Animal Care
Manual
This manual is not a legal document and is intended for educational purposes only. Producers are individually responsible for determining and complying with all requirements of local, state, and federal laws and regulations regarding animal care.
Dairy producers have a compelling story to tell to consumers - one that centers on the care and the well-being of the animals, and that enables producers and their families to live on the farm. To protect this way of life, dairy producers need to have a unified voice to communicate to consumers how producers care for dairy cows. The increased interest of consumers about where their food comes from has made it vital that we tell our story. This story is one based not only on science, but also on the caring relationship with our animals.

The National Dairy FARM Program: Farmers Assuring Responsible ManagementSM is a nationwide, verifiable animal well-being program that provides consistency and uniformity to best practices in animal care and quality assurance in the dairy industry. The program aims to provide a consistent platform for animal well-being, which producers can use to evaluate their on-farm animal care practices. By completing an animal care evaluation, producers have a chance to identify opportunities for improvement in their current animal care program. Producers and evaluators can work together to identify opportunities and develop plans to make improvements to on-farm practices.

The National Dairy FARM Program was developed by producers, veterinarians, and animal care experts with the goal of a comprehensive and verifiable dairy animal care program that is consistent with the principles and guidelines provided by the National Dairy Animal Well-Being Initiative (NDAWI). We ask that you read the educational materials provided in the program, including this Animal Care Manual, and evaluate your management practices and how they relate to the quality of animal care on your farm. By participating in the National Dairy FARM Program you will be able to confirm that the care you provide your animals maintains their health and comfort.

Dairy producers have a great story to tell and we hope that the National Dairy FARM Program will become an integral part of relaying the message that dairy producers invest heavily in their animals’ well-being, and work hard every day to provide for the animals in their care.

Sincerely,

Randy Mooney
Chairman
National Milk Producers Federation
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Chapter 1  Introduction

“A long tradition of animal care enables milk producers to provide a healthy, safe, and wholesome milk supply to the global consumer. Milk production is not just a profession; it is a way of life. Milk producers live and work on their farms and treat their cows with respect and care, knowing that this is the proper and humane thing to do for the animal and their livelihood.

MISSION

The National Dairy FARM Program: Farmers Assuring Responsible Management (NMPF), with support from Dairy Management, Inc. (DMI), to demonstrate and verify that U.S. milk producers are committed to providing the highest standards of animal care and quality assurance.

THE PROGRAM

Our customers and consumers want to know that dairy products are safe, wholesome, and nutritious, and that animals receive the highest level of care. The National Dairy FARM Program, voluntary and available to all producers, establishes an on-farm animal well-being program and third-party verification system that demonstrates that commitment. Third-party verification ensures the validity and the integrity of the program to our customers and consumers. Our industry has an excellent track record of responsible management practices; this national effort simply brings consistency and uniformity to on-farm care and provides reassurance to consumers.

This manual details best management practices for a variety of animal care issues including animal health from birth to end of life, facilities/environment, nutrition, and transportation and handling. The manual should be used as an educational resource for producers, evaluators, and verifiers participating in the National Dairy FARM Program.

BACKGROUND

Consumers are more informed and educated about the nutritional benefits of their food now than at any time in history, but are more removed from production practices than ever before. With this lack of knowledge about how food is produced comes an increasing need to know that the animals that provide meat, milk, and eggs are raised and cared for in a humane and ethical manner. The dairy industry responded to this need for assurance by forming the National Dairy Animal Well-being Coalition. The Coalition developed principles and guidelines that should be included in any dairy well-being program to meet the ethical obligations milk producers have to the well-being of their animals. On October 2, 2008, the National Dairy Animal Well-being Initiative (NDAWI) introduced the principles and guidelines, as follows:

Nutrition

**Guiding Principle:** Animals and animal groups should have access to a nutritionally adequate diet and clean, fresh water.
Guideline for Newborn Calves: All calves should receive colostrum or colostrum replacer and be fed in a way that promotes health and reduces the risk of disease.

Guideline for Weaned Calves and Growing Cattle: Weaned calves and growing heifers should receive adequate nutrition and water to achieve a proper body condition score and be fed in a way that promotes health and reduces the risk of disease.

Guideline for Adult Cattle: All cattle should receive adequate nutrition and water to achieve a proper body condition score and be fed in a way that promotes health and reduces the risk of disease.

Animal Health

Guiding Principle: The health of all animals and animal groups should be maintained through preventive care programs augmented by rapid diagnosis and treatment when necessary.

Guidelines: Dairy operations should have:
- A valid Veterinary/Client/Patient Relationship (VCPR)
- A current Herd Health Plan
- Management protocols for painful procedures and conditions
- Management protocols for special-needs cattle – cattle with a physical or medical condition that require additional care and/or monitoring
- Appropriate euthanasia guidelines and training for designated and assigned personnel

Management

Guiding Principle: To promote animal well-being animal caretakers should be adequately trained, follow protocols, and have access to record systems to meet the requirements of their position.

Guidelines: The operation should have a Herd Health Plan as well as training and protocols for handling, transporting and caring, and euthanasia for cattle of all ages and health conditions.

The plan should include:
- Training for new employees, plus refresher training for existing employees
- Standard operating procedures to be reviewed annually and revised as necessary

Environment and Facilities

Guiding Principle: Facilities should be designed, constructed, and maintained to provide and promote animal health, comfort, and safety.

Guidelines for Calves (Birth to Weaning or Sale) and Young Stock (Weaning to Parturition or Sale): Calves and young stock should be given space to stand, lie down, and turn around without difficulty, provided an environment that is clean and dry, and be protected from seasonal weather extremes.

Guidelines for Adult Cattle: Adult cattle should be given space to stand and lie down, be provided an environment that is clean and dry, and be protected from seasonal weather extremes.

Facilities should be designed, constructed, and maintained to reduce the risk of injury and the development of leg lesions.

Handling, Movement and Transportation

Guiding Principle: All animals and animal groups should be handled, moved, and transported in a manner that reduces the risk of the potential for injury, discomfort, or disease.

Guideline: Facilities should be designed and maintained so animals can be moved in a manner that reduces the risk of slips, falls, and collisions. Employees should be trained to follow appropriate handling, movement, and transportation protocols.

Third-Party Verification

Guiding Principle: Assuring on-farm dairy animal well-being requires third-party verification.

Guideline: All dairy animal well-being programs should include third-party verification to assure the program is able to demonstrate our commitment to meeting our ethical obligation to provide for the well-being of animals in the U.S. dairy industry.
FORMAT OF THE MANUAL

The National Dairy FARM Program has adopted the National Dairy Animal Well-Being Initiative Principles and Guidelines in the development of this educational manual. The National Dairy FARM Program Animal Care Manual has been formatted for ease of use by providing best practices for (1) nutrition, (2) animal health, (3) environment and facilities, and (4) handling, movement, and transportation. In each of these chapters you will find a management checklist, a description of the best practices, a section for specific lifecycle considerations, and a list of other resources. Separate chapters cover the care of newborns and special-needs animals. Management and training are recurring themes throughout each chapter and are covered in the beginning of the manual. The National Dairy FARM Program Animal Care Manual is a comprehensive animal care resource tool.

The companion National Dairy FARM Program Animal Care Quick Reference User Guide is a condensed version of the manual for on-farm use and implementation. These materials will be supplemented with additional educational resources for producers. Additional information tailored for customers and consumers will provide important communication about the program through the dairy value chain.

Two key elements of the National Dairy FARM Program are the on-farm evaluations and the third-party verification of the program. For program participants this is a two-step process. The first step is the on-farm evaluation, which provides the producer with an external review of animal care practices based on the National Dairy FARM Program guidelines. Once the evaluation is complete the producer is eligible to be randomly selected, through statistical sampling, to undergo third-party verification. A more detailed explanation of these two processes is provided in Chapter 2 and Chapter 11.

Additional information on The National Dairy FARM Program is available online at www.nationaldairyfarm.com

ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>BCS</td>
<td>Body Condition Scoring</td>
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<tr>
<td>DMI</td>
<td>Dairy Management, Inc.</td>
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<tr>
<td>NAIS</td>
<td>National Animal Identification System</td>
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<tr>
<td>NDAWI</td>
<td>National Dairy Animal Well-being Initiative</td>
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<tr>
<td>NMPF</td>
<td>National Milk Producers Federation</td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operating Procedure</td>
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<tr>
<td>TMR</td>
<td>Total Mixed Ration</td>
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<td>USDA</td>
<td>United States Agricultural Service</td>
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DEFINITIONS

For the purposes of the National Dairy FARM Program Animal Care Manual, the following words found in the text are defined as follows:

Body Condition Scoring (BCS) – A common dairy practice used to determine the nutritional status of an individual heifer or cow, or to evaluate the average condition for a group. Animals are evaluated on a 5-point scale, with 1 being extremely thin and 5 being extremely fat. Most dairy cows should score between 2 and 4. (See Appendix A)

Bred Heifer – A young pregnant dairy animal that has not yet given birth to her first calf; typically 13-to-24 months of age.

Caretaker – Trained personnel responsible for the care and well-being of the animals on the dairy farm.

Dry Cows – Non-lactating pregnant cows from the end of a lactation until next parturition. A pregnant cow is generally dry or non-lactating for a period of 40-60 days before the next calving.

End of Life – On-farm death due to illness, euthanasia, or death at a packing house.

Freemartin Heifer – A sexually imperfect, usually sterile, female calf twinborn to a male.

Growing Animals – Period of time between weaning and first parturition during which an animal grows through puberty and begins to approach maturity, approximately from 6 weeks to 24 months of age. See also Bred Heifer, Open Heifer, and Springing Heifer.
**Mature Bulls** – Male bovine used for breeding.

**Milking Cows** – Cows that are lactating.

**Newborn** – The young of the domestic cow, from birth up until the calf begins to eat only dry feed rations, usually around 6-to-10 weeks of age.

**On-farm Evaluation** – An external review of animal care practices on a participating farm based on the National Dairy FARM Program guidelines.

**Open Heifer** – A young cow that has not yet become pregnant.

**Special-Needs Animals** – Sick, injured, or non-ambulatory animals.

**Springing Heifers** – A heifer that is in the last trimester of pregnancy.

**Third-Party Verifier** – A trained and qualified person who does not have a conflict of interest in the operation or the outcome of the verification process.

**Transition Cows** – Cows or heifers that are “transitioning” from the period of late gestation (pregnancy) through the period of early lactation, that is, within the period of about three weeks prior to and about three weeks after calving (periparturient period).

**Waste Management** – Management or handling of manure on the farm.

**Weaned Animals** – A young calf that is removed from being fed milk or milk replacer to eating only dry feed, usually about 6-to-10 weeks of age.

**Willful Mistreatment of Animals** – Acts that intentionally cause pain, injury, or suffering including, but not limited to: needlessly applying any type of prod to a sensitive part of the animal (prods should only be used when animal or human safety is in jeopardy, and as a last resort); malicious hitting or beating of an animal; movement of non-ambulatory cattle in a manner inconsistent with National Dairy FARM Program guidelines; lack of access to feed and water; or inappropriate on-farm harvest or euthanasia.
Chapter 2

On-farm Evaluations

The on-farm evaluation provides an external review of animal care practices based on National Dairy FARM Program guidelines. The results of the initial evaluation will provide the producer with a status report and enable the producer to develop an action plan for continuous improvement if necessary. Subsequent evaluations, at least once every three years, will enable the producer to track progress in on-farm care of the animals.

A veterinarian, extension educator, co-op field staff person, university personnel, or otherwise qualified personnel who have completed National Dairy FARM Program training can perform an on-farm evaluation. Evaluators will use the management checklists provided in the National Dairy FARM Program to conduct the evaluation.

MANAGEMENT CHECKLISTS

The management checklists provided in the following chapters highlight key on-farm practices that should be in place on participating dairy farms.

The Management Checklist points will be highlighted in the following way:

- Management Checklist Point.
Chapter 3

Management - Standard Operating Procedures (SOPs), Training and Record Keeping

When addressing management, it is important to describe the procedure, train to the procedure, document the completion of the training, and monitor it over time. Although verbal directions are acceptable as long as all employees are conducting the protocol and procedure in the same manner, written SOPs are preferred. In the absence of a key employee, the written information would benefit another employee stepping in to assist. Train and educate animal caretakers about animal care expectations and animal well-being policies. The operation should have a Herd Health Plan, as well as training and protocols for handling, transportation and movement, and euthanasia for cattle for all ages and health conditions. Much of the information in this chapter is interdependent on criteria in other sections and/or animal observations.
**VETERINARIAN/CLIENT/PATIENT RELATIONSHIP**

The dairy has a Veterinarian/Client/Patient Relationship.

To correctly diagnose, treat, and prevent disease, producers should establish a Veterinarian/Client/Patient Relationship. According to the American Veterinary Medical Association (2008), such a relationship exists when:

- The veterinarian has assumed responsibility for making clinical judgments regarding the health of the animal(s) and the need for medical treatment, and the client has agreed to follow the veterinarian's instructions.
- The veterinarian has sufficient knowledge of the animal(s) to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s). This means that the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of an examination of the animal(s), or by medically appropriate and timely visits to the premises where the animal(s) are kept.
- The veterinarian is readily available, or has arranged for emergency coverage, for follow-up evaluation in the event of adverse reactions or the failure of the treatment regimen.
- The veterinarian or a trained consultant can help a producer establish a routine Herd Health Plan.

**TRAINING**

Documentation exists of employee training for new and existing employees at least on an annual basis.

Animal care training should be conducted promptly and thoroughly based on job responsibilities and the need for cross-training during the training period for new employees and at least yearly for all employees. Training should encompass care expectations for particular circumstances, such as how to move uncooperative cattle or what to do in cases of emergencies, as well as general expectations, such as how to humanely handle animals. Combined with periodic training, written job descriptions can provide clarity to roles and responsibilities, because each employee may have different roles in animal care. Consequences of inhumane animal care must be known and enforced. By adequately training and motivating staff, a producer can achieve high-quality animal care under all conditions.

**STANDARD OPERATING PROCEDURES**

SOPs are readily available, and in many cases posted, in the native languages of employees assigned animal care responsibilities.

SOPs are instructions for various aspects of animal care on the dairy. While SOPs can be verbal, written SOPs are preferred for consistency in communication to employees. The SOPs provide enough detail to ensure that all employees empowered with a specific animal care assignment (consistent with their job description and training) can routinely and consistently perform their animal care duties. SOPs should be reviewed at least annually and updated as necessary. A dairy should have SOPs including a Herd Health Plan, Newborn Management, Feed and Nutrition Management, and Non-Ambulatory Animal Management. Sample written SOPs are available from the National Dairy FARM Program.

**EMERGENCY PLANNING**

An emergency plan is readily available to address animal care needs arising from unique circumstances such as a fire or natural disaster.

