AMERICAN Veal ASSOCIATION
Excellence in Agriculture

The Science of Veal Calf Welfare & Nutrition
Executive Summary

Emotions and misconceptions, fueled by decades of non-science based misinformation, run high when it comes to veal calf production. A small but vociferous group of activists, who have never had the pleasure of visiting today's modern American veal farms and family farmers, seen first hand the veal industry's meticulous animal husbandry practices, or studied the superior nutritional content and nearly perfect digestibility of veal calf milk diets, prefer to make sensational claims of veal calf cruelty. However, these groups have yet to do **one** peer reviewed study or review of the science behind veal calf production.

Without verifying their false accusations or researching the ramifications of their demands, activists call for housing, diet and management reforms in veal calf production that are actually detrimental to the calves they claim to protect.

To help direct the veal industry manage calf welfare and nutrition, there are many dedicated agencies such as the USDA, FDA, farm bureaus, universities, cooperative extension services, trade associations, retail associations, as well as animal, medical and scientific organizations. As a result, the veal industry is a model of excellent calf welfare with some of the lowest rates of sickness and mortality and the highest records of quality control, food safety, and superior calf growth, reflecting our industry's animals over all well being.

Housing: Even well-meaning scientists occasionally weigh in with opinions on veal welfare based on outdated production practices and can cite research sources which appear to support their claims. However, their arguments fall apart under closer scrutiny. For example, so-called experts tend to refer to veal housing as "crates," a gross misrepresentation of the veal environment. Today's U.S. veal calf farms have long retired small stalls in favor of larger individual pens with shoulder height fences, open sides and open backs which promote freedom of movement, optional socialization, security and comfort for calves, both day and night.

Tethers: Tethers are not stressful for calves and allow freedom of movement, grooming, and facilitate socialization for the calf. The comfort, well-being and safety of the veal calf is enhanced by the use of tethers as well as the protection of the veal farmer whose frequent close contact with these large animals could put him in jeopardy if not for some level of restriction on the calf. Tethers allow the veal farmer the ability to move liberally around veal calves that grow to 500 pounds in 18 to 20 weeks. Tethers can also enhance regular sanitation procedures and serve to restrict young calves from consuming or laying on their waste.

Feeding Iron: Oral feeding of iron to young calves, as required in proposed New Jersey legislation, is mutually exclusive to young calf well being. Cow's milk is naturally devoid of iron, no doubt because iron supports pathogenic bacteria such as E. coli and Salmonella in the intestine, which cause sickness and a high rate of mortality. Veal farmers closely scrutinize veal calves' iron levels to determine which calves need iron. Farmers then provide iron using iron dextran injections to ensure that calves do not become anemic and to bypass the intestine. Through education from farm industry partners, veal farmers have advanced tremendously in the last decade in their understanding and management of veal calf iron, so as to avoid anemia.

Fiber: Regulations which dictate that fiber must be a part of the young calf's diet in order to develop the rumen function, is based on the false assumption that young calves require fiber, that baby calves on pasture regularly consume grass, that eating fibers such as hay or straw will promote rumen development, and that rumen development equates to calf well-being.

None of these assumptions are true. Young calves do not require fiber. In fact, fibers such as hay and straw are not digestible for young calves and are detrimental to calf well being, causing abomasal ulcers and abnormal development of the rumen. And, straw is not generally considered a feedstuff for cattle. Straw is considered a bedding material for cattle in cold housing.

Young beef calves on pasture do not eat any appreciable amounts of grass until they are 3-5 months old and, therefore, do not begin to develop a functional rumen until 3-5 months of age. Young calves on the pasture drink cow's milk until they are 6-9 months, while their mothers graze on grass.

Development of the rumen, a large fermentation vat for digestive purposes, is not necessary for good calf well being. The calf is born as a "pre-ruminant" in which the rumen, reticulum, and omasum are quite small and not developed. Through the esophageal groove mechanism, milk bypasses the rumen and is shunted directly into the abomasum (gastric, human type stomach). Milk is the most nutritious and easily digestible feed for baby mammals.

