

Veal Re-Vealed: The Veal Industry

Veal comes from the male offspring of dairy cows. These animals are not grown to maturity for beef because dairy breeds have been developed primarily for their milk-producing capability and not for the quality of their meat. Therefore, these animals are slaughtered as calves and marketed as "veal."

Veal may be highly regarded for its pale color and tenderness, but the quality of veal reflects a calf's diet, muscle development, and the age and weight at which it was slaughtered. "*Bob*" veal is the meat of calves slaughtered within a few days of birth, at about 90 lb. Though white in appearance, "bob" veal can be overly soft, even slimy. *Crass-fed veal* comes from calves raised on pasture, sometimes supplemented with grain. These animals are slaughtered at anywhere from a few months to a year of age, depending on market demand. Grass-fed veal is generally pink or red in color, and can be tough or grainy, depending on the age at which a calf was slaughtered.

The third type of veal is called "*white veal*." It is this type which is of primary interest to those concerned with animal welfare. White veal is also known as "milk-fed," "special-fed," "fancy," "prime," and "nature" veal. In the U.S., calves raised for white veal are confined from 3 or 4 days of age inside unbedded, wooden stalls or crates. They are fed an all-liquid, milk-based diet. Movement is severely restricted, as is intake of roughage and iron. These restrictions are designed primarily to assure production of a pale and tender meat. After 14-16 weeks of confinement, calves are slaughtered at a weight of about 330 lb.

Development of White Veal Industry

Until about 30 years ago, "bob" and grass-fed veal were the only type of veal

widely available in the U.S. Both were, and still are, considered unacceptable to most gourmets. However, there have always been small quantities of white veal available to connoisseurs from the private stocks of dairy farmers. Tales of how some farmers attempted to produce white veal are bizarre. The general practice, apparently, was to select a newborn calf, tie it in a dark corner of the barn to keep it inactive, and muzzle it so it could not eat hay or straw that might darken the flesh. Calves were unmuzzled only once or twice a day to drink whole milk from a bucket. Another story describes New York City dairymen bleeding their calves up to six times before slaughter in the belief that a slow death produced whiter veal (G. Carson, *Men, Beasts and Cods*, 1972, pp. 81-82).

Commercial production of white veal began in Europe in the early 1950's. At that time, the U.S. government was buying surplus milk from American farmers under the milk price-support system and shipping it to Europe at very low prices in the form of skim-milk powder. In Europe, makers of animal feeds began using the plentiful supply of milk-powder to produce "milk-replacers" for baby farm animals - an inexpensive alternative to feeding animals whole milk.

In Holland, where the European veal industry was concentrated, the Dutch Provimi Company mixed the milk-powder with whey, fat, antibiotics, vitamins, and minerals, and produced the first commercial milk-replacer specially formulated for veal calves. The company also developed a system of confining calves individually in stalls so farmers could bucket-feed each animal a daily measured ration of the new milk-replacer. Iron levels in the milk-replacer were controlled, thereby inducing borderline anemia, because it was believed that too much iron darkened the calves' flesh. That was the beginning of the modern veal industry.

By the mid-1950's, the Dutch Provimi Company (the name comes from PROteins, Vitamins, and Minerals) had become the leading European manufacturer of milk-replacer for veal calves. Aat Cro-

enevelt, whose father was then Provimi's president, saw the potential for a similar business in the United States. In 1957, Croenevelt, then 23 years old, left Holland and came to New York. By 1962, he had established Provimi Inc. (U.S.A.), and opened a feed manufacturing plant in New Jersey. However, there was little demand for his white veal. "Our biggest problem was that our type of veal was nonexistent then in the United States," Croenevelt recalls. "We had to promote it heavily." Land O'Lakes disagrees with this assessment and argues that the demand was created by a variety of ethnic groups (*Fancy Veal Production Guide*, 1977).