A dairy should arrange for personnel or temporary help to cover emergencies, weekends, holidays, and unexpected absences of assigned caretakers. The owner and/or manager should ensure that personnel are informed of animal care expectations and qualified
to perform assigned duties. Posting the names and telephone numbers of emergency contacts (e.g., herd manager, owner, veterinarian, site address) in a prominent place in the animal facility in employees’ native languages is necessary to speed communications in an emergency. While an emergency plan can be verbal, a written emergency plan is preferred for consistency in communication to employees.

**Identification and Record Keeping**

> Each animal is permanently identified and an effective record keeping system is employed for animal care and management decision-making.

Animal identification and record keeping are critical for making important management decisions about feeding, grouping, selecting, medicating, breeding, and culling an animal from the herd. In addition, food safety, foreign animal disease threats, and bio/ agro-terrorism concerns make premise and individual animal identification a necessity (IDairy 2009). The U.S. Department of Agriculture (USDA) recognizes the use of the Official National Animal Identification System (NAIS) 840-RFID tags for the dairy animal for its lifetime. Every animal should be identified by a method that is permanent and easily read by caretakers. The National Dairy FARM Program recommends participating in the National Animal Identification System and using official 840-RFID eartags.

Effective record keeping shows compliance with training, inventory control, animal identification, disease prevention and control, residue withdrawal and avoidance, and disposal to help avoid liability from residue contamination or other animal health concerns. On a daily basis, it is necessary to identify animals treated with medications or health care products. Records are required for registering animals with purebred cattle organizations and for official production testing systems. They may include such items as:

- Birth date
- Sex, pedigree
- Origin
- Owner
- Location

Production and reproduction records help monitor an animal’s performance and well-being. Important management information includes:

- Average daily weight gain for heifers and yearlings
- Milk production and composition
- Nutritional information and history where known
- Breeding dates
- Sire identification and calving dates
- Identification of the calf
- Ultimate disposition of the animal

Equally important:

- Vaccination dates
- Parasite control measures
- Blood tests and veterinary treatments, including:
  - dates
  - names of medications
  - amounts and routes of administration
  - surgical procedures performed
  - condition diagnosed and being treated
  - veterinary clinic information

**Milking Routine**

> A specific milking routine, procedures, and actions are followed to ensure cow comfort and well-being.

Establishing regular routines for the cow, particularly at milking time, helps to minimize stress. When a dairy cow is frightened or excited or experiences pain, she releases hormones into the bloodstream that interfere with her milk let-down and reduce resistance to mastitis and other diseases. Therefore, a consistent routine for bringing cows and milking machines together is essential. Gates and restraining equipment should operate smoothly, quietly, and safely. Waiting time should be consistent for each milking; generally the time interval between initial udder stimulation to milking...
machine attachment is between 45-to-90 seconds. The preparation routine that signals the beginning of milking should be pleasant to the cow and consistent. The routine should include checking for abnormal milk, and thorough cleaning and drying of the teats. Avoid medical examinations or unpleasant experiences from being associated with the place of milking. Teat ends should be inspected and scored frequently.

The milking facility—whether it is in stanchions or in a milking parlor—must have clean floors with good traction and proper illumination if it is to be hygienic and safe. Grooved floors will prevent the cow from slipping. The facility should be designed and operated to meet or exceed Grade “A” dairy standards (Pasteurized Milk Ordinance, 2007).

The pre-milking holding area on farms with milking parlors is the place of highest animal density on the farm and of the greatest opportunity for injury. Consequently, it is important that prevention of injury be considered in the design of the holding area’s flooring, space, sidewalls, and entrance to the milking parlor. Moderation of temperature extremes by use of fans, sprinklers, or other technology should be considered for holding areas and the milking parlor.

Milking equipment should be regularly maintained and checked for vacuum level, pulsation rate and pulsation ratio. Equipment should also be checked for stray voltage if unusual behavior is exhibited or milk production drops. Portable equipment should be maintained to Grade “A” dairy standards of efficiency and sanitation. Equipment must be cleaned between milkings, and deposits of mineral, milk fat, and protein must be removed. Cleaning by hot water, disinfectant, or other chemical agents is effective. Neglecting to wash equipment even once can cause the next shipment of milk to fail the quality tests performed on every milk shipment. Carefully review milk test results for any signs of improper equipment function.

**RESOURCES**

Principles of Veterinary Medical Ethics of the AVMA
(American Veterinary Medical Association, April 2008)

Why Animal Identification?
Online at [www.idairy.org](http://www.idairy.org)
(IDairy, 2009)

Grade “A” Pasteurized Milk Ordinance
/Public Health Service/Food and Drug Administration, 2007)
All calves should receive colostrum or colostrum replacer and be fed in a way that promotes health and reduces the risk of disease. Health should be maintained through preventative care programs augmented by rapid diagnosis and treatment when necessary. Caretakers should be adequately trained, follow protocols, and have access to record systems to promote animal well-being. Calves should be provided space to stand, lie down, and turn around without difficulty, provided an environment that is clean and dry, and protected from seasonal weather extremes. Calves should be handled, moved, and transported in a manner that reduces the risk of the potential for injury, discomfort, or disease.
Chapter 4  Newborn Calves (continued)

**NUTRITION**

- Calves receive colostrum or colostrum replacer soon after birth.
- Calves are fed milk or milk replacer until weaned.
- Calves have continuous access to fresh water or are provided water at least twice a day or as necessary to maintain proper hydration.
- Calf rations provide the required nutrients for maintenance and growth (and to stimulate rumen development) as found in references such as the National Research Council, 2001:
  - A palatable, high-quality starter ration offered within two weeks after birth.
  - Forage/roughage sources should be offered along with the grain-based ration before 12 weeks of age.

Providing an adequate volume of high-quality colostrum or colostrum replacer is critical to calf health because calves depend on colostrum for immune protection. Dairy calves are born with no natural immunity and depend on the immunoglobulins in colostrum to provide passive immune protection. Colostrum is the milk produced right after calving and is a better source of immunoglobulins, protein, fat, minerals, and vitamins than milk. The concentration of these nutrients is usually highest in the first milk produced after calving and decreases with subsequent milkings. The calf has the ability to absorb the immunoglobulins directly from the digestive tract into the blood. The ability of the calf to absorb these antibodies decreases rapidly within the first few hours after birth. Colostrum or colostrum replacer should be fed within the first few hours following parturition to promote immune system development.

Another benefit of colostrum is that it increases a calf’s tolerance to cold temperatures. A calf housed in dry, individual shelter with protection from wind and drafts (e.g., pens or hutches) and fed colostrum can tolerate temperatures as low as -27 degrees Fahrenheit (as opposed to about 50 degrees Fahrenheit in the absence of colostrum) (Jorgenson et al., 1970; Webster, et al., 1970; Arave, 1993). During extremely cold weather, calves should be provided additional colostrum.

To achieve these benefits, calves must be fed an adequate amount of high-quality colostrum. Large-breed calves should be fed four quarts or more at birth. Small breed calves should be fed at least two quarts of high quality colostrum at birth and an additional two quarts 12 hours later. The first feeding should occur as soon as possible after birth, preferably within one hour. Use an esophageal tube feeder if necessary (Wisconsin Herd Health Working Group, 2001).

Colostrum management

- Provide a sufficient quantity of antibodies that is passed from the colostrum to the calf’s bloodstream in a hygienic manner.
- Use colostrum from cows with known production of high-quality colostrum or a colostrum replacer.
- Use a colostrometer or other instrument to gauge colostrum quality.

Colostrum quality may be determined prior to feeding it to calves. High-quality colostrum contains high levels of specific proteins, including antibodies. The best source of colostrum used in hand feeding calves is from tested, Johne’s-free older cows (Raising Quality Replacement Heifers, 2007). Herds with animals that have tested positive for Johne’s Disease should not use colostrum from those cows. The amount of immunoglobulin in colostrum tends to increase with the lactation number of the cow. The amount of immunoglobulin in colostrum can be estimated with a colostrometer, an instrument that measures the amount of solids (e.g., protein) in a liquid (Mechor, et al., 1992; Pritchett, et al., 1991; Pritchett, et al., 1994; Quigley, et al., 1993). Pasteurizing colostrum before feeding is recommended but should be done by heating at
140 degrees F for one hour. Higher temperatures will destroy some of the immunoglobulins. A high-quality colostrum replacer can be used as a substitute for colostrum based on colostrum availability and disease/health status of the cow.

Newborn calves may be fed with a nipple bottle or nipple pail. Special attention to cleaning nipples is necessary. Rinse with warm water, then clean bottles, buckets and equipment with soap and hot water after each feeding. An esophageal tube-feeder may be used to administer colostrum or electrolytes only when needed. When an esophageal tube-feeder is used, only persons adequately trained in its use should feed the calves. After receiving immunity through feeding colostrum or colostrum replacer, calves should be fed milk or milk replacer through weaning. Caution should be taken if calves destined for sale or slaughter are fed a medicated milk replacer or milk from cows treated with antibiotics. This will prevent problems associated with antibiotic residues in the meat of slaughtered calves. All withdrawal times for medicated feeds should be followed.

Milk replacers with protein derived from dairy products are the most easily digested. Other protein sources (fish protein, cereal flours, unprocessed soy, or meat protein) are not as easily digested. Some milk replacers that contain processed vegetable protein with improved digestibility are being developed.

See A Guide to Modern Milk Replacers (Bovine Alliance on Management & Nutrition, 2008) for guidance on choosing a milk replacer. The milk replacer should mix easily in water and stay in solution after mixing. Water used with milk replacers should be fresh and clean. Employees should take care to use the appropriate weight of powder, and volume and temperature of water to ensure consistency when mixing milk replacers.

Within two weeks after birth, calves to be retained on the dairy should be offered a palatable, high-quality starter ration (no forage). Time of weaning should be based on starter intake and may be done as early as six-to-eight weeks of age. The objective is to achieve 1½ lbs of starter intake for three consecutive days prior to initiating weaning. At 8-to-12 weeks of age, offer forage or other high-quality fiber sources along with a grain-based ration. A sound nutritional program will ensure that calves reach their genetic potential and that many problems later in the mature animals will be avoided (National Research Council, 2001). Calves will undergo changes as they switch from a milk/liquid diet to become fully developed ruminant animals using dry feed (Raising Quality Replacement Heifers, 2007). Calves should have continuous access to fresh water—or provided water at least twice a day or as necessary to maintain proper hydration that is free of contaminants or pollutants. The calf rations should provide the required nutrients, net energy, and net protein requirements for maintenance and growth found in references such as the National Research Council, 2001.

**ANIMAL HEALTH**

The dairy has a Herd Health Plan, developed in consultation with the herd veterinarian (or other knowledgeable professional such as a cooperative extension agent), which includes specific areas pertaining to newborn animals.

The Herd Health Plan (preferably written), developed in conjunction with a veterinarian through a Veterinarian/Client/Patient Relationship, should include information specific to the care of newborn animals. Topics in the Herd Health Plan relevant to

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**Signs to watch for in healthy calves:**

- Dry navel
- Ability to walk unassisted
- Alert ears and clear eyes
- Good body condition
- No signs of diarrhea
- Resuming a normal standing posture after standing and stretching
newborn animals include colostrum management (discussed above), navel dipping, identification and record keeping, and protocols for vaccination, dehorning, supernumerary teat removal, castration, tail docking and euthanasia.

Navel Dipping

Navels are dipped in an effective antiseptic solution as soon as possible.

Dip navels in disinfectant as soon as possible after birth. If the umbilical cord is not severed immediately after birth, it may be tied two to three inches from the calf’s body. Wet cords are entry points for pathogens into the calf’s body. An effective preventive treatment is to dip the navel repeatedly into a solution of chlorhexidine or tincture iodine (discard used solution).

Identification and Record Keeping

Animal identification and record keeping are critical for making important management decisions about feeding, grouping, selecting, medicating, breeding, and culling an animal from the herd. A newborn calf should be permanently identified. The National Dairy FARM Program recommends participating in the National Animal Identification System and using official 840-RFID eartags.

Protocols for Vaccinations

Vaccinations for common diseases are administered for disease prevention.

Medical procedures are performed as soon as possible and with appropriate use of analgesics and/or anesthetics.

Vaccinations should be administered to all replacement heifers, recording the date of each vaccination according to the Herd Health Plan (Raising Quality Replacement Heifers, 2007).

Dehorning

Dehorning or disbudding is performed to avoid injury to herdmates and personnel, reduce feeder space requirements, and increase handling ease. Dehorning should be done at the earliest age practicable. Disbudding is the preferred method of dehorning calves. Local anesthetic should be considered for other dehorning procedures. Producers who administer an analgesic during the disbudding process should be trained by a veterinarian in the procedure and have an SOP in place. Older calves are more difficult to restrain and handle, and the risk of blood loss, infection, and fly larvae infestation increases.

Supernumerary Teat Removal

Extra (supernumerary) teats may be removed from young heifer calves because they may interfere with milking and may leak, increasing the possibility of disease such as mastitis. This procedure should be conducted by a qualified person. Extra teats should be removed within the first six months of life with an emasculatome, a scalpel, or sharp scissors in a hygienic manner. Older calves or heifers should have teats removed under local anesthesia by a veterinarian. Precautions should be taken to avoid unnecessary pain or distress during the procedure and recovery. If calves go off feed, review processes and timing with a veterinarian.

Castration

Castration of young male calves reduces the chance of unplanned mating, venereal disease, and aggression against other animals and animal caretakers. Although various techniques are available, surgical castration prior to weaning is recommended (Morrow-Tesch, 2001). Castration should generally be done at the earliest age practicable, and certainly at less than four months of age. After four months of age, a licensed veterinarian should use a local anesthetic when performing operations. Elastrator rubber banding techniques have been associated with increased chronic pain and should be discouraged. High tension-banding systems may be used with appropriate veterinary supervision and/or training in those situations where
surgical castration may predispose to postsurgical complications. There are a number of acceptable castration techniques used by the cattle industry. The castration method used should take into account the animal's age and weight, skill level of the technician, environmental conditions, facilities available, and human and animal safety.

Tail Docking
Tail docking of dairy calves is not recommended. A thorough review of the scientific literature does not support anecdotal reports of the benefits of tail docking (AVMA 2006). Switch trimming is recommended as a preferred alternative to tail docking.

Euthanasia
At times, euthanasia for a newborn may be necessary to humanely deal with complications from birth or other conditions. Euthanasia should be consistent with recommendations from the American Association of Bovine Practitioners. (See Appendix B)

ENVIRONMENT AND FACILITIES

A clean, dry, well-lit, well-ventilated calving area is used.

Calves are housed in a clean, dry area with adequate space to stand, lie down, and turn around without difficulty.

Calves are protected from extreme temperatures, wind drafts, and precipitation during seasonal weather extremes.

A clean, dry, well-lit, well-ventilated calving area has many health benefits for the calf at the time of birth. Wet, dirty calving areas foster the growth of bacteria that can invade the newborn calf's navel or mouth and create a disease load that overwhelms the calf's naïve immune system. A separate calving area (maternity pen or paddock) that is designed to be comfortable, functional, and hygienic allows for close observation of the cow and easier, more effective assistance at calving. Patience and gentle firmness in handling calves and cows generate a better response than does force. Calves should be removed from the cow immediately to prevent transmission of diseases such as Johne's. Pens, corrals, or paddocks should be cleaned between calvings.