The concept of activists demanding that calves be fed fiber to ensure development of the rumen is akin to forcing vegetarians to eat meat because they were born with canine teeth. Young calves thrive when fed milk (or milk replacer). When forced to consume high fiber feeds, calves develop "hay belly" - a condition of ill thrift characterized by poor body condition and rough hair coat.

The veal farmer would gladly feed fiber if it were beneficial to the calf. The cost of high quality, milk replacer is about 15 times greater than fibrous feeds. Calf health, well being, and growth are severely compromised when calves are forced to consume fiber at an early age. Even beef calves and replacement heifers that are fed grains at an early stage have relatively reduced growth rates compared to veal calves, because grain is not as nutrient dense or digestible as milk.

Role of Government: In 1990, the U.S. Congress refused to pass legislation that contained similar requirements to the ideas espoused by activists on issues such as housing and roughage. The USDA stated that the role of government should be to generate and transfer needed technology to enhance, not regulate, farm management. This philosophy of the role of government in the United States has been unchanged since the establishment of the U.S. Department of Agriculture (May 15, 1862) which was established to "acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word, and to procure, propagate and distribute among the people new and valuable seeds and plants."

The "Homestead Act" was enacted five days later (May 20, 1862) to encourage the settling of government lands and the Morrill Act (July 2, 1862) was passed to establish the land-grant universities in the U.S. These universities were established to "teach such branches of learning as are related to agriculture and the mechanic arts." From these three Acts, the government of the U.S. established the mechanism to discover new information and transfer this new information to students and, through the Cooperative Extension Service in each state, transfer information to the men and women involved in production agriculture. At the time these Acts were enacted (1862), the vast majority of Americans were directly involved in growing their own food, as opposed to today when less than 2% of the U.S. population is directly involved in production agriculture. Today’s farmers feed their families, and the U.S. population, plus produce enough surpluses to export food to other countries. Education, rather than regulation has served agriculture and the nation.

Conclusions: Activists, legislators and regulators must be held to abide by the same rigorous scientific criteria for change by which the farming industry now abides. When multi-disciplinary changes are proposed, those introducing them must demonstrate, through research, that reforms, in their entirety, will create superior welfare for the livestock. In addition to productivity as the best reflection of calf welfare, those demanding change must include such comparisons as measures of medication needs, feed intake, sick days, death loss, iron levels, stress levels, stool quality and compare them with control calves and current industry standards. It is not fair to allow activists to piecemeal out of date studies, factors based on guesswork or old issues that have been resolved, in order to force extensive changes to existing, successful, and humane farming production methods.

Activists rushing to require new farming practices without knowing all of their ramifications are treading down a slippery slope that will create a dangerous precedent. Overriding science in favor of propaganda may also, in the long run, discourage future research projects, as scientists will be dissuaded by the omnipotence of state and local authorities who can supercede their findings without any scientific basis for doing so. Accusing farmers of mishandling the livestock they care so much for will cause more farmers to leave the farming industry, knowing that it is illegal to provide the best care, the best nutrition, in the best ways possible.

If activists are permitted to legislate livestock minutia without understanding all the ramifications, the state's judiciary is destined to leave a legacy of poor farming practices and livestock suffering in their aftermath.

It's time to take a closer look at the science of veal production and counter the misconceptions before the state's judiciary branch imposes unnecessary suffering, growth impediments and stressors on U.S. milk-fed veal calves.

Veal Production – The Science

Calf Housing - Supports Comfort, Individual Care and Attention

Veal housing and stall design have changed dramatically throughout the U.S. veal industry, over the last 20 years. Modern veal housing now consists of specialized barns that are well lighted, with computer-controlled ventilation systems and they often have soft music playing during the day.