Whatever the source of the demand for white veal, Provimi has grown and prospered since 1962. In addition, while the company remains the leader of the U.S. veal industry, there are now a number of competitors who share a market of between \$250 and \$400 million. In all, there are now about 20 U.S. companies involved in the industry, including such large agribusiness firms as Agway, Land O'Lakes, A.E. Staley Mfg. Co., and Cold Kist.

Number of Veal Calves

The number of calves raised each year for white veal is between 750,000 and 1 million. This is a "best-estimate" based on a comparison of estimates given by several people involved in veal production. The U.S. government does not keep separate statistics on the production of white veal, but counts all varieties of veal together. The government figure for slaughter of all types of veal in 1980 is 2.25 million calves. Thus, of all calves slaughtered each year, about one-third are for white veal. Most are Holstein bull calves produced in the major dairy states such as Wisconsin, New York, Pennsylvania, and New Jersey.

Veal Growers

Most veal calves are raised by individual farmers who work under contract to the large veal feed and packing companies. The number of farmers (the industry refers to them as "growers") engaged in this work nationwide is about 1,500. Most farmers grow veal calves as a way of supplementing regular income (*Vealer USA*, May/June 1979, p. 17). As such, most veal operations are relatively



small in size. The typical veal grower maintains only about 225 confinement stalls (although some large operations have as many as 3,000-*Feedstuffs*, July 20, 1981, p. 22). However, as it takes only 14-16 weeks to grow calves to slaughter weight, under ideal conditions a grower can produce three "crops" of calves per year.

The contracts under which growers work with the feed/packing companies are of two basic types: the labor-lease and the forward-purchase. Under the labor-lease contract, the veal company provides a grower with money for calves, feed, and medication, and the grower's weekly income. The grower supplies the barn, utilities, and labor. This arrangement may also involve bonus incentives for weight and grade of calves. Under the forward-purchase contract, the feed/packing company simply agrees to purchase the grower's calves when finished for a pre-arranged price. Under both types of contract, the grower may either be encouraged or required to raise his calves according to specifications of the feed/packing company, such as construction of barn, formulation of feed, and use of medications. The feed/packing companies will usually have field representatives visit the grower at intervals to advise on growing methods.

While it is true that the vast majority of veal calves are grown by individual farmers, there may be a trend developing toward the feed/packing companies growing calves themselves. In 1979, *Veal/er USA* (May/June, p. 13), the industry trade journal, reported that in Wisconsin, six veal operations "have been taken over by feed companies and/or put on contract or owned outright...more and more, the larger units are being controlled by the companies or packers."

Veal Consumption

Americans eat relatively little veal - only about 2.0 lb (all types) per person in 1980. This figure increases, however, in urban, affluent areas of the Northeast, where government statistics show veal consumption is at least twice the nation-

al average (Economic Research Service, USDA, 1978).

Consumption of white veal, in particular, is said to be greatest among consumers of European descent and among gourmets of all ethnic descriptions (*New York*, November 5, 1979). One producer has estimated that 70 percent of all white veal produced in the U.S. is consumed within a 300-mile radius of metropolitan New York. The distribution pattern for veal reflects this highly concentrated and relatively affluent market. Veal sold to "white tablecloth restaurants" (a term used by Provimi) and quality butcher shops is almost exclusively white veal. The less expensive veal that is used in frozen and fast foods and sold in supermarkets and "checked tablecloth restaurants" is more likely to come from "bob" or grass-fed calves.

Though government statistics show that total veal consumption has decreased from 5 lb per person in 1965 to 2.0 lb today, this does not necessarily mean that consumption of *white* veal is declining. In fact, the slow but steady growth of the white veal industry and the increase in public awareness of white veal suggest that even as consumption of less expensive veal declines, consumption of white veal continues to increase.

Must Veal Be White to Taste Good?

