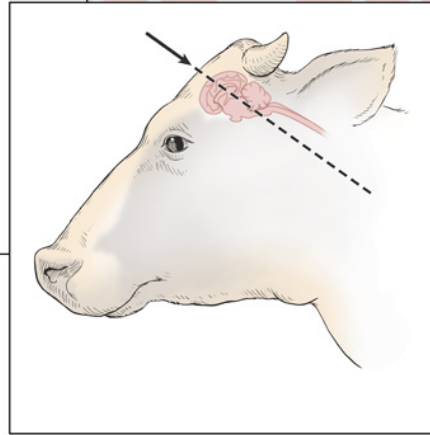


Figure 2

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

**Figure 1.** Proper positioning of the firearm or penetrating captive bolt is essential to ensure a quick death. 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 polled or dehorned animals.

**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.

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:** 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.<sup>1</sup>

**When using a captive bolt gun:** The device must be held in contact with the head using proper landmarks (figures 1 and 2). Restraint may be necessary to ensure proper application of the captive bolt gun. A rope halter is typically sufficient to restrain the head.

<sup>1</sup> American Association of Bovine Practitioners (2013) Practical Euthanasia of Cattle Available [http://www.aabp.org/resources/AABP\\_Guidelines/Practical\\_Euthanasia\\_of\\_Cattle-September\\_2013.pdf](http://www.aabp.org/resources/AABP_Guidelines/Practical_Euthanasia_of_Cattle-September_2013.pdf)

## ***Appendix K: 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.<sup>1</sup> For cattle, including calves, it is better to use a chest stick where possible rather than a neck cut.<sup>2</sup>



**Figure 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.

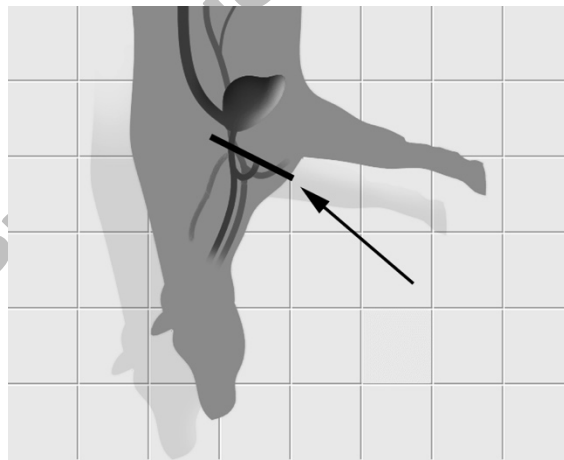
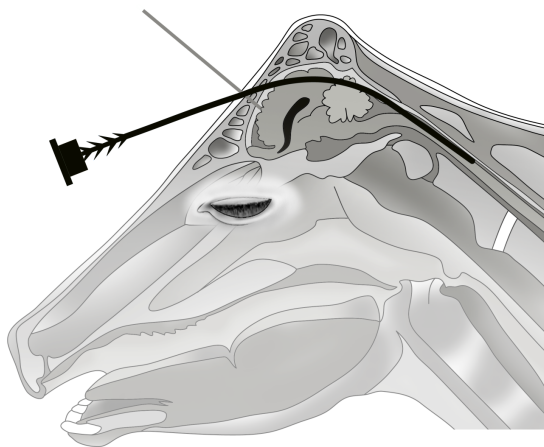


Figure 2 illustration used with permission of The Humane Slaughter Association. Copyright: The Humane Slaughter Association ([www.hsa.org.uk](http://www.hsa.org.uk))

**Figure 2.** Chest stick of an unconscious animal (previously stunned with captive bolt device or gunshot): Sticking should be carried out by an incision made with a sharp knife in the jugular furrow at the base of the neck, the knife being directed towards the entrance to the chest to sever the major blood vessels close to the heart.<sup>3</sup>

## Pithing

Pithing is the process of mechanically destroying the brain of an unconscious animal to prevent return to consciousness. 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).<sup>3</sup> Pithing rods are commercially available (e.g. [www.pithingrods.com](http://www.pithingrods.com)). The carcass is no longer safe for consumption due to possible contamination.<sup>1</sup> Producers are also advised to confirm that pithing will not affect dead stock removal.



**Figure 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.

## Biosecurity Considerations:

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

- 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 (floors, walls and equipment etc.) 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.

<sup>1</sup> American Veterinary Medical Association (2013) *AVMA Guidelines for the Euthanasia of Animals: 2013 Edition*. Available at: <https://www.avma.org/KB/Policies/Documents/euthanasia.pdf>

<sup>2</sup> Anil, M. H., McKinsty, 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.