The smaller stalls seen years ago have long been replaced with individual stalls and "half-stalls" - a system of short fences between calves which allow calves:

Additional space for a broad spectrum of natural movements, self-grooming, lying down and sleeping with legs outstretched in a comfortable and restful position. Today's veal housing is sufficient in size to allow calves to lie with legs outstretched while awake and sleep outstretched or curled. Some scientists have misinterpreted the curled position as representing more restful sleep (de Wilt, 1985). It is widely held that calves sleep in a curled position in order to conserve energy and stay warm. In today's climate controlled veal barns, temperature regulation and energy conservation are not issues, so calves can sleep in a more outstretched and comfortable position.

Continuous yet protected social contact with neighbors. Neighborly licking, grooming, nuzzling, and mooing are readily accessible and beneficial for the calf. This social contact is good for calves as it promotes lower heart rate and satisfies their innate social tendencies. However, group interactions are limited in this design, to help prevent aggressive interactions (Sato et al., 1991), widespread sickness transfer and the need to medicate all calves in a barn should an illness develop.

Access to individual clean water, feed and gentle human contact.

Hoof comfort, environmentally friendly and expedient waste removal. Flooring surfaces provide ergonomic type comfort with slots for easy waste removal into a system that is regularly flushed and used to fertilize fields. This flooring is referred to as "Tenderfoot" flooring surfaces (Wilson et al., 1998).

Individual care and monitoring. Farmers can ensure that each calf eats well and that eyes, skin, nostrils, and manure consistency are monitored daily, so that issues of health can be quickly addressed, if necessary. Iron status is regularly monitored and supplemented as needed to prevent anemia. Gentle human contact is provided during each feeding session. Unlike other industries, the veal industry does not use automated feeding systems which have been implicated in disease transfer and reduce individual human contact, which is needed for optimum calf well-being (Le Neindre, 1993, Maatje et al., 1993, McFarlane et al., 1988, Perez et al., 1990, Terosky et al., 1997, Veissier et al., 1998).

New Jersey legislation proposes that veal calves be provided housing space to be free to turn around. The notion that calves need to physically turn around is not a documented need of calves. In fact, given the opportunity, calves turned around only twice per day, on average (Stull and McMartin, 1992). Why? Even at a young age, cattle are creatures of habit and generally lie in the same orientation within their stalls. University of Kentucky research showed that beef cows on pasture spend most of their time within only a fraction of pasture space available and anyone who has been in a pasture with cows can attest to the cows developing certain "paths" which they follow every day. Dairy cows enter the milking parlor in nearly the identical order for every milking. Calves lie in their stalls with their heads toward the feed bucket and do not generally turn around. Turning would merely position calves to face their waste and possibly allow them to create waste in their milk feed and water.

Calves do not attempt to turn or butt or fuss against their housing stalls. They are calm, secure and comfortable. Stalls are sufficiently wide, have short partitions between calves (fences) and have open backs. Cattle have eyes positioned on the

sides of their heads which allows them to see behind themselves without turning their heads much. Great peripheral vision may be a factor in why calves do not exhibit the need to turn around.

In many respects, individual stalls actually simulate the natural situation for young calves, with the veal farmer acting as "foster mother," providing milk, protection from other calves, protection from disease transfer, and gentle individual attention.

Tethers - Not Stressful

Tethers have many benefits for veal production. The greatest benefits are that they allow for individual calf stalls to be larger and permit non-aggressive head and neck licking of neighboring calves, while restricting aggressive licking of back and rump of neighboring calves (Sato et al, 1991). If veal housing were truly the narrow crate design, as depicted by activists, there would be no need for tethers. The walls would sufficiently restrict calves' movements. Tethers and "half-stalls" housing systems allow calves to sleep in a normal, outstretched position and experience more deep sleep.

Consider that in nature, gentle animal coexistence is not the rule; survival of the fittest is the rule, with animal "pecking orders" quickly developing in every group, herd, flock, hive, colony, etc. Unrestricted interactions are not necessarily in the best interest of fellow calves' welfare. "Bully" calves have aggressive and antagonistic behavior towards more timid calves (Veissier, et al., 1994). Tethers help protect against bully calves while allowing socialization.