There are at least two studies that have been done to test this question. The first study was done in 1970 by Dr. Robert W. Gardner, professor of animal sciences at Brigham Young University. Dr. Gardner raised two groups of calves in confinement. He fed one group a commercial milk-replacer. He fed the other group primarily on grain. "The veal from our grain-fed calves appeared a little darker than that from the milk-fed calves," he reported. Panels of taste-testers then sampled veal roasts made from both groups. The results showed "panel members could not detect differences in odor, appearance, flavor, juiciness, character of juice, or tenderness of overall quality. A ... sheet test verified no differences in tenderness" (*Feedstuffs*, March 7, 1970, p. 24).

The second study was done in 1979 by *New York* magazine in connection with publication of an article entitled "Veal: The Great White Hoax" (November 5, pp. 66-72). To compare milk-fed veal that was very white in color with milk-fed veal that had turned out dark-pink, as well as redder veal from calves raised on grass and/or grain, the editors assembled a panel of "great palates": chefs James Beard and Jacques Pepin, restaurateurs Elaine Kaufman and Alfredo Yiazzi, and food critics Barbara Kafka, Paula Wolfert and Gael Greene. The results showed that, blindfolded, the food experts could not consistently agree on which of the veal meats was of superior taste.

The question of whiteness is critical in any debate comparing the merits of the milk-fed method of raising veal against other methods. And yet there appears to be little evidence that whiteness is essential. In a recent letter to The Humane Society of the U.S., Provimi argued, in essence, that veal must be pale because the public *expects* it that way.

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Concerning the animal rights issue, Mailman observed that it has gained considerable momentum in recent months and that in the process it has become "very emotional." The animal rights cause, he asserted, "will not be won on facts." He stated that the best remedy for the turmoil created by welfare advocates was an educational program on modern agriculture, to explain the production methods currently in use, to consumers who may still believe that veal calves grow up "out on a grassy hill."

In truth, all of the data necessary to arrive at a *final* verdict on the detriments versus benefits of the confinement system, in terms of its two principal aspects, welfare and productivity, are not yet in. There have already been, however, some important small-scale studies, as well as one large-scale trial of considerable significance: the conversion of the Quantock veal-raising operation from individual confinement units to group pens, with straw for roughage, natural light and ventilation, and *ad libitum* feeding from automatically supplied nipple feeders.

The Quantock Experience with Croup Pens

Quantock, Ltd., is an affiliate of Volac, Ltd., which is the largest manufacturer of milk-replacer and seller of veal products in Britain. Phillip Paxman, the Managing Director of Volac, was responsible for the switch-over from confinement units to group pens, which was first begun on an experimental basis in 1975. At present, about 14,000 Quantock calves are raised each year in this system. Paxman did note, in his testimony before the House of Commons Agriculture Committee (Minutes of Evidence, March 19, 1981), that there were some advantages in the crate system:

In defense of the system, I think it must be said that each calf receives a high measure of individual attention. It is fed individually twice a day. The quality and consistency of the dung, which is a cardinal husbandry point, can be determined by inspection twice a day and treatment

of the animals is very straightforward.

Problems with the Crate System

But Paxman also lists the numerous problems created by the confinement system:

For the animals, there was clearly a lack of movement- very restricted movement- which in turn reduced grooming, and the coats of the animals deteriorated. It is reasonable, I think, to suppose that the thwarting of a natural instinct, of which grooming is a very strong one, is distressing to the animal. Play, a very natural habit- and a healthy one in young animals - was totally impossible. It is, of course, a very easy trap to fall into an anthropomorphic attitude and to ascribe to animals our own feelings and attitudes. But, despite that, I think that to frustrate anything as deeply instilled in the animal's instincts as play among babies must be construed at the very least as unnatural and, more properly, as cruel [Minutes of Evidence, 1981].

Paxman observed that lack of roughage inhibits the onset of rumination, and displacement activities lead to hairballs in the true stomach. Sometimes, as many as 12 of these are removed from the stomach of a mature calf. Also, the complex controls involved in maintaining the "total environment" within the rearing shed mean that more can go wrong, so there are frequent severe variations in humidity, temperature, and ventilation. And, for the men who work in the veal confinement industry, the job is basically boring; they spend most of their time cleaning, flushing, and hosing the flooring under the crates. Paxman also notes that the capital costs of setting up a confinement unit are extremely high.