Signs to watch for in the calves' environment:
- Cleanliness of calving area (e.g., frequency with which bedding is changed).
- Clean, sanitized, dry, and well-ventilated housing facilities and pens.
- Availability of fresh, clean water and feed.
- If pastured, appropriate fencing, access to water, supplemental feed, and shade/shelter.
Calf and young stock should be given space to stand, lie down, and turn around without difficulty. Calves should be protected from extreme temperatures, wind, drafts, and precipitation during periods of inclement weather. During cold weather, ventilation in houses for newborn calves should maintain acceptable air quality in terms of water vapor and other pollutants without chilling the animals. Avoid drafts or direct breezes on young animals. A dry calf protected from wind can endure lower temperatures. Blankets can be used to keep a small calf warm to limit the amount of energy the calf uses.

Calf hygiene can be scored on a point system such as those described by the New York State Cattle Health Assurance Program (NYSCHAP, 2002) and Fulwider et al. (2007); this system can be used as an indicator of pen and facility cleanliness.

**HANDLING, MOVEMENT AND TRANSPORTATION**

- Calves are moved by lifting or walking.
- Personnel are trained to handle and restrain calves with a minimum of stress to the animal.
- Vehicles used to transport calves are clean, and properly designed and maintained.

Calves should be handled in a calm, controlled, and gentle manner. Employees should be properly trained in animal handling, and the consequences of inhumane handling should be known and enforced. Handlers should be assessed and retrained on a regular basis. Handling facilities, including trailers, must be well maintained and free of objects such as broken boards or rails that may cause bruising.

The animal in transit and the entire industry benefit from all appropriate early-care measures – clean, dry housing, protection from temperature extremes, a dry navel and treatment to prevent navel infection, and feeding of high-quality colostrum. To make certain that the value of these measures is not lost, producers should ensure that calves receiving proper care are not mixed in transit with those that did not.

The transit of calves should be safe, humane, and comfortable in order to ensure their health, quality, and market value. Workers should be trained to handle and restrain a calf with a minimum of stress to the animal. Calves should be moved on the dairy, on the truck, or in the auction market by walking or lifting them. Calves can be injured if they are dragged, pulled, or caught by the neck, ears, limbs, tail, or any other extremities, or if they are thrown.
Management should be prepared (and calf caretakers trained) for:

- Handling cows having difficulties calving.
- Observing time elapsed after calving (e.g., important for colostrum management) and time elapsed between calvings in any calving pen.
- Guaranteeing that calves have continual access to a source of fresh water or are watered at least twice a day or as necessary to maintain proper hydration.
- Guaranteeing that calves receive high-quality colostrum or colostrum replacer in a timely manner (identify the person responsible for checking colostrum quality, feeding colostrum, and saving excess colostrum).
- Guaranteeing that calves are given a palatable, high-quality starter ration offered within a week after birth.
- Monitoring calves at least twice daily and recording their health status.
- Maintaining daily records of the calves’ health and any medication used (dosage, duration of treatment, route of administration, compatibility of medications, and withdrawal times).
- Handling calves gently and firmly.

RESOURCES

Better Cows From Better Heifers
(A supplement to Hoard’s Dairyman, 2001)

Raising Quality Replacement Heifers
(DQA Center, 2007)

Raising Dairy Heifers
(A supplement to Hoard’s Dairyman, 1990)

Raising Dairy Herd Replacements
(University of Georgia, Ely and Guthrie, 2000)

Waldner, Recommended Vaccination Schedules
(Oklahoma State Program, 2002)

Castration and Dehorning of Cattle
(American Veterinary Medical Association, April 2008)

Welfare Implications of Tail Docking of Dairy Cattle
(American Veterinary Medical Association, April 2006)

Recommended Vaccination Schedules
(Waldner, 2002)

(AFIA Publications, 2008)

Monitoring Dairy Heifer Growth
Online at www.das.psu.edu/dairy/nutrition/pdf/ud006.pdf
(Penn State University, 1998)
Chapter 5 Nutrition

Animals should have access to feed and water on a daily basis, in a consistent manner, on a regular schedule, and according to their specific requirements. Rations should provide the required nutrients for maintenance, growth, lactation, and pregnancy (based on an animal’s life stage) as found in references such as the National Research Council, 2001.

Nutritional management is greatly improved when producers take the time to observe their animals to maintain uniform groupings, and give attention to animals that are lagging behind. Body condition scoring should be used to monitor the energy balance and nutritional condition of the herd.
WATER

Water is tested periodically if recommended by the Herd Health Plan (for example, for nitrates, pathogens, minerals, etc.).

Water is protected from freezing.

Procedures are in place for regular cleaning of waterers.

All animals have continuous access to fresh water or are provided water at least twice a day or as necessary to maintain proper hydration.

Waterers are positioned at a convenient height.

Watering locations prevent a dominant animal from limiting water to other animals.

Fresh, clean water is just as important to animals as nutritious forages and concentrates. When continuous access is impossible for other classes of animals besides lactating cows and non-lactating cows, make water available for 30 minutes at least twice daily. More frequent watering may be necessary, depending on the cow's feed intake and milk production, and the weather. Water should be prevented from freezing in cold weather (Murphy et al., 1983). (See Table 1)

Access to waterers—large tanks, troughs, buckets, or fountains—is essential for cattle to satisfy their need for water. Waterers should be convenient for the animals to reach on demand, and there should be sufficient waterers (number, size, and capacity) to accommodate the number of animals in the herd or lot (Hoehne et al., 1994).

Footing should be firm and dry in watering areas. Animals should not be able to wade in drinking water. Water should be fresh and free of harmful contaminants, especially human and animal waste, which may introduce pathogens into the human food chain.

FEED

Rations should provide the required nutrients for maintenance, growth, and lactation for the appropriate physiological life-stage as found in references such as the National Research Council, 2001.

Cows are not restricted from feed for more than four hours at one time.

Feed equipment is washed and disinfected after being used for non-feed purposes.

Feed for other species is never mixed with dairy animal feed.

Homegrown or purchased feed ingredients and commodities are checked for nitrates, mycotoxins, or other soil- or climate-induced problems, as recommended by the Herd Health Plan.

Feed considerations include nutritional quality and quantity, feed bunk design, and proper feed storage. Advances in ruminant nutrition science have greatly improved animal production. References such as The Nutrient Requirements of Dairy Cattle (National Research Council, 2001) should be used to provide the basis for ration formulation. To benefit from such research, producers should monitor feed quality and nutrient content of feed components. They should evaluate their protocols to assure that their feeding program meets the basic nutritional requirements for the animals' maintenance, growth, production, and reproduction. Qualified nutritional consultants normally assist in formulating rations that economically meet nutritional requirements of animals. Managers should:

• check that feed and feed ingredients are carefully mixed and formulated according to the animals' dietary needs;
• periodically weigh the amount of feed being offered to the animals to determine dry matter intake;
• adjust rations to assure the correct content of protein, energy, and micronutrients in feed whenever forages are changed; and
• adjust diets to provide for production level. Check feed quality to see if it matches the manufacturer’s statement.

Fence line feeding or feed bunks should give animals easy access to the feed. The design of feeders for comfort in eating is more important than the method in which they are fed. The daily removal of feeds not consumed will ensure freshness of feed, prevent mold and spoilage, and aid in insect control. This is a particularly important practice when high-moisture feeds such as silage are used. A smooth feeding surface will facilitate cleaning and should enhance dry matter intake. Feeding at floor level reduces feed tossing behavior and feed wastage. Feeding with the cow’s head down increases saliva output (Albright 1993). Feeders should be far enough from waterers to minimize contamination of water. Sprinklers should be pointing away from the feed bunk to avoid adding moisture to the total mixed ration (TMR). Adequate bunk space per cow should be available to allow every animal feeding a balanced diet per feeding cycle. Feed should be pushed up several times daily. Sanitation of eating areas will improve if caretakers check them several times each day and remove any feed not eaten daily.

TABLE 1. WATER CONSUMPTION OF DAIRY CATTLE.\(^a\)

<table>
<thead>
<tr>
<th>Class of Cattle</th>
<th>Age or Condition</th>
<th>Gallons Per Day(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holstein Calves</td>
<td>1 month</td>
<td>1.3 to 2.0</td>
</tr>
<tr>
<td>Holstein Calves</td>
<td>2 months</td>
<td>1.5 to 2.4</td>
</tr>
<tr>
<td>Holstein Calves</td>
<td>3 months</td>
<td>2.1 to 2.8</td>
</tr>
<tr>
<td>Holstein Calves</td>
<td>4 months</td>
<td>3.0 to 3.5</td>
</tr>
<tr>
<td>Holstein Heifers</td>
<td>5 months</td>
<td>3.8 to 4.6</td>
</tr>
<tr>
<td>Holstein Heifers</td>
<td>15 to 18 months</td>
<td>5.9 to 7.1</td>
</tr>
<tr>
<td>Holstein Heifers</td>
<td>18 to 24 months</td>
<td>7.3 to 9.6</td>
</tr>
<tr>
<td>Jersey Cows</td>
<td>30 lbs milk/day</td>
<td>13.0 to 15.5</td>
</tr>
<tr>
<td>Guernsey Cows</td>
<td>30 lbs milk/day</td>
<td>13.8 to 16.0</td>
</tr>
<tr>
<td>Ayrshire, Brown Swiss, and Holstein Cows</td>
<td>30 lbs milk/day</td>
<td>14.5 to 17.0</td>
</tr>
<tr>
<td>Ayrshire, Brown Swiss, and Holstein Cows</td>
<td>50 lbs milk/day</td>
<td>24.0 to 27.0</td>
</tr>
<tr>
<td>Dry Cows</td>
<td>Pregnant, 6 to 9 months</td>
<td>9.0 to 13.0</td>
</tr>
</tbody>
</table>

**WATER INTAKE FROM FEED AND DRINKING WATER**

Milk Cows  
4.5 to 5.0 lbs/lb milk produced daily

\(^{a}\) Adapted from Dairy Reference Manual, Pennsylvania State University.

\(^{b}\) Consumption at air temperatures of 50 to 80F, intake depends upon water content of the forage ration. Higher levels apply to an all hay ration. One gallon of water weighs 8.34 pounds. A cubic foot of water weighs 62.4 pounds.

Online at [http://www.ag.ndsu.edu/pubs/ansci/livestoc/as954w.htm](http://www.ag.ndsu.edu/pubs/ansci/livestoc/as954w.htm)
Safely store bulk supplies of feed in appropriately designed areas to avoid moisture, vermin, bacterial, or fungal contamination. Proper labeling of storage containers or areas, controlling moisture, and using an effective program of vermin control will help assure maintenance of feed quality and safety. Make sure medicated feeds are stored separately and are properly labeled. Store toxic compounds outside of the feed storage area and outside of the animals’ resting area. Safely store bulk supplies of feed in appropriately designed areas to avoid moisture and vermin, and bacterial or fungal contamination.

**SPECIFIC LIFECYCLE CONSIDERATIONS**

**Newborns**

Monitoring during the first 12 weeks of life is especially important because this is when the foundation is laid – determining how the calves will grow, develop, and eventually mature in the dairy herd. For more information refer to Chapter 4.

**Growing Animals**

Growing animal nutrition is very critical, and adequate bunk space should be available so all heifers have a nutritionally balanced diet per feeding cycle. The recommended space at the feed bunk is 6 inches for calves 4-to-11 months of age, 12 inches for calves 12-to-17 months, and 18 inches for heifers over 18 months of age. (Dairy Heifer Production, Penn State University, 2000).

**Milking Cows**

Lactating cows should have access to water at all times except when they are in the milking parlor or parlor holding pen.

**Dry Cows**

Non-lactating cows consume 3-to-5 pounds of water per pound of dry matter consumed, depending on environmental temperature. Working with a herd nutritionist, identify any mineral supplements needed to maintain the proper mineral balance for gestational growth of the calf and proper mineral metabolism in late gestation.

**Mature Bulls**

While most bulls do not remain on the dairy long enough to reach full maturity, long-term access to a lactating cow’s diet for bulls should be avoided so that mature bulls do not become overweight; this can lead to health problems such as lameness or injury to the bull or cow during breeding.

**RESOURCES**

Nutrient Requirements of Dairy Cattle
(National Research Council, 2001)

Dairy Reference Manual
(Penn State University, 1995)

Dairy Heifer Production
(Penn State University, 2000)


Body Condition Scoring in Dairy Cattle
(Elanco Animal Health, 1997)

Fresh Water Needs for Dairy Cows
Online at www.oneplan.org/stock/DairyWater.asp
(University of Idaho, 2009)
Chapter 6  Animal Health

The health of cattle on a dairy is an essential part of good husbandry and a well-being program. One of the foundations for animal well-being is the freedom from pain, injury, and disease. Disease is prevented by adherence to herd health, nutrition, and management programs that enhance well being. If disease is present, rapid diagnosis and treatment is instituted. A dairy maintains the health of the cattle by providing appropriate nutrition, housing, disease prevention, and detection along with well-designed treatment programs. These programs should be developed through consultation with a qualified veterinarian.
HERD HEALTH PLAN

An effective Herd Health Plan emphasizes prevention, rapid diagnosis, and quick decision-making on necessary treatment of sick or injured dairy cattle. A licensed veterinarian, or other appropriately trained consultant, can help producers develop and implement a routine Herd Health Plan. While a Herd Health Plan can be verbal, a written Herd Health Plan is preferred for clarity. A sample Herd Health Plan is available at www.nationaldairyfarm.com

The dairy has a Herd Health Plan, developed in consultation with the herd veterinarian (or other knowledgeable professional such as a cooperative extension agent), to prevent common diseases such as mastitis, lameness, metritis, metabolic diseases, displaced abomasum, and other infectious diseases such as pneumonia and infectious diarrhea.

The Herd Health Plan should include:
- Veterinarian/Client/Patient Relationship. (See Appendix I)
- Vaccination protocols.
- Daily observation of all cattle for injury or signs of disease.
- Protocols for newborn calf management. (See Chapter 4 text boxes)
- Protocols for cattle that develop disease or are injured.
- Protocols for prevention, detection, and action for common diseases, and parasite and pest control.
- Protocols for non-ambulatory animal management. (See Chapter 9 text box)
- Protocols for euthanasia. (See Appendix B)
- Protocols to ensure food safety.
- Training programs for family members and employees involved in detecting disease and injury, and reporting the cases and actions to be taken.

Each animal should be permanently identified and an effective record keeping system employed for animal care and management decision-making.

ANIMAL MONITORING

Even with the best prevention programs, animals can become sick or injured. Observation is key to identifying health issues early in order to provide effective treatment.