Use of tethers in individual stalls is not stressful to veal calves as demonstrated by measuring health, growth, and blood levels of the stress hormone "cortisol" and neutophil:lymphocyte ratios, plus pathological changes of the abomasum (Stull and McMartin, 1992, Stull and McDonough, 1994). Tethers reduce stress by allowing veal farmers to gently feed, administer necessary vaccinations and other needed animal health products and monitor iron status without chasing calves or forcing calves through chutes, which creates stressful experiences for calves.

Tethers are not only a protection for the calf but for farmers as well. Milk-fed veal calves grow to 500 pounds within 4 1/2 to 5 months and can become dangerous to the farmer if "spooked" by another calf or a noise. Tethers allow farmers to gently and safely adjust calf positions when necessary for the purposes of contact, feeding, treatment and sanitizing, thus increasing welfare and reducing disease and malodor. It would be more stressful to add a tether at a later and larger stage than to have it become a part of the early environment, to which the young calf readily adapts and benefits.

Activists may argue that tethers are stressful at first. However, animals in every setting, whether on the range, on the farm, in the sky, or in the water, will experience a variety of stressors throughout their lives. Baby veal calves may experience a minimal amount of initial stress due to the unfamiliarity of a tether but this is overcome quickly (within 24 hours) and any minimal short-term stress is far outweighed by the longer-term security and comfort that tethers provide.

Iron Management

Cow's milk, often considered nature's most perfect food, is naturally deficient in iron. An observant student of nature would hypothesize that the lack of iron in milk must benefit the young calf and seek nature's reasoning rather than creating legislation, as in the New Jersey proposal, that forces farmers to "feed a daily diet" of iron to baby calves.

Why doesn't cow's milk contain iron? Pathogenic bacteria in the intestine, such as Salmonella and E. coli, require iron. These nasty bacteria cause diarrhea, systemic infections and are the leading cause of death in calves (USDA, 1994). Orally ingested iron is a contributor to these deaths. Lactobacillus bacteria - the so-called "friendly bacteria" do not require iron because they derive their energy needs through a different enzyme sequence. (These are the "friendly bacteria" found in yogurt.) By feeding milk which is deficient in iron, Lactobacillus have a "competitive advantage" over pathogenic bacteria, resulting in better calf health and well-being. For this reason, most veal farmers utilize more costly, more labor intensive injectable iron dextran for supplementing iron to young calves and constantly monitor blood variables to assess iron status of all calves.

Recent research (unpublished) has shown that about 4.25% of veal calves in the study were classified as "clinically anemic" at birth, compared with 3.125% at market. Research in The Netherlands has shown that iron status of the calf is poorly related to iron status of the cow (Miltenburg et al., 1991). Additional research is needed to determine why calves which are born anemic do not respond to iron supplementation like normal calves.

Compare the concept of iron supplementation in the veal calf to the vegetarian diet and B12 supplementation. As meat is the only reasonable natural source of vitamin B12 (plant sources of vitamin B12 would have to be consumed in mega quantities to satisfy the human requirements), the vegetarian must supplement vitamin B12 in order to maintain good health. Legislators could claim that according to nature, meat was intended as the natural source of vitamin B12 and, therefore, vegetarians must eat meat. However, in the vegetarian view, there are alternative sources of vitamin B12 such as in a vitamin pill. The veal farmer would argue that while edible iron sources exist in nature, other means of iron supplementation, such as injectable iron are not only effective but superior for the baby calf.

Veal farmers and veal feed companies spend a great deal of time, effort, and expense in managing iron intake and in the prevention of anemia (Abdelrahim et al., 1983, Bowers et al, 1989, Bremner and Dalgarno, 1973a, Bremner and Dalgarno, 1973b, Bremner et al., 1976, Welchman et al., 1998, Wensing et al., 1986). Anemia is a condition with many different causes, most commonly iron deficiency. Anemia results in reduced feed intake and growth rate, pale mucous membranes, weakness, reduced feed intake, increased heart and respiratory rates, rough hair coat, characteristic chalky manure and death in extreme cases.