In the new group-pen system, calves are usually raised in groups of 20 to 40; each animal has about 20 sq ft of floor space. Light and ventilation are natural, and straw for roughage and bedding is

provided (each animal is allotted about 8 bales for its 15-week lifetime). Floors are made of concrete. The calves feed themselves at an automatic nipple feeding machine. Nutritional iron levels are kept at 35 part per million, which has been found sufficient to prevent anemia in studies by the British Rowett Research Institute.

Once the company began to experiment with group pens, advantages for both calf welfare and productivity were discovered. The calves:

didn't need a controlled environment, they didn't pass diseases to each other because they were in groups, the eating of straw did not result in a deterioration of the carcass, the staff did adapt to caring for calves in groups, natural daylight worked perfectly well and was cheaper than artificial light {Minutes of Evidence, 1981}.

The system was also found to be more profitable than the old one, and there are lower capital costs. Paxman indicates that he makes about \$40 per calf in his loose-housed system compared to just breaking even in the crated system. Furthermore, the mortality rate has been shown to be lower in loose housing (see Table 1). The only new costs associated with the Quantock system occurred because calves could no longer be individually rationed. Milk consumption is higher in loose housing, and the efficiency of feed conversion is slightly lower-1.65 lb of feed per lb of weight gained in the loose housing, as compared with 1.55:1 in the crates.

The veal produced in the loose housing is of equal quality to crate veal and the color of the meat appears to be perfectly acceptable to the British consumer. The only exception to this is the restaurant trade. Restaurant owners continue to insist on purchasing only the palest white veal; they have, Paxman claims, "aped quite needlessly Continental inclinations."

A Different Opinion on the Matter

However, Dr. C. Van Putten, of the Research Institute for Animal Husbandry, (Zeist, Holland) has reached conclusions that are substantially different from the Quantock experience. In a paper presented at the Congress of the British Veterinary Association, September 19, 1981, he reviewed the data from several sets of his experiments, conducted over the years. As an initial premise, Dr. Yan Putten stated that we must accept two facts about animal husbandry: (1) that farmers require some profit for their labor and investment and (2) that "modern farming systems generally have, in some way or another, a detrimental effect on the well-being of the animals involved." The goal, therefore, is to find the set of possible systems of husbandry that are economically feasible and, from these, to determine which is least harmful to the well-being of the animals.

Considering the crate system as one economically feasible method, Yan Putten concedes that animals raised in this system do suffer from problems like boredom and denial of suckling, but that their main difficulty is an inability to lie down, particularly as they age and increase in size. He therefore recommends that, for veal calves who will eventually reach a body weight of 200 kg, crate dimensions must be at least 70 cm (28 in) in width by 170 cm (70 in) in length (as compared with the standard dimensions for U.S. stalls, 22-24 by 52-60 in).

While tethering offers few advantages, Yan Putten admits that group housing does permit calves to indulge in more of their natural social behaviors and to explore their environment. But he argues that, in balance, the disadvantages of group housing outweigh the advantages.

For calves penned in small groups, the negative aspects include the following.

- There is a decrease in food intake during the fifth month of life, unless growth-promoting hormones are used (N. Steenkamer, EEC Seminar on Calf Welfare, July 9-10, 1981, Brussels).

- If kept on straw, calves will eat it unless a more palatable form of roughage is supplied. Van Putten has found that eating roughage increases the incidence of abomasal lesions by about 20 percent. Also, straw bedding increases the incidence of claw problems by 11 percent (J.F. Webster, EEC Seminar on Calf Welfare, July 9-10, 1981, Brussels).

- Calves must be tied up after feeding- lapping milk from buckets, the procedure used because automatic nipple feeders are not cost-effective for small groups, does not satisfy the sucking instinct. If left untied, calves will suck each other.