<sup>3</sup> 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.

## *Appendix L: Resources for Further Information*

### GENERAL

- 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](http://www.contextbookshop.com/books/calf-rearing-guide-practical-easy-to-use)
- Calfcare.ca [website] [www.calfcare.ca](http://www.calfcare.ca)
- Canadian Veal Association (2013) Verified Veal The Canadian On-Farm Food Safety Program for Veal. Copies are available through Veal Farmers of Ontario (<http://ontarioveal.on.ca/>) and Les Producteurs de bovins du Québec (<http://bovin.qc.ca/>).

### CALF SELECTION AND CARE OF NEWLY ARRIVED CALVES

#### Colostrum

- Quigley J. (2001) Freezing and thawing colostrum. Calf note #13. CalfNotes.com Available [www.calfnotes.com/pdf/CN013.pdf](http://www.calfnotes.com/pdf/CN013.pdf)
- Quigley J. (2009) Prolonged colostrum feeding and calf health. Calf note #138. CalfNotes.com Available [www.calfnotes.com/pdf/CN138.pdf](http://www.calfnotes.com/pdf/CN138.pdf)

### HOUSING

#### Ventilation

- Calfcare.ca (n.d.) Ventilation. Available [www.calfcare.ca/housing/ventilation/](http://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.calfcare.ca/content/wp-content/uploads/2015/03/PPAT-Ventilation-for-Calf-Housing.pdf](http://www.calfcare.ca/content/wp-content/uploads/2015/03/PPAT-Ventilation-for-Calf-Housing.pdf)
- Nordlund K. Practical considerations for ventilating calf barns in winter. American Association of Bovine Practitioners, 40<sup>th</sup> Annual Conference, September 18, 2007. Vancouver, BC, Canada. Available [www.vetmed.wisc.edu/dms/fapm/fapmtools/9ventilation/Practical\\_ventilating\\_calf\\_barns.pdf](http://www.vetmed.wisc.edu/dms/fapm/fapmtools/9ventilation/Practical_ventilating_calf_barns.pdf)

#### Emergency Planning

- Department for Environment, Food and Rural Affairs (2004) Farm Fires – Protecting Farm Animal Welfare. Available [www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69362/pb9326-farm-fires.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69362/pb9326-farm-fires.pdf)
- 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](http://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](http://www.omafra.gov.on.ca/english/engineer/barnfire/toc.pdf)
- The Alberta Environmental Farm Plan Company (2008) Rural Emergency Plan. Available [www.ruralemergencyplan.com/](http://www.ruralemergencyplan.com/)

## FEED AND WATER

- Calfcare.ca [website; n.d.] The calf's digestive system [www.calfcare.ca/calf-feeding/the-calf%E2%80%99s-digestive-system/](http://www.calfcare.ca/calf-feeding/the-calf%E2%80%99s-digestive-system/)
- Quigley J. (2001) Methods of feeding water. Calf note #077. CalfNotes.com Available <http://www.calfnotes.com/pdf/CN077.pdf>

### Milk Feeding

- Bovine Alliance of Management and Nutrition (2008) Guide to calf milk replacers: types, use and quality [www.aphis.usda.gov/animal\\_health/nahms/dairy/downloads/bamn/BAMN08\\_GuideMilkRepl.pdf](http://www.aphis.usda.gov/animal_health/nahms/dairy/downloads/bamn/BAMN08_GuideMilkRepl.pdf)
- Costello R. (2012) Bloat in young calves and other pre-ruminant livestock. Merrick's Inc. Available [www.merricks.com/Images/Uploaded/TechLibraryPDF/pdf\\_Bloat\\_in\\_young\\_calves-2012.pdf](http://www.merricks.com/Images/Uploaded/TechLibraryPDF/pdf_Bloat_in_young_calves-2012.pdf)
  - Grober Nutrition (2009) Clean-sterilized feeding utensils. Available <http://www.grobernutrition.com/grofacts/clean-sterilized-feeding-utensils/>
  - Milk Products (2009) Milk replacer versus whole milk: effects on calf performance. [www.certifiedfeed.com/documents/articles/T001%2075e%20Milk%20Replacer%20vs%20%20Whole%20Milk.pdf](http://www.certifiedfeed.com/documents/articles/T001%2075e%20Milk%20Replacer%20vs%20%20Whole%20Milk.pdf)
  - Quigley J. (2001) Rumen acidosis and rumen drinking in milk-fed calves. Calf note #113. CalfNotes.com Available [www.calfnotes.com/pdf/CN113.pdf](http://www.calfnotes.com/pdf/CN113.pdf)

