

Chapter 11: Guidelines for Veal Calf Husbandry

Special-fed veal production in the United States typically utilizes Holstein bull calves that are fed a diet of liquid milk replacer and grown to finishing weights of 160 to 200 kg (350 to 450 lb) at 15 to 20 wk of age. Meat from these calves is referred to as milk-fed veal. Bob veal refers to calves, usually less than 3 to 4 wk of age and less than 68 kg (150 lb), which are destined to be slaughtered. Grain-fed veal or veal calves that are not special-fed are reared on feeding programs including grain and hay and are marketed at weights between 68 to 181 kg (151 to 400 lb). Meat from these calves is referred to as red veal (USDA, 1991).

The AVMA (1995) recognizes that veal calf production systems are well established and can be humane. Veal calves should be handled with care, gentleness, and patience. Stress on calves usually results in suboptimal physiological functions or adverse behavioral reactions and should be minimized to ensure calf well-being and performance (Stott, 1981; Dantzer et al., 1983; Wilson et al., 1994b). Sick or injured calves should be segregated and treated promptly (AVMA, 1987).

FACILITIES AND HOUSING

Calves should be housed in settings that are conducive to optimal performance, health, and overall well-being. Several systems satisfy these objectives, but each has certain limitations (Webster et al., 1985a,b; Agriculture Canada, 1988; Le Neindre, 1993; Rushen, 1994; Stull and McDonough, 1994).

Internal surfaces of veal calf barns should be made of nontoxic materials that either can be cleaned and disinfected effectively or are disposable. Internal surfaces and fittings of houses, stalls, pens, and other equipment accessible to calves should have no sharp edges or projections. All floors, particularly slotted ones, should be designed, constructed, and maintained so as to avoid injury or distress to calves.

During daylight periods, natural or artificial indoor lighting intensity should be high enough that every calf can be seen clearly for inspection at any time. Light levels above 22 lux are recommended at the level of the floor (Andrews and Read, 1983) or the calves' eyes (Stull and McDonough, 1994).

Ventilation and air temperature are important considerations, especially for the newly arrived calf. The lower critical temperature for a calf under 1 wk of age is 10°C (50°F) (Webster et al., 1978), but the optimal temperature for young calves is 18 to 21°C (65 to 70°F) (Meyer, 1991).

Relative humidity between 50 and 60% is recommended, but older calves can tolerate over 70% (Meyer, 1991). High temperatures create stress in calves that can reduce appetite and affect meat color. Two low cost cooling methods are recommended for hot weather of 27 to 38°C (80 to 100°F): large diameter paddle fans overhead and evaporative cooling (Meyer, 1991).

Veal calves may be raised in either group pens or individual stalls. Stalls provide an opportunity for the caretaker to feed and monitor calves individually (Parker, 1968; Heard et al., 1972; Linton et al., 1974; Roy, 1980; Andrews and Read, 1983; Wilson et al., 1994b). All enclosures should be constructed to allow for proper drainage of waste to ensure calf cleanliness. Arranging stalls in rows facilitates visual inspection of calves and allows for social, visual, and head-to-head contact between neighboring calves.

Size of Stalls

Individual calf stalls in the United States for calves weighing 160 kg (350 lb) commonly measure .56 to .60 m (22 to 24 in) wide and approximately 1.5 to 1.65 m (60 to 66 in) long (Colby et al., 1975; Schwartz, 1990; AVA, 1994; Stull and McDonough, 1994). In all new or renovated facilities, stall size should be a minimum of .65 m (26 in) wide and 1.65 m (66 in) long. The minimal length of the side wall partition is usually .61 m (24 in). Shortening the sides of the stall reduces problems with bruised flanks as calves increase in size (Kammel, 1991; AVA, 1994). To accommodate larger veal calves (>160 kg [350 lb]), an additional 2.5 cm (1 in) and 10 cm (4 in) in the width and length, respectively, should be allowed for each additional 11.4 kg (25 lb) increase in body weight.

The larger Dutch-style stalls of .75 m × 1.8 m (30 × 72 in) are recommended. Calves are tethered for the first 6 to 8 wk of age and then released. Calves so motivated can turn around, get up, lie down, and rest comfortably; barriers should prevent calves from defecating in their feed buckets (van Putten and Elshof, 1982; AVA, 1994).

Slotted Floors

Slotted floors for veal calves may be made of oak, expanded wire with plastic coating, or other suitable material that is maintained in good repair in order to minimize knee injuries and lameness (Steenkamer, 1982). Slats should be oriented perpendicularly to the dorsal axis of the calf to improve footing and reduce injury.