- Keeping calves on straw requires frequent, laborious cleaning.

There was, however, one major advantage noted when calves are kept in large groups (15-50) as opposed to small: It becomes economic to install automatic feeding equipment for the milk replacer. This method of feeding also allows the calves to suck as often as they want, so there is no need to tie them up twice a day after meals. However, in addition to the other disadvantages associated with small-group pens, use of large-group pens means that:

- Drugs cannot be added to food for treatment of individual animals; calves that need treatment must be caught and medicated with injections.

- At the end of the rearing period, weights among calves will differ more than in bucket-fed animals, which means that the farmer will get a lower price, overall, for his animals.

- Detection of illness in animals is usually delayed, and pneumonia is three times more common than in individual confinement units (N. Steenkamer, EEC Seminar on Calf Welfare, July 9-10, 1981, Brussels).

Many of Van Putten's findings have been disputed by other researchers. For example, Van Putten admits that the precise cause of the abomasal lesions is unknown; it has been suggested that they may simply be a natural consequence of the beginning of rumination in calves.

Temple Grandin Reports on Veal Production

Temple Grandin, a staunch advocate of humane slaughter practices and a strong critic of cruelty to farm animals, has recently (June 30, 1981) praised the U.S. confinement veal industry. Not surprisingly, her comments are being used by the industry in its public relations efforts. She stated:

In my opinion veal calf raising is acceptable from an animal welfare viewpoint provided that good animal husbandry practices are followed. Most veal operations are owned and operated by farm families, and the entire family helps to take care of the calves. The veal industry is not perfect but most of their problem areas can be easily solved. The veal raisers have already started to make improvements in the design of the stalls. The accusations about no physical contact and inability to groom are false. For example, the calves in all seven barns were able to reach around and groom their rear ends. Before veal raising started the dairy bull calves were nearly worthless and the farmers would sometimes just hit them over the head. The tiny bob calves also end up as "bob" veal. Hauling tiny baby calves to a "bob" veal plant and handling them in the plant causes many animal welfare problems. Knocking calves in the head and throwing them away is also unacceptable.

The number one problem for veal growers is the fact that many of the calves do NOT receive colostrum at the dairy of origin. Research needs to be done on preconditioning of calves and on disease prevention.

Other research needs, as she sees it, include studies on optimal stall designs; for example, stalls should be large enough to permit the calf to "reach around and groom its rear end." A well-designed stall should also allow the calves to touch and lick each other, to prevent

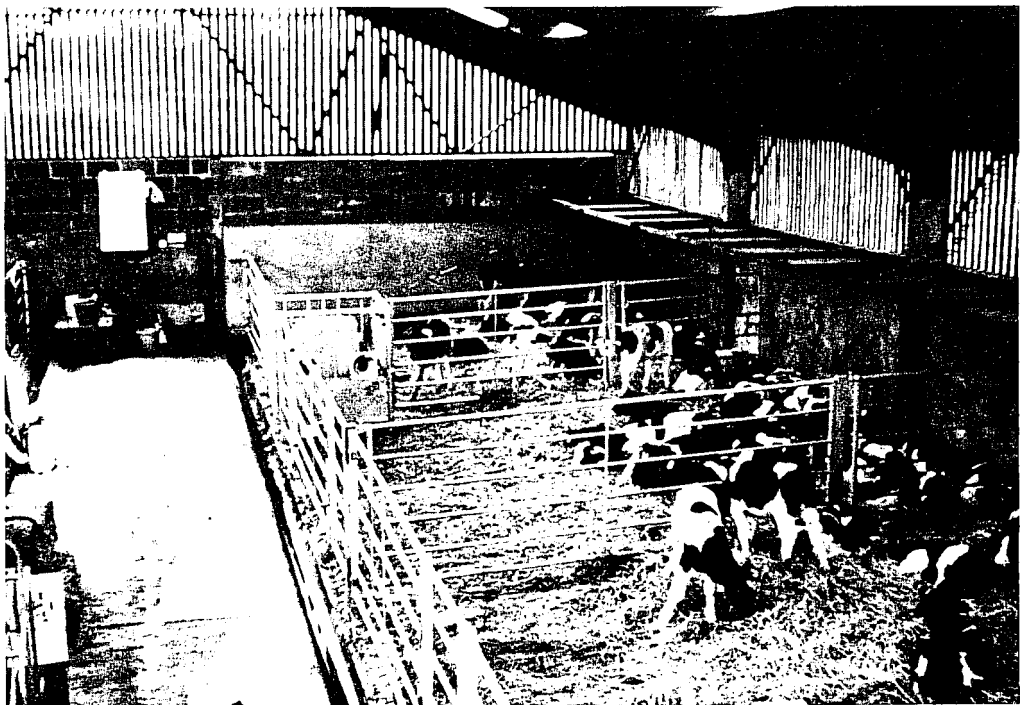
stereotyped behavior- but in most of the barns she visited, this requirement had already been met, since she was unable to observe any true stereotyped behavior. Lighting that appeared to be adequate was also noted, but here again, she asserts that more work needs to be done to establish the actual lighting requirements of young calves.