Because anemia causes a reduction in feed intake and growth rates, veal farmers would suffer dramatic economic losses if calves would develop anemia. It is not logical to accuse veal farmers of creating anemic conditions among calves, that would risk the health, growth, well-being and lives of their valuable investment. Veal veterinarians and veal feed companies play an active roll, as part of their service programs, in helping veal farmers manage their calves' iron to prevent anemia, and maximize health, well-being, and performance. Iron management programs limit excessive iron because providing more iron simply increases the concentration of myoglobin - the iron-containing pigment in the muscle. Providing iron beyond the calf's minimum needs does not improve its performance, health, or well being (Eeckhout et al., 1969, McFarlane et al., 1988).

Blood hemoglobin (Hgb) levels and blood hematocrit levels are commonly used to assess iron status in veal calves. Hgb levels in veal calves at birth average about 10 mg/l with a range from 5.4 (considered anemic) to 17.6 mg/l. Hgb levels fall after birth as the calf utilizes its fetal Hgb and synthesizes adult Hgb. Levels rise through 10 weeks of age, and then decline gradually based on dietary intake of iron, copper, zinc, manganese, molybdenum, folic acid, and vitamin B12. Normal Hgb levels in healthy calves range from 7 to 13 mg/l and groups of veal calves will average 8-10 mg/l, depending on age. Calves are classified as marginally anemic (no adverse affects on health, performance, well-being) when Hgb levels fall below 7 mg/l. Clinical anemia occurs when blood Hgb levels fall below 6 mg/l and adverse physiological changes occur when Hgb falls below 5 mg/l (Stull and McMartin, 1992).

Calves are born with differing amounts of iron stores and on-going, individual monitoring of blood variables (hemoglobin, hematocrit, mean corpuscular volume, platelets, red blood cell counts, white blood cell counts) is routinely practiced to determine which calves need iron and which calves have excessive amounts of iron stores.

The same blood testing instruments found in leading hospital diagnostic laboratories are found in veal industry laboratories to monitor calf health and iron status. The veal industry is one of the leading users of this blood monitoring equipment. Based on individual calf blood readings, veal farmers supplement iron both through injection of dextran in young calves, and with oral iron supplements in older calves, on an individual basis.

Some claim requiring the feeding of baby calves oral assures good health. However, oral iron and maintaining good health are mutually exclusive.

Feeding Fiber

Feeding fiber is detrimental to calves, and does not promote rumen development. Proposed New Jersey legislation requires, "if the calf is more than 14 days old, it must be provided each day with food containing sufficient digestible fiber to prevent impairment of the development of its rumen," (A1948, Weinberg).

If fibrous feed had any true nutritional value for the calf, the veal farmer would gladly feed it for a great economic advantage. Hay costs about $90 per ton whereas milk replacer costs about $1000 per ton. The premise that fibrous feeds will improve calf health and well-being and lead to functional rumen development is based on misinformation. In fact, feeding these indigestible fibers at such a young age is detrimental to calves.

What is "digestible fiber" for a 14-day old calf? In a word, nothing! Calves are born as "pre-ruminants" and efficiently digest milk or milk replacer but are unable to digest fiber or other carbohydrates (Huber et al., 1961a, Huber et al., 1961b). Feeding

fiber or other carbohydrates to young calves results in carbohydrate malabsorption, diarrhea, and a severe reduction in calf well-being and performance (Beharka et al., 1998, Dreau and Lalles, 1999, Hammer et al., 1990).

The demand to feed fiber appears to be based on the notion that baby beef calves consume grass on pasture and eventually develop a functioning rumen; therefore, veal calves on milk should develop a rumen too. In reality, calves on pasture do not, except for a rare nibble, consume any appreciable amount of grass until 3 to 5 months of age. Young calves on the pasture drink cow's milk until they are 6-9 months old, while their mothers graze on grass.

Grass is very different in nutritional content compared to hay or straw. The sugar and starch content in grass and grains help stimulate rumen function. Roughages such as hay and straw do not effectively stimulate rumen development. Even corn silage, which is one of the most nutritious high-fiber feeds is not a good source of nutrition for veal calves (Welchman and Baust, 1987).