Tethers

Tethering is used in conjunction with individual stalls to allow normal daily care of the calves and to avoid undue transmission of disease. Tethers are utilized to prevent the calf from leaving its stall or turning around and possibly contaminating the feeding area with feces. Tethers should be long enough to permit the calves to stand, groom, eat, rest in a natural sternal posture, or with their head and neck turned to the side of their body, and allow movement forward and backward, yet be short enough to prevent strangulation or turning around. Tethering devices may be straps, chains, or ropes and must incorporate a swivel feature in the design. Tethered calves should be monitored at least twice daily; tether and collar lengths should be adjusted as needed. All calves should be carefully trained and conditioned to the tether (AVA, 1994). Research results have shown no difference in veal calf performance (average daily gain, feed efficiency, hemoglobin, or carcass quality) whether movement in pens or stalls was restricted by tethers or was unrestricted (Knesel et al., 1983, 1993).

Group Pens

When group pens are used, pen size should be determined by the number of calves, finished market weight of calves, flooring material, and waste management system. Calves in systems utilizing ad libitum intake should be grouped according to size to facilitate sufficient individual intake of milk replacer (Stephens, 1974). Larger groups may decrease the caretaker's ability to detect illness (van Putten, 1982). Veal calves in groups tend to exhibit more variation in growth rate than do calves housed individually (Roy, 1980; Webster and Saville, 1981; Steenkamer, 1982; Stull and McDonough, 1994). Even if they are destined to reside in groups eventually, calves may need to be kept in individual accommodations until at least 1 to 2 mo of age for health reasons (Wood et al., 1967; Roy, 1980; Stephens, 1982; van Putten and Elshof, 1982).

In multiple-pen rearing systems, calves may be kept on slotted floors or solid floors with bedding; under these conditions, straw may be offered for ad libitum intake from a feeder (Bogner, 1982; Steenkamer, 1982). When small groups of calves (e.g., 3 to 5) are kept together, 1.4 to 1.7 m² (15 to 18 ft²) of floor area per calf should be provided. Large groups (usually no more than 20 to 30 calves) of calves fed using automated feeding machines with artificial teats should be placed in a single pen with 1.2 to 1.4 m² (13 to 15 ft²) of available floor area per calf (Stull and McDonough, 1994).

SOCIAL ENVIRONMENT

Behavior of veal calves housed under various systems has been studied extensively (Stephens, 1974, 1982; van Putten and Elshof, 1982; de Wilt, 1985; Webster et al., 1985b, 1986; Le Neindre, 1993; Rushen, 1994; Stull and McDonough, 1994; other work cited elsewhere in this chap-

ter). Recent research has confirmed that there are few major differences between postures and behavior of calves kept in stalls and those kept in group pens (Albright et al., 1991; Stull and McMartin, 1992). Total time spent in recumbency or the number of transitions from recumbency to standing was similar in a study comparing calves in stalls with calves penned in groups over 8 wk of age (Stull, 1992). Although some normal behaviors are better satisfied in group pens than in individual stalls, certain abnormal or detrimental behaviors (e.g., cross-sucking and genital sheath sucking, urine drinking, tongue playing, aggression, and competition for feed) may increase.

In view of the strong stimulatory effect that milk has on sucking behavior, the provision of a dry teat for calves to suck after feeding should be considered as a means of enriching their environment (de Passillé et al., 1992).

FEED AND WATER

Veal calves should be fed to meet or to exceed the established nutrient requirements for calves (NRC, 1989), except for iron (see Iron section). Calves are usually bucket-fed twice daily, and a supply of clean, fresh drinking water should be available (NRC, 1989) after about 2 wk (AVA, 1994). There is no evidence that offering water to young calves for ad libitum intake causes diarrhea (Kertz et al., 1984).

Grain-fed (red) veal calves are fed a variety of diets including milk replacers, grain, forages (hay, silage, or pasture), and processed feeds (NRC, 1989; AVA, 1994; Wilson et al., 1994b). Early performance and health of the young calf are highly dependent upon proper digestive function in the abomasum. This structure can effectively bring about coagulation of milk protein by the action of rennin and partial digestion by pepsin and hydrochloric acid. Development of strong curd formation results in greater retention time in the abomasum, enabling more complete enzymatic action on protein and fat fractions (Radostits and Bell, 1970; Ternouth et al., 1974, 1975; Cunningham and Knesel, 1982). However, modern technology for feed manufacturing appears to have eliminated the need for clotting of milk replacers (Longenbach and Heinrichs, 1998). Milk replacers for starting and growing veal calves contain 20 to 24% protein and 16 to 20% fat and should be fed for the first 6 to 8 wk. Finisher milk replacers should then be fed to provide 16 to 20% protein and 18 to 20% fat until slaughter weight is reached. Vitamins and minerals should be supplemented in milk replacers, and amino acids may also be added to the diets (Heinrichs, 1994, 1995).

The protein in milk replacers for veal calves is typically based on milk sources (Warner, 1970; Colby et al., 1975; Roy, 1980; Cunningham and Knesel, 1982; Stull and McDonough, 1994). Low quality milk protein or milk protein substitutes have insufficient curd-forming properties and may not support top performance in veal calves. Homogenization and addition of emulsifying agents for fats generally improve

both dietary digestibility and performance (Cunningham and Knesel, 1982).