Grandin also believes that calves kept in individual stalls should be fed individually, rather than automatically, since the isolated calves need the contact and attention that are an integral part of individual rationing. She also feels that group rearing of very young calves can be impractical because competition among the animals may prevent the less aggressive animals from receiving sufficient food. Any group rearing system, she concludes, must be shown to provide results on critical factors like mortality, morbidity, and feed conversion ratios similar to those obtained with crates before veal growers will be willing to consider it. Many of her opinions are, however, contradicted by Paxman. Furthermore, Webster (see below) does not agree with her statement that the crates

provide sufficient space for the calves.

Grandin has also visited the Dutch Denkavit Veal Research Farm and talked with N. Steenkamer, the Assistant Director of Denkavit, and with Van Putten, some of whose data were described above. Her findings were reported in the January/February issue of *Vealer USA*.

The Dutch stalls, she notes, are inferior to the U.S. confinement units from a welfare point of view, since U.S. stalls allow contact between calves, while Dutch stalls do not. The Dutch have recently been experimenting with feeding barley straw to calves, in small amounts. Several advantages were noted: (1) straw reduces boredom; (2) as long as the straw is iron-free, it does not affect the whiteness of the meat; (3) the incidence of rumen bezoars and ruminal keratosis decreases; (4) each calf ruminates about 3 hours a day; and (5) there is lower morbidity and, in particular, less respiratory disease. However, as noted above, Van Putten found that feeding straw increases abomasal ulcers, although Steenkamer believes that these ulcers may simply be a consequence of giving large doses of iron sulfate or other mineral supplements.



Grandin then lists the advantages and disadvantages, noted in Dutch studies, of group housing (15 calves per pen) with a nipple milk dispenser, as compared with group housing for a smaller number of animals (5 per pen) fed by buckets through locking-head stanchions. Advantages included:

1. The incidence of hairballs in the rumen is reduced.
2. Animals can engage in social behavior.
3. Animals can engage in normal nursing behavior and feed about 16 times each day.
4. Weight gains are improved.
5. Labor for feeding is reduced.

Whereas the disadvantages included:

1. Feed costs are increased 10 to 15 percent due to calves drinking more formula than they can assimilate; the conversion ratio is poor.
2. There is three times more pneumonia and other illness.
3. Calves tend to differ in weight and therefore have a lower market value.
4. Catching calves to treat them for illness is difficult.
5. It is impossible to medicate the feed of an individual calf- the whole group must also be treated.
6. Straw is very expensive, and difficult to dispose of.
7. Sick calves are usually not identified for 24 hours later than in an individual-housing system.
8. Mortality is 50 percent higher, and more drugs are used.