Animals are observed daily to assess the following items:
- Hair coat
- Behavior changes (includes vocalization)
- Abnormal respiration
- Feed and water consumption
- Nasal or ocular discharges
- Abdominal fill
- Manure consistency
- Locomotion
- Milk abnormalities

Storage and Care of Medicinal Agents (from the Center for Dairy Excellence)

- Observe and obey the manufacturers recommended storage instructions for each animal health product.
- Where refrigeration is needed, be sure it is kept clean and located in a safe place – not likely to be overheated or contaminated by dirt or grime.
- Animal health products should be stored away from feed ingredient or mixing areas unless regularly mixed with feed additives.
- Storage of partially used medication or vaccine bottles is discouraged because they may become contaminated and could cause infections or tissue reactions, if re-used.
SANITATION

Ninety percent or more of animals in all pens or groups should score less than 3 on the NDFP Hygiene Scorecard (1 is clean; 4 is dirty). (See Appendix C)

Proper sanitation and waste management keep animals dry, and clean and free of manure and provide them with comfortable, healthful surroundings. In contrast, poor sanitation contributes to many animal health problems. The goals of sanitation for animal facilities are to:

- Minimize animal disease through clean facilities.
- Minimize generation of odors and dust
- Minimize pests and parasites
- Minimize spread of pathogens

Basic sanitation practices include keeping the interiors, corridors, and storage spaces of animal facilities clean, cleaning waste removal implements frequently, and emptying waste containers. Facilities should be free of standing water, excess manure, unnecessary farm items, and clutter.

Sanitation may be achieved by heat, chemicals, or high-pressure washing, or by manually scrubbing equipment and surfaces in the facilities with appropriate detergents and disinfectants.

A practical program of effective cleaning and disinfection minimizes pathogens in the environment. It is recommended that producers clean and disinfect equipment such as bucket loaders, scrapers, and shovels, routinely. Feed and bedding should be clean. Personnel dealing with animals should maintain a level of cleanliness to minimize the spread of pathogens. If a serious pathogen has been identified, it is best to consult with your veterinarian on the most appropriate sanitation process to use. This is likely to include disinfection of the animals’ immediate environment and thorough cleaning of enclosed housing facilities, followed by chemical disinfecting. Dry-lot facilities may need to be scraped and refilled with uncontaminated materials. Removal of cattle for a short time may be a means of eliminating muddy areas in pastures.

Manure should be removed regularly from facilities and freestalls. At least daily scraping or flushing of traffic areas and walkways improves sanitation and traction. Individual freestalls should be cleaned and groomed daily. Sand or other products provide excellent materials for maintaining sanitation of animals.

LOCOMOTION

Ninety percent or more of the herd score 2 or lower on the locomotion scorecard (1-normal gait, 5-refuses to bear weight on one leg). (See Appendix D)

Foot care is important to the well-being of all cows. Lameness will interfere with movement to the milking, feeding, and watering areas, limit the exhibition of estrus, and influence general health. Routine examination and trimming of hooves can help prevent foot problems and infections. Where possible, avoid exposing animals to sharp rocks, muddy ground, broken concrete or concrete with exposed rocks, and avoid exposure to wet manure. Improper feeding, improper hoof trimming, and inadequate wearing of the hooves can lead to foot damage and should be corrected. Antiseptic footbaths, properly maintained and located, may prevent potential outbreaks of foot infections. Whenever lameness (measured by

Parasite Control

Some parasitic infections, such as coccidiosis and cryptosporidiosis, can cause serious health problems. It is recommended that a regular parasite control program be developed with a veterinarian’s assistance. A clean environment is the best tool for combating parasite infections. As with vaccinations, products to control parasites should be used according to the manufacturer’s specifications and, if necessary, under supervision of a veterinarian. All guidelines for use and withdrawal times should be carefully followed.
A popular system developed by the University of California puts special emphasis on the cow’s back posture (UC Davis, Berry and Robinson, 2001) to determine extent of lameness. Observe the cows standing and walking on a flat surface. Those cows that walk or stand with a level back are given a score of one (1). A five (5) is assigned to a cow with a reluctance or inability to bear weight on one or more limbs or feet (UC Davis, Berry and Robinson, 2001).

**BODY CONDITION SCORING (BCS)**

- Ninety percent or more of the dairy animals should have a body condition score between 2.0 and 4.0 with no more than five percent of the dairy animals below 2.0 (1.0 is thin and 5.0 is over-conditioned). (See Appendix A)

Achieving growth targets for heifers and monitoring change in body condition during gestation and lactation are very important. Body condition can change rapidly at and after calving and should be used to guide ration changes.

Body condition scoring for dairy cattle is an important management tool for optimizing milk production and reproductive efficiency while reducing the incidence of metabolic and other peripartum diseases. Over-conditioning at the time of calving (BCS > 4) often results in lower feed intake and increased incidence of peripartum problems. Cows should not lose more than 1.0 body score during early lactation.

**HOCK LESIONS**

- Ninety percent of cows score 1 and 99 percent score 2 or less utilizing the NYSCHAP “Hock Assessment Chart for Cattle” assessment (1 – no swelling, 3 – swelling evident). (See Appendix E)

Hock lesions (swelling, abrasion, and even ulceration) are an important indication of inadequate bedding and lack of animal comfort. Dairy farms with a higher

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**Pest Control**

Pest control is part of a herd health program because vermin transmit diseases and interfere with the animals’ comfort. Producers should adopt procedures to control flies, mosquitoes, lice, mites, ticks, grubs, fleas, rodents, skunks, and pest birds (e.g., starlings, pigeons, and sparrows). One method of controlling rodents and pest birds is to restrict their entry into the animal facility even though they quickly adapt to opening of doors. Use screens with one-half-inch mesh on building openings and three-quarters-inch mesh on ridge vents. Apply sealer to cracks and eliminate breeding, nesting, roosting, and refuge sites for birds. Fly and insect populations should be monitored and controlled. Use pesticides in or around animal facilities only as approved and only when necessary. Exercise particular caution to avoid contaminating feedstuffs, as contaminants may pass into the animals’ bodies and milk. A certified pesticide applicator or a pesticide service may be used. In some regions, rabies and other diseases are spread to dairy animals by skunks, raccoons, foxes, bats, and other wildlife. Veterinarians should teach animal caretakers about the signs of these diseases in both wildlife and cattle and how to handle and report potentially diseased animals. If cats and dogs are kept on the facility, be certain that their rabies immunization status is current (Parasites and Pests—Management for Profit, 2000).
prevalence of hock lesions also tend to have a higher number of lame cows. A healthy hock is free from hair loss (the hair coat is smooth and continuous with the rest of the leg) and swelling. Skin breakage provides an opportunity for infection to occur, which can lead to swelling, discomfort, and possibly lameness. The incidence of hock lesions is reduced with adequate bedding and proper stall design (length and width of stall, and stall partition placement). A consistent method of scoring hocks for swelling and hair loss (NYSCHAP “Hock Assessment Chart for Cattle) can help assess the need to modify stall management.

**SPECIFIC LIFECYCLE CONSIDERATIONS**

**Growing Animals**

Growing animals typically do not need to have their feet trimmed. However, animal foot health should be regularly observed to detect infectious causes of lameness or injury.

**Breeding Heifers**

Heifers should be in good health and condition when they are bred. Although the typical age to breed heifers is between 13 and 15 months of age, heifers may grow at different rates. *(See Table 2)*

**Springing Heifers**

A general guideline is for the heifer to weigh 60 percent of the desired mature weight at breeding. This amounts to approximately 800 to 875 pounds for large breed heifers and allows the heifer, if fed satisfactorily, to calve at 1,250 to 1,350 pounds. *(See Table 3)*

**Mature Bulls**

Mature dairy bulls are known to be aggressive towards humans. Workers should be trained in safety issues when mature bulls are housed with the milking herd. Bulls should be rested and rotated into breeding pens. To ensure breeding soundness, proper foot care should be given to bulls to prevent claw lesions, injuries, and hairy heel warts.

Have the herd veterinarian conduct a breeding soundness examination on dairies where facilities are adequate to safely restrain the bulls. This examination includes a microscopic examination of semen quality and a complete physical examination, including evaluating the bull for signs of testicular and other reproductive abnormalities. Bulls should also be tested for venereal diseases (if a bull infects cows during breeding, this can result in abortion).

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**Table 2. Suggested Weight and Heights for Breeding-Age Heifers**

<table>
<thead>
<tr>
<th>Breed Bodyweight (lbs.)</th>
<th>Height at withers (in.)</th>
<th>Hip Height (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jersey (525 to 575)</td>
<td>43 to 45</td>
<td>45 to 47</td>
</tr>
<tr>
<td>Ayrshire (700 to 750)</td>
<td>46 to 48</td>
<td>48 to 50</td>
</tr>
<tr>
<td>Guernsey (700 to 750)</td>
<td>46 to 49</td>
<td>48 to 51</td>
</tr>
<tr>
<td>Milking Shorthorn (750 to 800)</td>
<td>46 to 48</td>
<td>48 to 50</td>
</tr>
<tr>
<td>Holstein (750 to 800)</td>
<td>48 to 50</td>
<td>50 to 52</td>
</tr>
<tr>
<td>Brown Swiss (750 to 800)</td>
<td>48 to 51</td>
<td>50 to 53</td>
</tr>
</tbody>
</table>

Penn State University. Growing Dairy Heifer Guide, pg. 12
Online at [http://www.das.psu.edu/dairy/nutrition/pdf/ud006.pdf](http://www.das.psu.edu/dairy/nutrition/pdf/ud006.pdf)
Table 3. Guidelines for Weights and Heights of Dairy Heifers

<table>
<thead>
<tr>
<th>Age (Months)</th>
<th>Weight (lbs)</th>
<th>Height a (In.)</th>
<th>Weight (lbs)</th>
<th>Height a (In.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>96</td>
<td>29</td>
<td>55</td>
<td>26</td>
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<tr>
<td>2</td>
<td>170</td>
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<td>4</td>
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<td>34</td>
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<td>6</td>
<td>370</td>
<td>44</td>
<td>275</td>
<td>39</td>
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<td>8</td>
<td>500</td>
<td>46</td>
<td>385</td>
<td>41</td>
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<td>10</td>
<td>600</td>
<td>48</td>
<td>460</td>
<td>43</td>
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<tr>
<td>12</td>
<td>700</td>
<td>50</td>
<td>520</td>
<td>44</td>
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<td>14 b</td>
<td>800</td>
<td>51</td>
<td>575</td>
<td>45</td>
</tr>
<tr>
<td>16 b</td>
<td>900</td>
<td>52</td>
<td>650</td>
<td>46</td>
</tr>
<tr>
<td>18</td>
<td>990</td>
<td>53</td>
<td>730</td>
<td>47</td>
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<tr>
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<td>1050</td>
<td>54</td>
<td>800</td>
<td>48</td>
</tr>
<tr>
<td>22</td>
<td>1175</td>
<td>55</td>
<td>875</td>
<td>50</td>
</tr>
<tr>
<td>24</td>
<td>1300</td>
<td>56</td>
<td>960</td>
<td>51</td>
</tr>
</tbody>
</table>


Source: University of Wisconsin

a Height at withers.
b Target breeding age if heifers are at approximately these weights and heights.

**RESOURCES**

(Carlson, 2009)

Biosecurity—Foundation for Food Security and Food Safety
(Carlson, 2008)

Raising Quality Replacement Heifers
(Carlson, 2007)

Parasites and Pests—Management for Profit
(Carlson, 2000)

Top 10 Considerations for Culling and Transporting Dairy Animals to a Packing or Processing Facility
(NMPF, DMI, & AABP, 2008)

Understanding Dairy Cattle Behavior to Improve Handling and Production, a video
(National Institute of Animal Agriculture, 1992)
Chapter 7  Environment and Facilities

Proper management of the environment enhances animal production performance and minimizes animal disease, death loss, and behavioral problems. Dairy cattle are bred for growth, production, and reproduction in a variety of environments to which they can readily adapt. Facilities include all housing structures, handling structures, lots, pens, stalls, alleys, and pastures that are inhabited by cattle of any age and health status. Facilities should allow for natural animal movement and social interaction. Facilities should provide sufficient protection from temperature extremes. Feed and water should be provided within an area that is accessible to cattle. The structural integrity of the facility should not compromise the safety and well-being of the animals.
**ANIMAL ENVIRONMENT**

**Temperature**

*Practices are in place to minimize the impact of heat and cold stress due to extremes in temperature; tools include the use of sunshades, sprinklers, misting fans, dietary alterations, and windbreaks.*

Environmental temperature affects an animal’s comfort which, in turn, affects an animal’s behavior, metabolism, and performance. The temperature that the animal experiences and the effect on the animal is the net result of air temperature, humidity, air movement, shade, insulating effects of the surroundings, and the animal’s age, sex, weight, adaptation status, activity level, posture, stage of lactation, body condition, and diet. The range of environmental temperatures over which an animal uses the minimum amount of metabolic energy to control body temperature is called the thermoneutral zone, also referred to as its comfort zone. Research has shown that an adult dairy animal can adjust the upper and lower limits of its comfort zone by as much as 36 degrees Fahrenheit in response to cold and heat stress (Webster et al., 1970). Environmental temperatures may be temporarily cooler or warmer than the comfort zone without compromising either the animal’s overall well-being or its productive efficiency over the long term, but will lower productive efficiency in the immediate term.

Even though cattle are adaptable and can thrive in almost any region of the world, they should be protected from heat and cold stress caused by extreme weather events. They should have access to shelter even in moderate climatic regions. Heat stress adversely affects animal comfort more than does cold stress. Windbreaks, sunshades, or solid-roofed shelters are needed if trees or other landscape features do not provide adequate protection from winter storms and extremely cold or hot temperatures. The animal is the best sensor, and heat stress may be measured by respiration rate. Cattle do little sweating; they lose heat mainly through respiration and eventually, panting.

On hot days, one should count the breaths per minute of a representative number of cattle to see if they exceed the rate of 80 (Elstein, 2002). During hot weather, sunshades, sprinklers, misting fans, and other methods of cooling, as well as dietary alterations, will reduce heat stress and prevent a decrease in milk production. (Roman-Ponce et al., 1977; Hahn, 1981; Shultz, 1984; Bray et al., 1994; Armstrong and Welchert, 1994, UC Davis, 1998).

Heat stress can negatively affect the cows and be very costly to a producer. In hot temperatures, cows have to use energy to cool off through heat loss by means of surface skin and the respiratory tract. The effects of heat stress are: increased water intake, respiration rate, and sweating; decreases in dry matter intake, blood flow to internal organs, and milk production; slower rate of feed passage; and poor reproductive performance (Jones and Stallings, Virginia Cooperative Extension. 1999). Various cooling methods, such as providing sunshades, may be employed. Either natural or artificial shade can help alleviate heat stress. Other cooling methods, such as evaporative cooling pads, misters, foggers, sprinkling systems and fans, are also suggested. Adjusting the diet and ensuring there is plenty of cool, fresh, clean water can also help animals cope with heat stress. Cows may increase their water intake by five-to-six gallons per day on hot days. To help reduce heat stress around milking time, cows should only be in the holding pen for up to one hour prior to milking. The holding pens should be covered to protect the cows from direct sunlight. Sprayer systems and fans may also be used in the holding pens.