Iron

Hemoglobin concentration in blood varies considerably among calves at birth and between calves fed diets supplemented or unsupplemented with iron (Blaxter et al., 1957; Hibbs et al., 1961; Cunningham and Knesel, 1982). Veal calves fed only whole milk or milk replacers supplemented with iron experience declining blood hemoglobin concentration and changes in other blood traits over time (Niedermeier et al., 1959; Roy et al., 1964; Eeckhout et al., 1969; Warner, 1970; Bremner et al., 1976; Reece, 1980, 1984; Roy, 1980; McFarlane et al., 1988; Wilson et al., 1994a). These trends have not been shown consistently to influence the health, behavior, or performance of veal calves. The iron (inherent or added) that is available to veal calves in milk replacer, water, and supplementary sources should be adequate to maintain the health, performance, and overall well-being of the calves.

The supplementation of iron should be based on monitoring calves at 7 and 10 wk of age for hemoglobin concentration; targeted levels should be maintained between 7.5 and 8.5 g/dl (Wilson et al., 1994b). Iron content is highest in starter diets, and dietary concentrations then decline as calves reach market weight. This decline in dietary iron limits myoglobin content in the muscle, thus producing the preferred light-colored carcasses, but still allows for normal appetite and optimal growth (Bremner et al., 1976).

Research is needed (1) to confirm the optimal frequency for determining hemoglobin concentrations of calves and (2) to determine whether marginally anemic calves might be less able than normally fed calves to tolerate normal activity (Schwartz, 1990).

HUSBANDRY

Calves should ingest colostrum soon after birth. The risk of disease and mortality for veal calves may be related to individual immune status (Gay et al., 1965; Irwin, 1974; Postema and Mol, 1984; McDonough et al., 1994). However, good husbandry can minimize disease problems even when the calves arrive at the facility immunologically compromised and carrying infectious disease (Heard et al., 1972; Linton et al., 1974; Peters, 1986).

When calves arrive at the barn, the health of each calf should be assessed carefully, and any necessary treatment regimens should be started immediately. Health may be compromised by several conditions, including dehydration, navel infections, diarrhea, respiratory problems, or lice. If severe, these conditions may contribute to death. Signs of healthy calves are a dry navel, ability to walk unassisted, alert ears and clear eyes, no signs of diarrhea, and, upon arising, resumption of a normal standing posture after stretching.

A system of monitoring calves throughout the growing period should be established. Animal care personnel should be taught to recognize signs of illness and external parasites. Frequent observation is advisable during the first few weeks after arrival. Alert handlers should have the ability to perceive appropriate behavior and posture (Albright, 1993). Any sick or injured calves should be treated immediately. Daily records should be kept (e.g., calves treated and treatment).

Appropriate medication and vaccination programs should be used to reduce the incidence of disease and mortality, improve calf health and performance, and ensure that no violative residues occur in the carcass (Colby et al., 1975; Roy, 1980; Wilson and Dietrich, 1993). Treatment and vaccination schemes should be based on veterinary advice and experience.

STANDARD AGRICULTURAL PRACTICES

Because veal calves reach market at an early age, they are neither dehorned nor castrated. Calves should be identified by ear tags.

HANDLING AND TRANSPORTATION

Sand or barn grit to improve traction of calves coming into or exiting the barn is usually necessary, as is the prevention of any sharp turns or obstacles that may cause calf or human injury. Loading alleys and chutes should be wide enough to accommodate finished calves but not to allow the calves to turn around. Because there are fewer distractions, calves move better if the chute sides are solid rather than open. Portable panels to receive or ship calves are helpful. Electric goads (prods) should be used sparingly, if at all, and must not be used on very young calves. An alternative to these types of instruments is additional personnel or other techniques to help keep the calves moving.

The researcher or teacher should be the primary determinant of trucking practices and truckers used, even in a contractual feeding arrangement. Stress that occurs when the finished calves are moved from the barn and onto and off the truck at the packing plant can cause bruises and darkening of muscle color. Therefore, it is in the best interests of everyone concerned that the calves be handled with care and concern to prevent injury and stress (Grandin, 1982; AVA, 1994).

EUTHANASIA

When necessary, euthanasia should be performed by competent personnel using accepted methods established by the AVMA (1993). The approved method for young calves is barbiturates. Other techniques that may be used for calves are penetrative captive bolt, gunshot to the head, electrocution, and chloral hydrate (see Chapter 3).

SPECIAL CONSIDERATIONS

The all-in, all-out method of occupancy is recommended (Colby et al., 1975; Roy, 1980; Cunningham and Knesel, 1982) to minimize the transfer of pathogens from older to younger calves and to perform proper sanitation procedures. Facilities should be steam-cleaned and disinfected between successive groups of calves. All equipment used for feeding veal calves should be thoroughly cleaned immediately after each use and disinfected daily by heat or with dairy disinfectants approved under milk and dairy regulations. Equipment should be allowed to drain and dry thoroughly between feedings.

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