### Solid Feeds

- Heinrichs J. & Ishler V. (n.d.) Evaluating forage quality by visual appraisal, pH, and dry matter content. Penn State College of Agricultural Sciences DAS 00-7. [www.extension.psu.edu/animals/dairy/nutrition/forages/forage-quality-physical/evaluating-forage-quality-by-visual-appraisal-ph-and-dry-matter-content](http://www.extension.psu.edu/animals/dairy/nutrition/forages/forage-quality-physical/evaluating-forage-quality-by-visual-appraisal-ph-and-dry-matter-content)
- Lang B. (last reviewed 2010) Management of grain-fed veal calves. Ontario Ministry of Agriculture, Food and Rural Affairs AgDex# 415/20. Available [www.omafra.gov.on.ca/english/livestock/beef/facts/06-083.htm](http://www.omafra.gov.on.ca/english/livestock/beef/facts/06-083.htm)

### Cold Weather Feeding

- Lang B. (last reviewed 2008) Cold temperatures increase feed requirements for calves. Ontario Ministry of Agriculture, Food and Rural Affairs. Available [www.omafra.gov.on.ca/english/livestock/veal/facts/info\\_colder.htm](http://www.omafra.gov.on.ca/english/livestock/veal/facts/info_colder.htm)
- Philp L. (last reviewed 2008) Feeding pre-weaned veal calves during winter months: understanding calf metabolism and milk replacers. Ontario Ministry of Agriculture, Food and Rural Affairs AgDex# 415/60. Available [www.omafra.gov.on.ca/english/livestock/veal/facts/05-081.htm](http://www.omafra.gov.on.ca/english/livestock/veal/facts/05-081.htm)
- Quigley J. (2007) Added CMR feeding in cold weather. Calf note #121. CalfNotes.com Available [www.calfnotes.com/pdf/CN121.pdf](http://www.calfnotes.com/pdf/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](http://www5.agr.gc.ca/resources/prod/doc/terr/pdf/lwq_guide_e.pdf)
- Quigley J. (2001) Water. Primer on Calf Nutrition Series #101. CalfNotes.com Available [www.calfnotes.com/pdf/CN101.pdf](http://www.calfnotes.com/pdf/CN101.pdf)

## HUSBANDRY PRACTICES

### Handling and Restraint

- Farm and Food Care Ontario (n.d.) Work smarter not harder: veal handling with Bill Siemens [Video] Available: [www.farmimpact.ca/index.php/2-uncategorised/59-dairy-cattle-resources-main-page](http://www.farmimpact.ca/index.php/2-uncategorised/59-dairy-cattle-resources-main-page).
- 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](http://www.researchgate.net/publication/43202698_Engineering_and_design_of_holding_yards_loading_ramps_and_handling_facilities_for_land_and_sea_transport_of_livestock).
- 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](http://www.grandin.com/behaviour/principles/flight.zone.html)
- Grandin T. (n.d.) Principles of livestock restraint. Available [www.grandin.com/restrain/rest.princ.html](http://www.grandin.com/restrain/rest.princ.html)
- Gill R. & Machen R. (n.d.) Cattle handling pointers. Texas A&M AgriLife Extension. Available [www.effectivestockmanship.com/PDFs/Cattle-Handling-Pointers.pdf](http://www.effectivestockmanship.com/PDFs/Cattle-Handling-Pointers.pdf)

## HEALTH MANAGEMENT

### Federally Reportable Diseases

- **Canadian Food Inspection Agency (last modified 2015-02-10) Terrestrial animal diseases Available** [www.inspection.gc.ca/animals/terrestrial-animals/diseases/eng/1300388388234/1300388449143](http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/eng/1300388388234/1300388449143)

### 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](http://www.vetmed.wisc.edu/dms/fapm/fapmtools/8calf/Calf_Barn_Ventilation_Text.pdf)

## TRANSPORTATION

- Canadian Food Inspection Agency (2007) Livestock Transport Requirements in Canada. P0586-07. Available at: [www.inspection.gc.ca/english/anima/trans/transpoe.shtml](http://www.inspection.gc.ca/english/anima/trans/transpoe.shtml)
- Canadian Food Inspection Agency (2013) Transportation of Animals Program Compromised Animals Policy. Available: [www.inspection.gc.ca/english/anima/trans/polie.shtml](http://www.inspection.gc.ca/english/anima/trans/polie.shtml)
- Government of Canada (1990) Health of Animals Regulations, Part XII Transportation of Animals C.R.C. c. 296. Available [http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,\\_c.\\_296/page-16.html#h-70](http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._296/page-16.html#h-70)