**Air Quality**

*Airborne particles are minimized as a way to reduce odors and dust.*

Air temperature, humidity, quality, and movement should be monitored carefully, especially during seasonal changes, to ensure animal comfort and prevent diseases. Humidity (the water vapor pressure in the air) influences the animal’s ability to maintain its thermal balance. Relative humidity, which is ordinarily
used to measure the air’s moisture content, is easily determined. The relative air flow between animal and service areas in animal housing is an important consideration for reducing airborne transmission of disease agents or air impurities. Air quality affects the health and well-being of the animal and its caretakers. Quality is typically defined in terms of the air’s content of certain gases, particulate matter, and liquid aerosols. Five primary impurities are found in animal facilities: ammonia, hydrogen sulfide, carbon monoxide, methane, and airborne dust. Government standards for these impurities have not been established for many agricultural animals.

Compared with humans, animals can tolerate higher levels of inert, airborne dust without discernible detriment to health or well-being (Curtis and Drummand, 1982). However, airborne dust is important to control because microbes and pollutant gases attach to the dust. Ways to lower airborne dust concentrations are to:

- increase the relative humidity;
- add fat or oil to concentrate feeds; and
- control animal activity and air velocity which, at high levels, stir up more dust particles and keep them suspended longer.

Further control of microbes in the air can be achieved by segregating or isolating animals with highly contagious diseases. Care should be taken to ensure that the ventilation system does not move air from infected animals to an area occupied by healthy animals. Other ways to improve air quality are with waste management, husbandry practices, and good air movement (i.e., ventilation).

Adequate ventilation, be it natural or mechanical, helps to prevent respiratory and other diseases by removing heat, water vapor, air pollutants, and odors from an enclosed animal facility at the same time that it introduces fresh air. Ventilation also modifies the indoor air temperature, but supplemental heating and cooling may be needed when temperature control is critical. The increase in temperature in a building can be controlled by the rate of air movement (i.e., the ventilation rate). The rate should be 10 times higher in summer than in winter. Other factors that influence the desired ventilation rate are water vapor, heat, and (indirectly) odorous matter released from animals, equipment, and certain husbandry practices. A ventilation rate calculated on the basis of animal weight is more accurate than a rate based on air-exchange rate guidelines.

Dairy barns with open sides (curtains) and open ridges help expedite air movement, and eliminate moisture, heat, and gases (UC Davis, Stull, 1998). Ventilation system design and operation are now well understood. Technical guides can help determine how often to adjust ventilation and the type of ventilation to use in a free-stall barn, stanchion or tie-stall barn, maternity area, feeding area and calf barn (Curtis, 1983; Hinkle and Stombaugh, 1983; Midwest Plan Service, 1985; Holmes and Graves, 1994; Tillotson and Bickert, 1994).

**Lighting**

*Adequate lighting is in place to allow inspection of animals and to provide safe working conditions.*

Lighting should allow inspection of animals and provide safe working conditions. In facilities where animals are routinely observed or handled, such as for milking or estrus observation, lighting should be diffused evenly. An outdoor light attached to a corral or building where animals congregate provides sufficient illumination for safety purposes. A time-controlled lighting system can provide a diurnal lighting cycle and may be desirable in indoor facilities. Variable-intensity lighting can be used to make light intensities consistent with energy conservation, the needs of the animals (as they are understood) and the illumination needs of personnel working in animal rooms. Sufficient lighting helps workers see the animals and detect any problems (UC Davis, Stull, 1998). Precise lighting requirements are better known for reproduction and productive performance in some animal species, but are not known for the maintenance of good health and physiologic stability for most animals (Peters, 1994).
Noise

Quick movements and alarming sounds are avoided while working around animals.

Noise ordinarily experienced in agricultural facilities has little permanent effect on the production performance of dairy animals. Scientific research suggests that stress from fright may be more pronounced when an object is seen rather than heard. For example, disturbances by visitors can reduce milk yield. In contrast, music in the cows’ environment may produce a calming effect and stimulate milk let-down. Loud or alarming sounds can startle cows, causing erratic behavior (UC Davis, Stull, 1998). Acceptable noise intensities are not well established, but noise perception varies between cows of the same or different breeds (Albright, 1992).

Stray Voltage

Stray voltage in the animals’ environment may be indicated by unusual animal postures or behaviors, such as reluctance to enter an area, or by a sudden drop in milk yield (Agricultural Research Service, 1991). Other signs include lapping at water, uneven milk-out, and an increase of unresponsive clinical mastitis cases. When stray voltage problems are suspected, help is available to identify the problem. To solve the problem, contact a veterinarian, a local licensed farm electrician, the engineer for the local power supplier, an agricultural engineer, extension dairy specialist, milking equipment dealer, or milk plant field personnel. Symptoms associated with problems of stray voltage or electrical current are not unique. Many factors other than stray voltage or electrical current can cause similar problems in behavior, health, or milk production (Gorewit, et al, 1992).

FACILITIES

Routine observation of facilities includes monitoring and taking action for:

- Manure removal.
- Moisture collection on roof or walls or frequent condensation on other hard surfaces.
- Certain parts of building where animals refuse to rest or sleep.

- Slips and falls, including installing nonslip walkways or alleys.
- Cleaning all fans regularly.
- Facility sanitation and waste management programs resulting in clean animals (90 percent of animal pens or groups score less than 3).

(See Appendix C)

Stanchions/Tie Stalls

- Animals are turned out daily for exercise (weather permitting).
- Animals have room to stand and lie down (see specific guidelines for breed, size).
- Animals have room to stretch, eat, drink, and eliminate comfortably.
- Manure is removed on a routine basis.

Freestalls

- Bedding is refreshed (remove soiled sand or other bedding material), and fresh bedding is added on a routine basis.
- Stalls provide appropriate space to match size/breed of animal.
- Water space, feed space, and shelter are provided for each animal housed.
- Stocking rates allow for adequate time per animal for rest, exercise, and feed and water consumption.
- Lunge space is provided to aid animal movement.
- Air movement and/or sprinkling systems are provided for animal comfort.

Open Lots and Pastures

- Management practices are implemented promptly so animals can avoid standing in mud after rains.
- Animals can access shade during periods of heat stress or windbreaks during periods of cold stress.
Dairy animals use a variety of resting, feeding, exercise, handling, and transportation facilities throughout their lives. Under ideal conditions, cows normally lie down for approximately 14 hours a day. Other hours (40 percent) are spent eating, drinking, grooming, etc. To make all facilities safe and comfortable for the animals, there should be adequate space or floor area per cow, proper maintenance to remove any sharp or broken objects that may cause injuries, clean and dry bedding (if used), and non-slip flooring with minimal, if any, mud. Additional requirements for feed bunks, waterers, pre-milking holding areas, walkways between holding areas, loading areas, and transport vehicles will be discussed in other sections of this guide.

Housing facilities range from fenced pastures, corrals, and exercise yards with shelters to insulated and ventilated barns with special equipment to restrain, isolate, and treat animals. Generally, corrals and sunshades are used in warm, semi-arid regions; pastures and shelters are common in warm, humid areas; naturally ventilated barns with free stalls are used widely in cool, humid regions; and insulated and ventilated barns with tie stalls are common in colder climates (American Society of Agricultural Engineers, 1983; Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching, Federation of Animal Science Societies, 1999).

Floor space

The floor space available to a dairy cow affects her comfort. An adequate amount of space helps prevent injury, unhygienic conditions, and behavioral problems. Overcrowded animals may experience weight loss, lower milk production, and increased aggression. Many physical elements affect the amount of space sensed, perceived, and used by animals in enclosed housing systems. Producers need to assure that the animals have enough room to stand, lie down, stretch their legs, eat, drink, and eliminate comfortably. When animals lie down, their hind legs should not extend into common traffic areas, curbs, or gutters.

When tie stalls or stanchion barns are used, cows should be turned out on a daily basis, except when prevented by severe weather. Providing daily exercise and freedom of movement for dairy cows will help improve estrus detection and thus improve reproductive efficiency.

Allowed out of doors, cows are more likely to groom themselves and each other, sun themselves, and exhibit overall health and well-being (Albright, 1994). A general rule for stanchion and tie-stall floor space is that the area should be at least as wide as twice the hip width of the animal and as long as approximately 1.25 times stall width.

Determination of area requirements for dairy cows should be based on breed, body size, stage of life, behavior, health, weather conditions, and the planned frequency of cleaning and bedding practices. Increased frequency of cleaning and bedding can make smaller facilities quite comfortable for the animal.

Not all animals in a freestall environment want to be in a freestall at one time. Ample feed and water space is very important. Many producers provide one stall per animal, especially in hot weather conditions, or if the building has more than four rows of stalls, or if cows are milked twice a day.

Features inside an enclosure (enclosure shape, floor type, ceiling height, locations, and dimensions of feeders and waterers) should also be considered when determining an animal’s space requirement (McFarland and Gamroth, 1994). Consult with an agricultural engineer or your veterinarian for specific recommendations for your operation. (See Table 4)

Bedding

Dry, clean bedding keeps animals dry and insulates the udder against cold temperatures and pathogens. Appropriate bedding materials and manure removal help prevent mastitis.
Bedding should be of sufficient quantity and changed often enough to prevent animal waste from creating wet unsanitary conditions. Bedding material that is absorbent or well-drained, free of toxic chemicals or residues, and of a type not readily eaten by the animals, minimizes injuries to the animal and to the caretaker. Any permanent stall surfaces, including rubber-filled mats, should be cushioned with dry bedding.

Flooring

Roughened, nonabrasive flooring prevents animals from slipping, which can result in broken legs or crippling injuries. Skid-resistant working surfaces reduce injuries and increase mobility to water and feed, are easily cleaned and maintained, and must retain their non-slip characteristic after cleaning, scraping, or wear (Stull, 1998).

When concrete flooring is used, it can be roughened by making grooves. The dairy industry standard is to score concrete with grooves 3/8-inch deep, ½-inch wide, and approximately three-to-four inches apart. The grooves should be designed in a pattern to prevent slipping; a diamond pattern is recommended for high-traffic areas. Using a proper mix of concrete and setting of the surface texture will do much to prevent cows slipping and the wearing of animals’ feet (Albright, 1994).

Mud represents a significant physical obstacle with animal health consequences. Producers who make an effort to keep cows out of mud will increase the animal’s productivity and reduce the risk of infection to feet and udders. Mud decreases the animal’s ability to obtain feed and water. It also increases the animal’s nutritional needs, because when animals move through mud, they use energy and protein. Animals should not stand in mud over their dew claw. All animals should have the opportunity to lie down on dry areas.

Social Environment

The social environment of dairy animals is important because the cows operate within a herd structure and follow a leader. Lactating cows are moved and handled daily. Cows are gregarious and usually do not like to be isolated. They are creatures of habit and do not like new situations (UC Davis, 1998). Where possible, producers should manage the animals’ physical environment to allow animals in stanchions or stalls to view one another and animal care personnel. Handling several cows or calves together rather than individually will ease movement, lessen stress and anxiety, and require less restraint for medical treatment or artificial insemination (Albright, 1994).

Producers can reduce aggression in an established herd by minimizing changes to its composition and by controlling the manner in which new animals are introduced to the herd (Albright, 1994).

Table 4. Freestall Dimension

<table>
<thead>
<tr>
<th>Animal weight (lb.)</th>
<th>Freestall length Side lunge/forward lunge&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Neck rail height&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Curb to neck rail and brisket board (In.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>800-1,200</td>
<td>6’ - 6’</td>
<td>7’ 6” to 8’ 0”</td>
<td>62</td>
</tr>
<tr>
<td>1,200-1,500</td>
<td>7’ - 0”</td>
<td>8’ 0” to 8’ 6”</td>
<td>66</td>
</tr>
<tr>
<td>over 1,500</td>
<td>7’ - 6”</td>
<td>8’ 6” to 9’ 0”</td>
<td>71</td>
</tr>
</tbody>
</table>

<sup>a</sup> An additional 12” to 18” in stall length (compared to side lunge stalls) is required to allow the cow to thrust her head forward during the lunge process.

<sup>b</sup> Above top of curb or top of mattress (Midwest Plan Service, 2000).
Management of Facilities

Properly designed and maintained facilities operated by trained personnel greatly facilitate efficient movement of animals. Fences and gates should be made of strong, smooth material and be devoid of sharp objects that can cut, puncture, or bruise an animal. Their height and ground clearance should prevent animals from trying to go over or under them.

Fences should hold animals in designated areas. Corrals, holding pens, and feeding areas are generally permanently fenced, whereas temporary electric fences are often used around pastures.

Gates should let an animal easily pass through. It is beneficial to locate gates in the corners of pens. Install them to swing inward and outward so that the animals can easily enter or leave the pen. The latching mechanism on gates should be foolproof so that animals cannot open the gate. The latching mechanism on a stationary post should not create a sharp point when the gate is open, because this may injure passing animals.

SPECIFIC LIFECYCLE CONSIDERATIONS

Dry Cows

Non-lactating cows may be housed in groups. Corral space, resting area size, and protection from weather vary, depending on cow numbers, climate, and waste management considerations.

New Animals

To maintain a biosecure facility, it’s important to quarantine new animals before allowing them contact with other animals. New animals should be segregated or quarantined, based on veterinarian recommendations in the Herd Health Plan for a length of time sufficient to obtain test results.

Mature Bulls

Mature bulls when housed with the milking herd should have access to a clean, dry area for resting. Whenever bulls are separated from the herd and housed in individual pens the bull pens should be maintained so that the bull has access to a clean, dry area for resting.

RESOURCES

Dairy Freestall Housing and Equipment
(Midwest Plan Service, 2000)

Dairy Systems for the 21st Century
(American Society of Agricultural Engineers, 1994)

Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching
(Federation of Animal Science Societies, 1999)

Calf and Heifer Housing Special Circular 303
(The Pennsylvania State University, Cooperative Extension Service)

Effect of Flooring and/or Flooring Surfaces on Lameness Disorders in Dairy Cattle
(Shearer and Van Amstel, March 2007)
Cattle are to be handled in a calm, controlled, and gentle manner. Employees should be properly trained in animal handling and the consequences of inhumane handling should be known and enforced. Handlers should be assessed and retrained on a regular basis. Prods, canes, and other extreme cattle handling aids should only be used in situations that may potentially cause harm to the handler or the animals. Cattle should be moved in a manner that reduces the risk of slips and falls.
ANIMAL COMFORT

*Individuals working in animal movement are trained on the principles of flight zones and flight distances to know the importance of controlling the animal movement in lanes, alleyways, and other parts of the complex.* (See Appendix F)

When handling and transporting dairy animals, the animals’ comfort and safety, as well as the caretaker’s safety, are the primary concerns associated with animal well-being. Producers must ensure that animal caretakers are trained and qualified in proper handling techniques and in the appropriate use of restraint equipment. When using any handling device, abuse must not be tolerated. In addition, producers should ensure that an adequate number of caretakers are available to perform assigned tasks. Injuries can be prevented if facilities are properly designed and maintained.