Fiber is made up of structural cell-wall constituents, predominantly cellulose, hemicellulose, pectin, lignin, cutin, and silica (Goering and Van Soest, 1970). Hay and straw fiber are predominantly composed of the same cellulose found in newspaper or cardboard boxes. No mammal contains the enzyme "cellulase" which breaks down cellulose. Fiber is not digestible to the young calf because calves are born with essentially the same digestive stomach as humans. Feeding fibrous feeds such as grass, hay, silage, or straw to veal calves is detrimental to growth, health, and well-being as would be feeding grass, straw, hay, paper or cardboard to a human baby.

Straw is not generally considered a feedstuff. Straw is generally considered a bedding material for cattle in cold housing.

Development of the rumen, a large fermentation vat for digestive purposes, is not necessary for good calf health and well-being. The calf is born as a "pre-ruminant" in which the rumen, reticulum, and omasum are quite small and not developed. Through the esophageal groove mechanism, milk bypasses the rumen and is shunted directly into the abomasum (gastric stomach). Milk is the most nutritious and easily digestible feed for young mammals. The concept of legislators and activists demanding that calves be fed fiber, rather than milk, to develop the rumen is akin to forcing vegetarians to eat meat because they were born with canine teeth.

Young calves thrive when fed milk (or milk replacer). When young calves consume high fiber feeds, they develop "hay belly" – a condition of ill-thrift characterized by poor body condition and rough hair coat. By limiting milk intake and feeding grain (not fiber), or green grass as is provided to beef calves over time, the byproducts of microbial fermentation, in particular propionic acid, acetic acid, and butyric acid, stimulate rumen development. Dairy calves raised for replacement stock or for beef begin eating grains, such as wheat, oats, barley and corn, early in life, at about 35 days, with milk intake restricted to 1-2 gallons per day, to facilitate the development of the rumen. When milk is restricted, the rumen develops its capability to ferment roughage and forage and prematurely becomes functional. Growth of these grain fed calves are relatively stunted when compared to veal calves that receive premium nutrition in milk diets.

Abnormal rumen development occurs when fiber is fed to veal calves. The rumen is not fully developed and an abnormal rumen wall develops which is very thin and lacks normal papillae found in functional adult ruminants. Calf health, well-being, and growth are severely compromised when calves are forced to consume fiber at an early age, causing abomasal ulcers, rumen impaction (Canadian Agri-Food Research Council, 1998), parakeratosis (Gilliland, et al., 1962), and abomasal (stomach) ulcers (Bernier,et al., 1984, Pearson et al., 1987, Welchman and Baust, 1987, Wiepkema et al., 1987). Feeding limited fiber with a primarily milk diet has reduces the calves' well-being (Perez et al., 1990). The call for adding fiber into veal calf diets in Europe was partially in response to some observed calf behavior of tongue rolling being incorrectly perceived as dietary boredom. While tongue rolling was widely viewed as a sign of boredom and stress, it is becoming understood now as a sign of contentment. Calves that roll their tongues do not have abomasal ulcers, while calves which do not roll their tongues suffer from abomasal ulcers (Wiepkema et al., 1987).

Milk naturally bypasses the rumen via the esophageal groove to provide optimum nutrition directly to the abomasum. Beef calves on pasture with their mother cows do not consume significant amounts of solid feed until they are 3-5 months of age. These calves are not generally weaned and fully off of milk until they are 6-9 months of age. It is during the third to fifth month that beef calves begin to develop their rumens. Interestingly, beef calves on pasture with mother cows often suffer from abomasal ulcers as they begin consuming fiber.

Feeding solid feed needs to be an all or nothing strategy with calves: either feed all milk (or milk replacer) or limit milk intake and feed grain to develop the rumen, realizing that calf growth will be stunted compared to an all-milk diet. In no case is

feeding fiber, including grass, recommended to 14-day-old baby calves. Many universities and cooperative extension services in dairy producing states recommend that farmers not feed hay or other fibrous roughages until dairy calves are at least 2-3 months old.