For small groups, the benefits observed were:

1. Straw is fed, and therefore the incidence of hair balls in the rumen is lower.
2. Animals can engage in social behavior.
3. Weight gains, as well as conversion ratios, are better than in individual stalls.

On the other hand, there were also problems:

1. The cost of the straw bedding outweighs the advantage in feed conversion and weight gain.
2. There is more sickness, although the incidence is lower than in the group with the nipple feeding system.
3. There are somewhat higher labor requirements during feeding, to lock calves in and then turn them loose.
4. Animals are not allowed to engage in normal nursing behavior.

Steenkamer, she reports, believes that the five-calf system is the best available alternative to individual stalls. In Steenkamer's view, the main problem with this small-group system is the high cost of the straw bedding. But both Steenkamer and Van Putten are opposed to any form of group housing until the mystery of the precise causation of the abomasal ulcers has been solved.

Grandin concludes her article with several recommendations, based on her discussions with Steenkamer and van Putten, on minimum requirements for confinement stalls:

1. The stalls must be sufficiently wide to allow "unrestricted lying."
2. The barn must be well ventilated and well lighted.
3. The 20 percent of all calves that are born anemic should be treated with iron.
4. Colostrum should be fed to newborn calves.

However, there are several problems with the way in which Grandin reaches her conclusions about these two calf-rearing systems. First, we are given no indication of how many calves were studied, for what period of time, or even much information about the precise conditions of rearing. For example, she claims that Van Putten and Steenkamer report a 50 percent increase in mortality for the large-group pens, as compared with the five-calf system. We are not told which data this figure is based on, and it is in sharp contrast with the numbers reported by Paxman for the Quantock group-pen system: in his experience, mortality *declined* from 6.46 percent (crates) to 5.10

(groups). In short, given the fact that no references to specific studies are appended, the article is somewhat of a tease; we simply don't have enough information to interpret Grandin's conclusions.

Webster Compares Crate with Croup-Raised Calves

Professor A.J .F. Webster of Bristol University has been doing studies of the effects of the two major veal production systems, individual crates (bucket-fed) and group yards with deep straw (fed automatically with an automatic nipple). His results were reported at a symposium sponsored by The Universities Federation for Animal Welfare (UK) (UFAW) in 1981.

Bucket-fed calves were found to consume more milk than automatically fed calves unless anabolic steroids were used to increase consumption of the group-raised calves. The breed and sex of the calf also emerged as critical factors. Under group-pen conditions, Friesian-cross-Hereford heifers drank a greater proportion of their body weight at 8 weeks than Friesian bull calves and also spent four times as long competing for access to the nipple. All of the animals, though, were able to drink enough to satisfy their appetites.

Severity and duration of morbidity were also affected by the rearing system used. Infected calves suffered less severely in straw yards and recovered more rapidly, as measured by the ratio of treatment doses to number of calves treated.

Webster made round-the-clock observations of calf behavior and noted that crate-raised calves showed increasingly fearful responses to humans as they grew older, while calves in straw yards became tamer with time. Straw-yard animals also spent at least 5 percent of their time lying on their sides and 2 percent in play; both of these behaviors are impossible for crate-raised animals.

At an Institute of Biology (U.K.) Symposium later in 1981, Webster took a broader look at the many issues involved in intensive farming. First, he points out

two principal facts: (1) there is, at present, no legal limit on the farmer's right to crowd as many animals as possible into the limited area, and (2) the economics of the situation compel the same farmer to continue with intensification if he hopes to retain his competitive position in the market. He notes that, in his experience, the straw yard system of calf raising has yielded \$30-\$45 less in gross profit per calf sold than that of the crate system. Webster also finds a 70-cm wide crate unacceptable, although this is the figure that Van Putten has determined to be an acceptable minimum standard for crates in his studies. Webster and Van Putten also have different views on the broader issue of how to establish the proper relative emphasis that ought to be given to economic and humane considerations. Van Putten has stated that we must first determine which systems are economically viable, and then select the systems that are the least detrimental to the animals from among these. In contrast, Webster advocates that it is necessary to first establish which rearing systems are deemed acceptable by the majority of the public "for reasons beyond science," and then to conduct scientific studies to explore the consequences (nutritional, physiological, and veterinary) of implementing these systems.