Animals should be handled humanely at all times. Routine contact with humans from birth, including regular gentle handling, will reduce fear and flight distance, make observation and treatment easier, and enhance animal well-being and productivity. Cattle should be moved at a slow walk, particularly if the weather is hot or humid and if the flooring is slippery. It is particularly important to control the herd’s speed in lanes and alleyways to prevent crowding or crushing at corners, gates, and other narrow places in a facility (Grandin, 2000).

To prevent startling of cattle when approaching from the back, a gentle voice is calming. Cattle have panoramic vision, except directly behind them. Moving animals should be done calmly. Do not force animals to move faster than a walk. Excited animals have increased levels of natural stress hormones, which can reduce the quality of milk and meat and increase susceptibility to disease (Stull, 1998).

EQUIPMENT

Animals should be handled by equipment appropriate for the procedure. Use of flags, plastic paddles, and a stick with ribbon attached to it are appropriate for handling animals that refuse to move through facilities, but only if minimal force is applied. Any force used must be applied calmly. Dairy animals are creatures of habit and can sense when something different is happening or about to happen. Excessive or routine slapping or prodding indicates an underlying problem that requires management attention and correction. The problem may be (1) the caretaker may be too anxious or inadequately trained in proper animal handling techniques, (2) the facility may be designed improperly, or (3) the animal may be sick or injured. The first problem may be corrected by additional training so that the caretaker understands animal behavior and uses acceptable handling techniques. Addressing the facility design problem may be as simple as completing mechanical improvements on fences and gates or making general repairs (Grandin, 2000).

In all cases, use the least amount of force necessary to control the animal and still ensure the safety of herdmates and caretakers. Aggressive behaviors in dairy cattle can be modified and their impact reduced by using acceptable practices and restraint devices (e.g., palpation rails, head chutes, squeeze chutes, and stanchions). Preferably, use equipment with emergency release devices. (Palmer, 2002).

LOADING AND UNLOADING

Animals should be loaded and unloaded for transit in a manner that minimizes stress and anxiety. The process of being moved, especially if it involves a loading chute, is a novel and potentially stressful experience to many animals. Three measures should be taken to minimize stress: (1) train caretakers in proper loading and unloading practices, (2) properly locate and design loading areas, and, (3) minimize the number of directional changes an animal must take (Grandin, 2000).
Caretakers should observe proper loading densities and plan to load or unload animals at the time of day that is best for moving the animals. Animals grouped together for the first time should not be crowded or otherwise stressed. Sufficient labor and appropriate equipment should be available for loading or unloading animals. Sick or injured animals require special handling.

Animals should be transported before they become infirmed or at increased risk of becoming non-ambulatory during transportation. Near-downer animals are euthanized on farm and never shipped to a processing facility.

Loading areas should be located near hospital pens and roads and be accessible in all kinds of weather. Loading ramps should not exceed a 25-degree angle. Ramps should provide nonslip flooring for good footing. They should be equipped with wing gates and a self-aligning bumper to prevent animals from stepping down between the ramp and the truck or from getting stuck between the side of a chute and the truck. If at all possible, eliminate the use of inclined loading chutes. Loading and unloading facilities should be designed to minimize the number of directional changes an animal must take. Animals should not be forced to walk toward apparent dangers, such as a change in light intensity, that are likely to cause avoidance behavior. Because of poor depth perception, cattle have difficulty discriminating between a shadow or a hole in the ground and hence will balk at shadows. Because cattle have wide-angle panoramic vision and poor depth perception, facilities should have curved paths, be uniformly illuminated, and be a uniform color and texture to avoid sharp contrasts and shadows that may impede cattle flow. Single-file chutes, crowding pens, and other areas where cattle are crowded should have high, solid fences to prevent the animals from observing people, vehicles, and other distracting moving objects outside the facility (Grandin, 1988).

**TRANSPORTATION FACTORS**

- The dairy uses the “Top 10 Considerations for Culling and Transporting Dairy Animals” in handling and transportation decision-making. (See Appendix G)

Transportation factors related to animal well-being include: facilities that are safe and comfortable to the animal, in-transit care provided by knowledgeable crews and drivers, uniformity of the animals loaded, and duration of the trip. The Master Cattle Transporter Guide provides an extensive educational program on all aspects for transporting cattle.

**Trucks and Trailers**

Trucks and trailers have an impact on animal care. Even though transport vehicles are not stationary, they are facilities that require the same type of safety and comfort features of other facilities. These include:
1. Clean/disinfected truck or trailer when moving young stock or even cull cows,
2. Sides high enough to prevent animals from jumping over them,
3. Nonslip flooring that provides secure footing (avoid abrasive floor and wall surfaces),
4. Ventilation adequate for the weather conditions,
5. Proper bedding (to protect animals from weather extremes), and
6. Adequate (vehicle) covering to protect animals from adverse weather.

Providing shade, wetting animals, and bedding trucks with damp sand will protect animals in transit from heat stress. Truck flooring should be clean, in good repair, and covered with sand to prevent slipping and injury, and it then may be covered with clean, dry bedding. To protect animals from cold stress, provide wind protection from the front of the truck and use bedding material with high thermal insulative properties, such as chopped straw, to prevent body heat loss to the truck floor. Trucks with tight sides should have exhaust stacks that prevent the animals from being exposed to fumes.
In-Transit Care

Proper in-transit care will prevent animal injuries, bruises, and carcass damage, which can impair their well-being and value. Transport crews should be knowledgeable about animal care expectations and skilled in handling animals properly. Chances for injuries are reduced when animals on a truck are confined in several smaller groups. Animals should only be shipped in groups of uniform weight and species. Weak or unhealthy animals should only be shipped to a veterinarian and segregated from healthy ones during loading and during transit; care should be provided for their special needs (See Chapter 9).

An adequate amount of time for the trip should be allotted to include periodic checking of the condition of the animals. Drivers should start and stop the vehicle smoothly and slow down for curves and corners. If an animal falls in transit, it should be helped to its feet, provided that it does not pose a risk to the handler, and possibly segregated from the other animals for the rest of the trip. Provisions for water must be made and provisions for feed should be made if the trip takes more than 24 hours. Feeding high-fiber dry feed for 48-to-72 hours before shipping reduces the moisture content of manure, and increases air quality, and animal comfort and hygiene. Follow any state regulations regarding frequency and amounts.

All workers and handlers should be properly trained in handling dairy animals and should have a basic understanding of typical dairy cattle behavior. Having a concept of the animals’ flight zones, or the animals’ “personal space,” can be a valuable tool when moving them. Nervous or restless animals will move away when a person enters the animal’s flight zone or radius around the circle as shown in the diagram. Calmer animals will have smaller flight zones.

SPECIFIC LIFECYCLE CONSIDERATIONS

Transition Cows

To avoid the possibility of calves being born in marketing channels, cows near expected calving date should not be shipped, unless being transported for a medical emergency. In the event a pregnant cow needs to be transported, special considerations should be made.

Milking Cows

Lactating cows should be milked just prior to transportation.

RESOURCES

Livestock Handling and Transport  
(Grandin, 1993)

Livestock Handling and Transport  
(Grandin, 2000)

Livestock Handling Guide  
(Grandin, 1988)

Livestock Trucking Guide  
(Grandin, 1992)

Headlocks vs. No Headlocks  
(Palmer, 2002)

Behavioral Principles of Livestock Handling  
(Grandin, 1999)

Livestock Handling and Transport,  
2000 Master Cattle Transporter Guide  
Online at http://animalscience.tamu.edu/ansc/mastercattletransporter/index.html
Even with the best care and adherence to the Herd Health Plan, animals can become ill, require medical treatment or euthanasia, or die. If an animal becomes sick, non-ambulatory, or dies, it is critical to protect the other animals from potential diseases and to provide special care for the sick or recovering animal. Management on dairy farms should be prepared to handle these conditions through proper employee training, segregation, and prompt decision making to treat, cull, or euthanize an animal. To reduce the likelihood of transmitting disease, avoid going from sick animal facilities to healthy animal facilities.
**NUTRITION**

- Special-needs animals are not restricted from feed and water for more than four hours.
- Special-needs animals’ rations should provide the required nutrients for maintenance, growth and lactation for the appropriate physiological life-stage as found in references such as the National Research Council, 2001.

When an animal becomes sick or injured requiring separation from the herd for medical treatment (special-needs animal), the recovery of that animal is enhanced through appropriate nutrition. The animal should have access to clean water (or milk or milk replacer in the case of a pre-weaned calf). The diet of a special-needs animal may need to be adjusted from its healthy counterparts based on its feed intake abilities and special considerations for its illness or injury.

**ANIMAL HEALTH**

- The dairy has a Herd Health Plan, developed in consultation with the herd veterinarian (or other knowledgeable professional such as a cooperative extension agent), which includes specific areas for non-ambulatory animal management:
  - Proper movement to avoid dragging the animal.
  - Husbandry and nursing care that provides shelter, water, feed, isolation from other animals, and protection from predators.
  - Prompt medical care.
  - Euthanasia if warranted.
- The dairy has a Herd Health Plan, developed in consultation with the herd veterinarian (or other knowledgeable professional such as a cooperative extension agent), which includes specific protocols for euthanasia consistent with recommendations from the American Association of Bovine Practitioners:
  - Training of staff on the need for and recognition of animals to be euthanized.
  - Designated employees trained in proper technique(s).

- Confirmation of death.
- Record keeping of euthanized animals.
- Disposal of carcasses in compliance with local regulations.

Prompt decisions and actions are necessary if an animal becomes non-ambulatory. The producer or person in charge must determine immediately whether the injured animal is otherwise healthy and can be nursed back to health or cannot be saved. If the non-ambulatory animal can be nursed back to health, protect it from further injury, provide it with shelter, food, and water, and give it care to minimize its pain and discomfort during the recovery process. The use of flotation tanks should be considered.

Euthanasia is appropriate when an animal’s quality of life is decreased or when pain and suffering cannot be alleviated. Personnel who routinely work with livestock need to be trained to recognize the need for and to carry out procedures for emergency euthanasia. Designated employees should be trained to carry out euthanization through a preferred technique consistent with recommendations from the American Association of Bovine Practitioners (1999). If the animal appears to be experiencing severe pain or distress, can’t be saved or moved properly, has been chronically ill, or was recently treated with antibiotics requiring an extended withholding period, it should be euthanized by a person appropriately trained in the procedure.

Dead animals, either euthanized or expired from natural causes, are potential sources of infection. They should be disposed of promptly by a commercial rendering service or other appropriate means (e.g., burial, composting, or incineration) in accordance with applicable ordinances. Various state biohazard laws now regulate the disposal of infectious wastes. A postmortem examination on well-preserved animals can provide important animal health information and prevent further losses to the herd. Where warranted and feasible, waste and bedding of an animal that has died should be removed from the facility to an area inaccessible to other animals.
ENVIRONMENT AND FACILITIES

- Facilities are provided to segregate sick or injured animals.
- Self-locking stalls provide an emergency release for a non-ambulatory situation.

A hospital or sick pen isolates the animal(s) from the herd and makes treatment easier. Because sick or injured animals are more susceptible to discomfort than are healthy animals, it is important that the pen be equipped to maximize animal comfort. It should provide adequate shade, bedding, air movement, and accessibility to feed and water. Dead animals should be located in a remote area of the farm, away from public view, so that rendering trucks do not come near healthy animals.

HANDLING, MOVEMENT AND TRANSPORTATION

- Timely and prompt marketing of animals is part of the management plan.
- Designated staff members have been trained and proper equipment is available to move downer animals.
- Special equipment for injured or non-ambulatory animals is available.
- Trained personnel are available when sick, injured, non-ambulatory or dead animals must be moved.

Non-ambulatory cattle that cannot be carried should be moved with an appropriate sled, sling, or bucket with the exception of cases where an animal must absolutely be moved a short distance before an appropriate movement aid can be used (e.g. if a cow becomes non-ambulatory in a parlor). Cattle should not be pulled, dragged, or otherwise moved through mechanical force applied directly to the animal with the exception of specifically designed equipment for such purposes. The prognosis of an animal should be considered before the decision is made to move an animal. If the animal is highly unlikely to become ambulatory again, with little chance of recovery, the animal should be euthanized and then moved (in accordance with the Herd Health Plan).

Prevention, preparation, and prompt action are keys to their proper handling. Weak and emaciated animals often become non-ambulatory. Conditions that increase an animal’s susceptibility to injury—slippery floors, improperly designed loading ramps, excessive loading densities on trucks—should be minimized. A commitment to prevent animal injuries should include shipping promptly. Clearly defined policies requiring appropriate handling practices should be established and followed, and caretakers should be trained and supervised in proper animal handling, especially during parturition.

If moving a non-ambulatory animal becomes necessary, such movement requires the proper equipment and trained personnel. An animal may become injured on the dairy or during transportation. Use an adequate number of people along with equipment and handling devices that are appropriate to the animal’s size. If these techniques are not practical, euthanasia is recommended. Euthanasia is strongly recommended if an animal goes down in the belly compartment of a semi-trailer that does not have side doors, because humane removal is nearly impossible.

RESOURCES

- Proper Handling for Non-Ambulatory Animals
  (National Institute for Animal Agriculture, 1992)

- Preventing Crippled and Non-Ambulatory Animals
  (National Institute for Animal Agriculture, 2000)

- Practical Euthanasia of Cattle
  (Animal Welfare Committee of AABP, 1999)
Recommended procedures for moving a non-ambulatory animal:

- Gently roll a non-ambulatory animal onto a large piece of plywood or conveyor belting. If belting is used, reinforce one side with smooth-edged metal strips to prevent it from buckling and bending when moving the animal. If the animal goes down in a pen or alley, tow it on the plywood or belting with a truck or tractor to a transfer point. To off-load a non-ambulatory animal from the center compartment of a semi-trailer equipped with side doors or from a low-stock trailer, drag the belting with the animal on it to a transfer point.
- Carefully transfer the animal to a properly equipped forklift or to the bucket of a large loader, or move the animal with a special lifting harness.
- If a forklift is used, construct a pallet platform to fit over the forks. Angle the pallet’s leading edge to form a ramp for rolling the cow onto the pallet, and equip the pallet with straps to prevent the animal from falling off. Never use exposed forks.
- Specialized hoists can fit into tight spaces and are built to gently lift and lower a non-ambulatory animal.
- Use the bucket of a large loader only when there are at least three people available to transfer the animal into the bucket. One person runs the loader, and the other two roll the animal onto the bucket.
- Do not drag or lift an animal by its limbs unless there is no other alternative and only if the animal must be moved only a few feet, such as in a milking parlor. If the animal must be dragged because no other moving alternative exists or because it can be saved only by dragging, pad non-injured limbs and use padded belts to which a rope, chain, or cable can be attached. Drag the animal the shortest possible distance to a point where a better method of moving can be employed. If this procedure cannot be done humanely, the animal should be euthanized in place and then moved.
- If a mature animal is discovered to be down, it may need to be moved. If the animal is down in a stanchion, tie stall, or freestall, frequently the rear leg on the down side is cramped in an unnatural position. Often moving an animal so the legs are properly positioned will allow the animal to stand on its own. If, following treatment, the animal is unable to rise, it is imperative that it be moved so that its legs can be extended. The only practical way to move such an animal is with a strong halter on the head or a padded chain around the neck. If a single rear limb is used to move the animal, further injury may be incurred.
- Floatation tanks are often useful for metabolic disorders.
Dairy animals are an important source of beef in the United States. Approximately 20 percent of the nation’s total beef production on an annual basis comes from the dairy sector, including fed dairy cattle, and marketed cows and bulls. This chapter specifically focuses on marketed dairy cows, bull calves, and freemartin heifers during their time on the dairy farm and considerations for their marketing as beef animals. For information on animal care for beef animals (including dairy steers) please follow guidelines of the Beef Quality Assurance Program.
DAIRY BEEF

The dairy uses the “Top 10 Considerations for Culling and Transporting Dairy Animals” in culling, handling, and transportation decision-making. (See Appendix G)

Marketing a dairy animal as beef is an important part of dairy farming. A producer must ensure the appropriateness of transitioning a dairy animal to the beef sector. The animal should not be marketed if there is a reasonable chance it will become non-ambulatory at any time from leaving the farm to the harvest facility. Animals in poor body condition have an increased likelihood of becoming non-ambulatory during transport to or at a processing facility. Producers must also take care to observe all treatment withdrawal times.