Veal calves, fed only milk or milk replacer, are generally healthier than replacement Holstein heifers (young female cows) or Holstein dairy beef calves, and gain about 100 lb more weight in the first 90 days of life than beef calves fed grain and pelleted concentrate feeds. Schwartz (1990) expressed the widely held opinion of animal scientists and animal behavioral scientists that of the four categories of indicators of calf welfare (productivity, pathological changes, physiologic/biochemical changes, and behavioral changes), productivity is the most reliable indicator of animal welfare. Clearly, milk-fed veal calves, with 100 lb more weight gain (176% of grain-fed calf productivity) in the first 90 days versus grain fed Holstein beef calves, experience and exhibit superior welfare.

Environmental Benefits of Veal Calf Production

As President George W. Bush said, "Every day is Earth day for those who make their living tending the land." The veal industry serves to help maintain a balance among land, water and dairy industry waste by-products. Each veal calf consumes approximately 11,000 lb of waste by-products of milk, butter, and cheese production such as whey, whey protein concentrate and fat that would otherwise be spread on fields or buried in landfills. In other words, the veal industry uses 5,367,500,000 lb. of human food by-products per year as ingredients in its milk replacer feeds, which would otherwise be an environmental waste.

Veal calves, by directly digesting over 95% of milk replacer, do not generate so-called "green house gasses" because they do not have a functional rumen and make greater use of nutrients ingested. Many environmentalists believe that the ruminating process is harmful to the environment because it creates "green house gasses" which are linked to depletion of the ozone layer and global warming. The byproducts of ruminal fermentation are: heat, methane, ammonia and carbon dioxide, which some environmentalists believe negatively impact the environment. These waste products are part of the inefficiency of ruminal fermentation, since ruminating cattle only utilize about 75-80% of feed consumed, with the rest being wasted. Veal calves also produce much less manure than calves fed grains and roughages because of the superior digestibility of milk replacers.

The veal industry rescues young Holstein breed male bull calves that cannot be used for milking and are not highly desirable for beef. It would be an unfortunate waste of natural resources for a cow to carry a calf for almost 300 days and then for it to be processed at less than two weeks of age, or only 100 pounds, when it otherwise could become a highly productive 500-pound contributor to the human food supply and a benefit to the environment.

Other Issues Important to Veal Production

Veal farmers are well aware of the fact that quality production is no accident. It is the result of quality care. Farmers' livelihood depends on gentle handling and stress reduction. Excellent care carries benefits during the production process and even after the calves leave the farm. Farmers would have nothing to gain by providing anything less than best care for their livestock, which in turn produces a premium product for the consumer, and consequently a premium price back to the farmer for their animals.

Socialization Facilitated For Calf Welfare

Different breeds of cattle react differently to human interaction. Genetics plays an important role in calf performance and welfare needs (Dijkstra et al., 1990, Kaufmann et al., 1996, Meulenbroeks et al, 1986, Oldenbroek and Meijering, 1986, Vermorel et al., 1989,). The Holstein breed, used for veal production in the U.S., has a long history of close interaction with humans. Holstein calves respond positively to human contact and human interaction. Social contact between veal calves and veal farmers is very important to calf welfare and reducing stress (Veissier, et al. 1997). Individual attention and individual care of veal calves improves calf welfare, reduces reactivity, stress, and improves meat quality (Lensink et al., 2000a, Lensink et al., 2000b, Lensink et al., 2001, Veissier et al., 1998).

Transportation

On going gentle care carries residual benefits to veal farmers' livelihood, even when the calf leaves the farm. For example, a lifetime of gentle care prevents weight shrinkage during transportation due to stress. On-going research continues to study

ways to reduce stress in transportation of calves (Fernandez et al., 1996, Seubert, 1982, Smith and Wilson, 1999). Two pivotal studies showed that calves given more individual attention and care by veal farmers had lower stress during transportation and better meat quality (Lensink et al., 2000, Lensink et al., 2001). Veal farmers are well aware of the multiple benefits from gentle care and stress reduction.

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