Webster has determined a set of minimum requirements for calves that he believes can be supported "on the basis of veterinary science rather than emotional anthropomorphism":

No calf should be deprived of access to solid food and veal calves reared to a slaughter weight of about 200 kg should be accommodated in crates no less than 80 cm wide. Provision of solid food normalises oral behaviour, the development of the digestive tract and almost certainly reduces the incidence of enteric disease. Crates of 80 cm width do not allow calves to lie on their side nor when they are near slaughter weight to turn round, but they do permit normal grooming, reasonable movement and a comforta-

ble sleeping position (A.J.F. Webster, JOB Symposium, November, 1981).

What About Crain-Fed Veal?

Most of the studies described above have been concerned with the productivity and welfare of milk-fed veal. However, given the fact that the majority of consumers (at least in the U.S. and U.K.) find nothing objectionable in a pink tinge to their veal meat, other aspects of husbandry can probably be varied as well.

For example, one New York state farmer, Michael S. Mosner, is already profitably raising calves on grain in indoor and outdoor pens. Baby calves (Hereford, Angus, and Charlois breeds) are placed in the pens (12 by 32 ft) after weaning at 5 weeks of age and remain there for about 4 months, until slaughter. They are provided with a grain formula made up of corn, a protein supplement, and vitamins and iron, as well as fresh straw for bedding. Milk replacer is used only for baby calves, until they reach 5 weeks of age. The animals are generally healthier, because they are far less likely to develop anemia than milk-fed calves not given iron-containing straw. The system also appears to be substantially less stressful for the animals.

The meat that results from this system is a pale pink which, according to Mosner, has been found to be perfectly acceptable in butcher shops and in the chain stores. And because production costs are substantially lower, the meat can sell for far less than the milk-replacer veal.

Conclusions

It is obvious that much of the research detailed here is still in a preliminary stage. We simply do not yet have sufficient data to compare all of the elements involved in designing animal production systems that will ensure a fair profit for farmers and at the same time guarantee a minimum standard of well-being for the animals. Even the most basic questions remain largely unexplored: Do we need more technology, or less? Do legal regulations assist in guaranteeing welfare considerations, or merely stifle private innovation? How does the general public really feel about paying more to ensure that meat animals are raised as humanely as possible? There are also some specific areas of study that are vitally necessary for determining how best to rear veal calves, for example:

- Does milk-fed veal really taste better? Can most people distinguish it from grain- or grass-fed veal?
- What is the precise relationship among genetic factors, lack of roughage in the diet, and the redness of the meat?
- How can group housing conditions be improved? Can the automatic nipple feeders that distribute milk-replacer be improved?

Until we have at least tentative answers for these kinds of questions, the controversy about how best to raise veal calves will inevitably continue.

Dana H. Murphy

TABLE 1. Calf Mortality Rates in Loose-Housed and Crated Veal, Beef Calves, and the National Herd

| Farm | Method | Period | Total calves purchased | Total deaths | Percentage |
|------------------|--------------|-----------|------------------------|---------------|------------|
| Quantock Veal | Crates | 2/79-8/80 | 4,000 | 259 | 6.46 |
| Quantock Veal | Loose-housed | 9/80-2/81 | 2,090 | 105 | 5.10 |
| Wysing Grange | Loose-housed | 3/78-2/81 | 4,500 | 169 | 3.75 |
| Irish Veal Farms | Loose-housed | 1980 | 3,351 | 97 | 2.89 |
| British figures | All systems | 1963 | | National herd | 5.3 |

P.J. Paxman, Volac Ltd.
Minutes of Evidence,
March, 1981.