As transportation times from farm to harvest have increased due to consolidation in markets and processing, greater attention needs to be paid to potential udder discomfort. Before a lactating marketed dairy animal is shipped, she should be milked to reduce potential udder discomfort.

DAIRY BULL CALVES AND FREEMARTIN HEIFERS

Calves receive colostrum or colostrum replacer soon after birth.

Calves are fed milk or milk replacer until marketed.

If these calves are kept on farm after weaning, they should be fed rations that provide the required nutrients for maintenance and growth as found in references such as the National Research Council, 2001.

Calves have continuous access to fresh water or are provided water at least twice a day, or as needed to maintain proper hydration.

All calves, whether to be raised as a replacement heifer, veal, or dairy steer, should receive colostrum or colostrum replacer and be fed in a way that promotes health and reduces the risk of disease. Please refer to Chapter 4 for additional information on newborn calf animal care practices.

RESOURCES

Top 10 Considerations for Culling and Transporting Dairy Animals to a Packing or Processing Facility (NMPF, DMI, & AABP 2008)

The Cattle Industry’s Guidelines for the Care and Handling of Beef Cattle


Beef Quality Assurance Program

Online at http://www.bqa.org
Chapter 11  Third-Party Verification

Confirmation by third-party verifiers of the practices used by National Dairy FARM Program participants will demonstrate the integrity of the program’s animal care standards module and provide evidence to our stakeholders documenting the dairy industry’s commitment to ethical care and well-being of dairy animals. The objective of the National Dairy FARM Program is to set standards for care of dairy animals and to provide statistically verified data demonstrating that proper animal care is an expectation in the dairy industry.
Chapter 11  Third-Party Verification (continued)

**PROGRAM INTEGRITY THROUGH THIRD-PARTY VERIFICATION**

As part of the National Dairy FARM Program, the evaluated farm will participate in the random statistical sampling third-party verification program.

Third-party verification is not to identify winners and losers in animal care, but to test the integrity of National Dairy FARM Program animal care best practices. In essence, when the dairy industry makes assertions about animal care based on participation in the National Dairy FARM Program animal care element, third-party verification ensures those assertions are measurably true.

Proper animal care is an expectation of all participating producers. Through a statistical sampling, an appropriate number of dairy farms participating in the National Dairy FARM Program will be randomly selected for third-party verification. The third-party verification will be administered at the randomly selected sites, and is not intended to imply preference for those operations or give them permission to use the verification as an advantage over other operations. The statistical sampling will include selection criteria such as geographic location, size, and operation type, to ensure that the small number of randomly selected dairy farms mirror participants in the entire program. The program will have an annual third-party verification process. The complete statistical sampling program and third-party verification process are available on the National Dairy FARM Program website.

Third-party verification is conducted by someone who does not have a conflicting interest in the operation or the outcome of the verification process. From a pool of certified and trained or otherwise proven qualified verifiers, the National Dairy FARM Program will enter into a contractual agreement for third-party verification services. Verification by outside parties will help ensure that the program accomplishes its goals and objectives, and provides consumers with a statistically valid demonstration that producers are meeting their ethical obligation for on-farm animal care.

A third-party verifier will conduct an on-farm examination of each dairy farm that is randomly selected in the verification process. There are only two ways to be automatically removed from the National Dairy FARM Program: (1) refusal to participate in third-party verification, or (2) if willful mistreatment of animals is observed during the third-party verification. The National Dairy FARM Program animal care best practices module is a collective program for all participants, so an individual dairy farm that is randomly selected for third-party verification will not be responsible for the cost of the on-farm verification process. Checkoff funds may not be used for third-party verification. The National Dairy FARM Program has formalized mechanisms to fund third-party verification. Details on funding of the third-party verification process are available on the National Dairy FARM Program website.

**OTHER VERIFICATION OPTIONS**

An individual producer, cooperative, or proprietary processor may choose to have third-party verification conducted on their farm(s) outside of the statistical sampling that occurs among all National Dairy FARM Program participants. A producer, cooperative, or proprietary processor who chooses to have third-party verification will be responsible for associated costs. A cooperative or proprietary processor may use statistical sampling or conduct third-party verification on all of its producers.

In any of these cases, third-party verification should be conducted by someone who does not have a conflicting interest in the operation or the outcome of the verification process. Third-party verification services should be obtained from a pool of certified and trained or otherwise proven qualified verifiers. The National Dairy FARM Program can assist in identifying third-party verification service providers.
APPENDIX A

The following information in Appendix A was provided by Elanco Animal Health.
Dairy Body Condition Score (BCS) Chart

First view the pelvic area from the side. Check line from hooks, to the thurl, to the pins.

1. If hooks rounded BCS = 3.0.

2. If hooks angular BCS ≤ 2.75.

3. If pins angular BCS < 2.75.
   If palpable fat pad on point of pins BCS = 2.50.

4. If no fat pad on pins BCS < 2.50. View the short ribs. Look for corrugations along the top of short ribs as fat covering disappears. If corrugations visible 1.2 way between tip and spine of short ribs, BCS = 2.25. If corrugations visible 3/4 way from tip to spine BCS = 2.0. If thurl prominent and saw-toothed spine BCS < 2.0.
**Appendix A - PAGE 3**

**Dairy Body Condition Score (BCS) Chart**

1. If sacral and tailhead ligament visible $\text{BCS} = 3.25$.

2. If sacral ligament visible and tailhead ligament barely visible $\text{BCS} = 3.50$.

3. If sacral ligament barely visible and tailhead ligament not visible $\text{BCS} = 3.75$. If sacral and tailhead ligament not visible $\text{BCS} \geq 4.0$.

4. If thurl flat $\text{BCS} > 4.0$. If tip of short ribs barely visible $\text{BCS} = 4.25$. If thurl flat and pins buried $\text{BCS} = 4.5$. If hooks barely visible $\text{BCS} = 4.75$. If all boney prominences well rounded $\text{BCS} = 5.0$.

If the line forms a crescent or flattened U consider $\text{BCS} \geq 3.25$.
Body Condition Scoring in Dairy Cattle

Body condition refers to the relative amount of subcutaneous body fat or energy reserve in the cow. Wildman et al. developed a 5-point (1-5) scoring system to measure the relative amount of this subcutaneous body fat. Most body condition scoring (BCS) systems in dairy cattle use the 5-point scoring system, with quarter point increments. Body condition scoring of dairy cattle is an important management tool for maximizing milk production and reproductive efficiency while reducing the incidence of metabolic and other peripartum diseases.

Over-conditioning at the time of calving (BCS>4.0) often results in reduced feed intake and increased incidence of peripartum problems. Under-conditioning at calving (BCS<3.0) often results in lower peak milk yield and less milk for the entire lactation. Also, cows should not lose more than 1.0 body score during early lactation. Excessive loss of body condition in early lactation has been shown to reduce reproductive efficiency.

Dr. James Ferguson and coworkers at the University of Pennsylvania have developed an organized process for BCS dairy cows. This system utilizes a flow chart which directs the scorer to view certain anatomical sites of the pelvic and loin area. Use of the flow chart helps develop consistency and repeatability in VCS. This system concentrates its accuracy toward the mid scores (2.5 to 4.0) which include most cows. The mid-range BCS are also the most critical for making management decisions. Scores above or below this range indicate significant problems. Exact scoring of extremes in BCS are less critical.

While the majority of cows conform to the described criteria, a few cows may not fit exactly. The final BCS may need to be adjusted based upon consideration of observations from all designated areas. Also realize that using the quarter point system many cows will fall between two scores (i.e., 2.75 and 3.0). Under those circumstances the scorer will need to make a judgment as to the closest score. Quarter point differences in scores are not significant under most circumstances.

The first described step in the flow chart is to determine if the line from the hook bone, to the thuri, to the pin bone is angular (V) or crescent (U). This step is often the most difficult of the scoring process, especially if the cow is near the 3.0 or 3.25 score. If uncertain of the V or U proceed to the next step. View the cow from the rear. Observe the amount of padding over the hook and pin bones and the prominence of the tailhead and sacral ligaments. From this point the scorer can usually determine the appropriate score. When a BCS has been determined, the scorer should continue the evaluation process at least an additional step to confirm the final score.

Anatomical areas used in the flow chart are identified below.
APPENDIX B

Materials in this brochure (Appendix B) were prepared by the Animal Welfare Committee of the American Association of Bovine Practitioners.

Practical Euthanasia of Cattle

Considerations for the Producer, Livestock Market Operator, Livestock Transporter, and Veterinarian
Most individuals who work with large domesticated livestock will encounter situations where an animal is unlikely to respond favorably to treatment. The likelihood of treatment failure, the potential for animal suffering and the presence of drug residues are considerations that can make euthanasia of an animal the best available option. This pamphlet is designed to aid producers, livestock market operators, animal transporters and veterinarians in making the appropriate decisions regarding euthanasia of cattle.

Individuals who work with livestock should read this pamphlet, discuss euthanasia options with a veterinarian and determine an action plan for livestock encountered in these situations. This action plan should be reviewed annually.

Euthanasia requires that the animal be rendered unconscious without distress or suffering prior to cessation of vital life functions. There are three physiological mechanisms for inducing euthanasia in cattle. Although several techniques exist for inducing euthanasia, all techniques will fall into one of the following categories:

- Physical disruption of brain activity caused by direct destruction of brain tissue (gunshot, penetrating captive bolt).
- Drugs that directly depress the central nervous system (anesthetics, barbiturates) and induce death by hypoxia.
- Agents that induce unconsciousness followed by mechanisms that induce hypoxia (narcotics followed by exsanguination).

**Some Indications for Euthanasia**

- Fractured leg (irreparable); severe trauma
- Loss of production and quality of life (severe mastitis, etc.)
- Inability to stand or walk (disabled livestock)
- Diagnostic (eg. potential for human disease, such as rabies)

**Euthanasia is defined as** "the intentional causing of a painless and easy death to a patient suffering from an incurable or painful disease."

*Webster’s II University Dictionary, 1996*
Advanced ocular neoplasia (cancer eye)
- Debilitating or toxic condition
- Cost of treatment prohibitive and poor prognosis
- Extended withdrawal time for sale of meat and poor prognosis

### Decision Making

Actions involving debilitated, disabled, or injured cattle may fall into the following categories: treatment, slaughter, and euthanasia. Criteria to be considered in decision making should include:

1) Pain and distress of the animal
2) Likelihood of recovery
3) Ability to get to feed and water
4) Medications used on the animal
5) Drug withdrawal time
6) Economics
7) Condemnation potential
8) Diagnostic information

### Considerations

When euthanasia is the most appropriate option, the following considerations must be made when choosing a method:

1) **Human Safety:** The first consideration in the choice of euthanasia method is human safety. Obviously, the use of a firearm carries some danger. Some methods, such as a barbiturate overdose, usually result in a calm animal being euthanized quietly and easily.

2) **Animal Welfare:** Any euthanasia method utilized should produce a quick and painless death. However, certain environments and animal behaviors may prevent the use of a more desired technique. Use the technique that is safest for humans and animals alike.

3) **Restraint:** Availability of cattle chutes or other forms of restraint may make certain forms of euthanasia more practical than others. For example, it may not be possible to euthanize an adult cow using barbiturates without proper head restraint. Several methods, such as use of the captive bolt or gunshot, necessitate appropriate restraint capabilities and training. In all cases, firm but gentle restraint should be exercised.

4) **Practicality:** An appropriate euthanasia technique must also be practical to use. Not all individuals working with cattle have legal access to drugs, such as barbiturates.
Barbiturates require a federal license to store and use.

5) **Skill:** Some techniques, such as use of the captive bolt, require some skill and training to accomplish correctly. Designated individuals should be appropriately trained in proper euthanasia techniques wherever cattle are kept.

6) **Cost:** Some euthanasia techniques are more costly than others. However, other techniques (such as gunshot or captive bolt) require a larger initial investment, but continued use is very inexpensive.

7) **Aesthetics:** Certain euthanasia techniques, such as use of a barbiturate overdose, may ‘appear’ more pleasing to the untrained eye than other techniques. Many techniques result in significant involuntary movements of the animal which may be misinterpreted as a voluntary painful response to those inexperienced in bovine euthanasia. Trained individuals should know how the animal responds to different euthanasia techniques.

8) **Diagnostics:** When tissues from a euthanized animal are to be sent to a laboratory for testing, the euthanasia method may be critical (such as avoiding damage to brain tissue in cases with rabies potential.)

### Table of Bovine Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Human Safety Risk</th>
<th>Skill Required</th>
<th>Cost</th>
<th>Aesthetic Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gunshot</td>
<td>High</td>
<td>Moderate*</td>
<td>Low</td>
<td>Moderate; some blood and motion</td>
</tr>
<tr>
<td>Captive Bolt</td>
<td>Moderate</td>
<td>Moderate*</td>
<td>Low</td>
<td>Moderate; some blood and motion</td>
</tr>
<tr>
<td>Barbiturate Overdose</td>
<td>Low</td>
<td>Moderate*</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Exsanguination</td>
<td>Moderate</td>
<td>Moderate*</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Electrocution</td>
<td>High</td>
<td>Moderate*</td>
<td>High: Equipment</td>
<td>High</td>
</tr>
</tbody>
</table>

* Moderate-Operator training required.
Details of Table

1) **Gunshot**: The firearm should be held 2-10 inches from the intended point of impact, and the bullet should be directed perpendicular to the front of the skull to prevent ricochet. The point of entry should be at the intersection of two imaginary lines, each drawn from the inside corner of the eye to the base of the opposite horn (slightly above the ear in polled animals).

A .22 caliber long rifle bullet is sufficient for most animals, but a .22 magnum or 9mm round should be used on bulls. Use of a hollow-point or soft-nose bullet increases tissue destruction. If performed skillfully, gunshot induces instantaneous unconsciousness, is inexpensive and does not require close contact with the animal.

This method should only be attempted by individuals trained in the use of firearms and who understand the potential for ricochet. Care must be taken to minimize danger to the operator, to bystanders, and to other animals. In addition, since some cities have laws prohibiting the discharge of firearms in certain areas, the operator should be aware of local ordinances that may apply.

2) **Captive Bolt**: Captive bolt “guns” are either penetrating or non-penetrating. Penetrating captive bolt guns are meant to produce immediate brain tissue destruction. Both types (penetrating and non-penetrating) will consistently cause stunning of an animal. A stunned animal will “drop” but will still exhibit respiration and sudden quick limb movements. An additional procedure (exsanguination, chemical agents) **MUST** be used to insure death after the use of the non-penetrating captive bolt and is **RECOMMENDED** after use of the penetrating captive bolt.

The captive bolt gun must be placed firmly against the skull at the same entry point previously described for a gunshot. Since use of the captive bolt gun requires close proximity to the animal, good restraint and prior sedation or tranquilization may be required. Operator safety must be considered in the use of this technique.

Maintenance and cleaning of the captive bolt gun as described by the manufacturer must be followed exactly. In addition, selection of cartridge strength may vary among manufacturers and the appropriate strength for the size of the animal must be used.

3) **Barbiturate**: When properly administered by the intravenous route, barbiturate overdose (60-80 mg/kg sodium pentobarbital IV) produces rapid unconsciousness and anesthesia followed by respiratory depression, hypoxia, and cardiac arrest. The barbiturate selected should be potent, long acting, and stable in solution. Tissue residues of the barbiturate can be high. Care should be exercised to limit access of scavengers to the carcass.
4) **Exsanguination:** This method can be used to ensure death subsequent to stunning, anesthesia, or unconsciousness. It must not be used as the sole method for euthanasia.

There are several methods for exsanguination. The most common method in the bovine is to lacerate one or both carotid arteries. A long 6 inch sharp knife is fully inserted behind the point of jaw, just below the neck bones, and directed downwards until blood is freely flowing. Brachial vasculature can be lacerated by lifting a fore limb, inserting the knife deeply at the point of the elbow and cutting skin and vasculature until the limb can be laid back against the thorax of the animal. The aorta can be transected via the rectum, by a trained individual, so that blood pools within the abdominal cavity.

5) **Electrocution:** This method should only be attempted using specialized slaughter plant equipment that applies a minimum of 2.5 amp across the brain. A 120 volt electrical cord does not apply sufficient amperage to induce unconsciousness.

Electrocution does involve current as well as violent involuntary reactions by the animals. Therefore, this method does involve some danger to the operator.

**Confirmation of Death**
Confirmation of death is absolutely critical regardless of what method of euthanasia is chosen. Keep personal safety in mind when confirming death because animals can make sudden involuntary limb movements.

The following can be used to evaluate consciousness:
- Lack of a heartbeat.
- Lack of respiration.
- Lack of corneal reflex.

The presence of a heartbeat can be best evaluated with a stethoscope placed under the left elbow. Movement of the chest indicates respiration. (Note: breathing can be very slow and erratic in unconscious animals.) The corneal reflex can be tested by touching the eyeball and noting whether the animal blinks. A lack of heartbeat and respiration for more than five minutes should be used to confirm death.
Euthanasia of Calves and Bulls
Calves and bulls require special consideration in selecting the proper method of euthanasia. Ethical considerations do not change for the calf because it is small or more easily handled. Calves can easily be euthanized with a penetrating captive bolt gun. Barbiturate overdosing also works well, but legal restrictions must be followed.

Bulls require special considerations because of their size, attitude and physical thickness of their skull. Operator safety is of primary concern in euthanasia of bulls, and for certain techniques, proper restraint is critical. Bulls may be euthanized with specialized heavy duty captive bolt guns, firearms using a 9mm shot, or by barbiturate overdose.

Unacceptable Methods of Bovine Euthanasia
Ethical and humane standards of euthanasia DO NOT permit the following methods of euthanasia in the bovine:

1) Manually applied blunt trauma to the head.
2) Injection of chemical agents into conscious animals (e.g. disinfectants, electrolytes such as KCl and MgSO4, non-anesthetic pharmaceutical agents).
3) Air embolism (e.g. injection of large amount of air into the vasculature).
4) Electrocution with a 120 volt electrical cord.

Conclusions
Personnel at sites that routinely handle animals should at all times have the ability and facilities to carry out emergency euthanasia. Penetrating captive bolt and gunshot are the only two methods available to non-veterinarians for emergency euthanasia. Animal transporters should also be appropriately trained and should have phone numbers to contact appropriate personnel in case of an emergency.

Market and sale yards should have a written procedure to follow in case of emergency and should have personnel trained in emergency euthanasia during all shifts. When practical, choose a location where the carcass can be easily reached by removal equipment. An action plan for routine and emergency euthanasia should be developed and followed wherever animals are handled.

Location for exsanguination and correct site for captive bolt or gunshot euthanasia of cattle. The point of entry of the captive bolt or bullet should be at the intersection of two lines drawn from the inside border of the eye to the base of the opposite horn (slightly above the opposite ear in polled animals). Exsanguination should be done using a pointed, very sharp knife, with at least a 6-inch rigid blade. The knife is thrust into the neck just below the neck bones and drawn downward to sever the jugular vein, carotid artery and trachea: (1) external jugular vein; (2) common carotid artery; (3) trachea.
NDFP Hygiene Scorecard

No more than 10 percent of animals should score 3 or greater on the NDFP Hygiene Scorecard (1 is clean, 4 is dirty). Evaluators and verifiers will use the photos and scoring card below to aid in assigning scores to animals observed on a farm.

<table>
<thead>
<tr>
<th>SCORE:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tail head region</strong></td>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
<td><img src="image3" alt="Image" /></td>
<td><img src="image4" alt="Image" /></td>
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<tr>
<td><strong>Belly and udder</strong></td>
<td><img src="image5" alt="Image" /></td>
<td><img src="image6" alt="Image" /></td>
<td><img src="image7" alt="Image" /></td>
<td><img src="image8" alt="Image" /></td>
</tr>
<tr>
<td><strong>Thigh and lower rear leg</strong></td>
<td><img src="image9" alt="Image" /></td>
<td><img src="image10" alt="Image" /></td>
<td><img src="image11" alt="Image" /></td>
<td><img src="image12" alt="Image" /></td>
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</tbody>
</table>
APPENDIX D

The following information in Appendix D was provided by Zinpro.

LOCOMOTION SCORING

of DAIRY CATTLE

Steven L. Berry, DVM, MPVM, University of California-Davis, with adaptations from Nigel B. Cook,
University of Wisconsin-Madison, and Zinpro Corporation, Eden Prairie, MN
Appendix (continued)

Locomotion Scoring of Dairy Cattle

Locomotion scoring is based on the observation of cows standing and walking (gait), with special emphasis on their back posture. This system is intuitive and, therefore, easy to learn and implement. Use of locomotion scoring is effective for early detection of claw (hoof) disorders, monitoring prevalence of lameness, comparing the incidence and severity of lameness between herds and identifying individual cows for functional claw (hoof) trimming.

Animal observations should be made on a flat surface that provides good footing for cows. Cows scoring 2 or 3 should be examined and trimmed to prevent more serious problems. Trimming should be done by a competent trimmer with the goal of returning the claws to functional weight bearing and conformation.

**Locomotion Score 1**

**Clinical Description:** Normal

Description: Stands and walks normally with a level back. Makes long confident strides.

**Locomotion Score 2**

**Clinical Description:** Mildly Lame

Description: Stands with flat back, but arches when walks. Gait is slightly abnormal.

**Locomotion Score 3**

**Clinical Description:** Moderately Lame

Description: Stands and walks with an arched back and short strides with one or more legs. Slight sinking of dew-claws in limb opposite to the affected limb may be evident.
Locomotion Scoring of Dairy Cattle

Locomotion scoring is based on the observation of cows standing and walking (gait), with special emphasis on their back posture. This system is intuitive and, therefore, easy to learn and implement. Use of locomotion scoring is effective for early detection of claw (hoof) disorders, monitoring prevalence of lameness, comparing the incidence and severity of lameness between herds and identifying individual cows for functional claw (hoof) trimming.

Animal observations should be made on a flat surface that provides good footing for cows. Cows scoring 2 or 3 should be examined and trimmed to prevent more serious problems. Trimming should be done by a competent trimmer with the goal of returning the claws to functional weight bearing and conformation.

<table>
<thead>
<tr>
<th>Locomotion Score</th>
<th>Clinical Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal</td>
</tr>
<tr>
<td>2</td>
<td>Mildly Lame</td>
</tr>
<tr>
<td>3</td>
<td>Moderately Lame</td>
</tr>
<tr>
<td>4</td>
<td>Lame</td>
</tr>
<tr>
<td>5</td>
<td>Severely Lame</td>
</tr>
</tbody>
</table>

Clinical Description:

<table>
<thead>
<tr>
<th>Locomotion Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Arched back standing and walking. Favoring one or more limbs but can still bear some weight on them. Sinking of the dew-claws is evident in the limb opposite to the affected limb.</td>
</tr>
<tr>
<td>5</td>
<td>Pronounced arching of back. Reluctant to move, with almost complete weight transfer off the affected limb.</td>
</tr>
</tbody>
</table>

The normal, healthy hock is free from skin lesions and swelling. Ideally, the hair coat in that area is smooth and continuous with the rest of the leg.

Hock health is an important indicator of the abrasiveness of stall bedding and cow comfort. Injury is usually the result of prolonged exposure to an abrasive stall surface. Skin breakage provides an opportunity for infection to occur, which can lead to swelling, discomfort, and possibly lameness.

A consistent method of scoring hocks for swelling and hair loss allows you to assess the need to modify your stall management and can help you evaluate the effect of management changes.

Herd Assessment Method
1. Score the rear hock (one or both) from at least 20 cows for each housing or management group.
2. For each score, enter a stroke in the appropriate box of the table.
3. Count the number of strokes for each score and enter in the “tally” box.
4. Enter the total number of hocks scored.
5. Divide “tally” by “total number” and multiply by 100. Enter as percent for each score.
6. Monitor monthly to assess a change in management or stall surface.
7. Note that in deep sand stalls that are well maintained, it is rare to find a hock with a score greater than 1.

Adapted from James Nocek
APPENDIX F

From Temple Grandin, Safe Handling of Large Animals (Cattle and Horses)
Online at www.grandin.com/references/safe.html

Animal Handling - Figure 1
Animal Handling - Figure 2

Cattle will move forward when handler crosses the point of balance of each animal.
Flight Zone - Figure 3
APPENDIX G

The following information in Appendix G was provided by NMPF, DMI and AABP.

Top 10 Considerations for Culling and Transporting Dairy Animals to a Packing or Processing Facility

Culling and transporting decisions are an important part of dairy farming. Occasionally, an animal that is ambulatory on the farm may not be suitable for transport to a packing or processing facility. These “Top 10 Considerations for Culling and Transporting Dairy Animals to a Packing or Processing Facility” are designed to assist dairy producers in making the decision on the suitability for an animal to be transported.

1. Do not move non-ambulatory animals to market under any circumstances.
2. Make the decision to treat, to cull, or to euthanize animals promptly. Sick and injured animals should be segregated from the herd.
3. Delay transport of an animal that appears to be exhausted or dehydrated until the animal is rested, fed, and rehydrated.
4. Milk all cows that are still lactating just prior to transporting to a packing or processing facility.
5. Use a transportation company that is knowledgeable about your animal care expectations and provides for the safety and comfort of the animals during transport.
Do not transport animals to a packing or processing facility until all proper treatment withdrawal times have been followed.

Do not transport animals with bone fractures of the limbs or injuries to the spine. Animals with a recent fracture unrelated to mobility should be culled and transported directly to a packing or processing facility.

Do not transport animals with conditions that will not pass pre-slaughter inspection at a packing or processing facility. If unsure, consult with your veterinarian before transporting an animal to a packing or processing facility.

Do not transport animals with a poor body condition, generally a Body Condition Score of less than 2 (1-5 scale).

Do not transport animals that require mechanical assistance to rise and are reluctant or unable to walk, except for veterinary treatment. When using any handling device, abuse must not be tolerated.

If you would like to order up to five additional copies or would like more information on the dairy animal culling and transporting sheet, please call (703) 224-1381 or email: poster@nmpf.org.
APPENDIX H
The following information in Appendix H was provided by the Center for Dairy Excellence.

Extra-Label Drug Use Decision Flow-Chart for Food Animals

You made a careful diagnosis in the presence of a Valid Veterinarian/Client/Patient Relationship. You are contemplating extra-label drug use. You must ask yourself...

Are the animals to be treated, food animals?

YES

Does a drug labeled for food animals exist which fulfills all of the following:
  ▶ contains the needed ingredient
  ▶ in the proper dosage form
  ▶ labeled for the indication
  ▶ and is clinically effective?

YES

You must use this drug per label, as extra-label drug use is unnecessary. Observe label directions and withdrawal time.

NO

Is there a drug approved for food animals which could be used in an extra-label manner?

YES

Proceed with the extra-label use of food animal drug. Establish extended withdrawal time. Ensure food safety. Maintain required records. Label drug appropriately.**

NO

Is there a human drug or drug approved for non-food animals which could be used in an extra-label manner?

YES

Is there adequate scientific information available to determine withdrawal time?

NO

If compounding of approved drugs will prevent pain and suffering, refer to CPG 608.400 for compounding guidance.***

NO

Drug must not be used or treated animal must not enter the food supply.

** Compounding of bulk drugs is generally illegal

*** Compounding of bulk drugs is generally illegal
APPENDIX I

The following information in Appendix I was provided by the Center for Dairy Excellence.

Veterinary Client/Patient Relationship Validation Form

I. Producer

Producer Name:
Address: City: Zip:

Farm Name and Location:
Section: Township: County:

Certified Status:
Verified: Review Date:
Expiration Date:

Type of Operation Certified: (circle all that apply)
1. Cow-Calf
2. Dairy Production (cull cows)
3. Beef and/or Dairy Beef Grower
4. Beef and/or Dairy Beef Grower-Finisher

II. Veterinarian

Name: , DVM
Address: City: Zip:

Farm Name and Location:

SD License No. USDA Accreditation No.

I hereby certify that a valid Veterinarian/Client/Patient/Relationship (VCPR) is established for the above listed owner and will remain in force until canceled by either party or the verification expiration date is reached.

Veterinarian’s Signature:
Date:


To learn more about the National Dairy FARM Program, log on to www.nationaldairyfarm.com or call the National Milk Producers Federation at (703) 243-6111.