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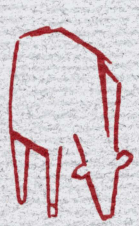
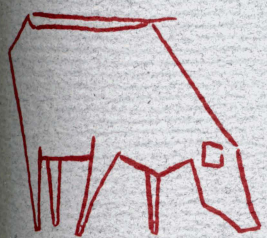
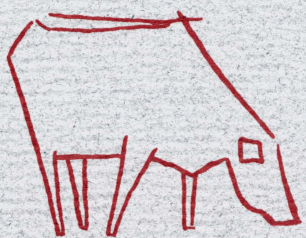
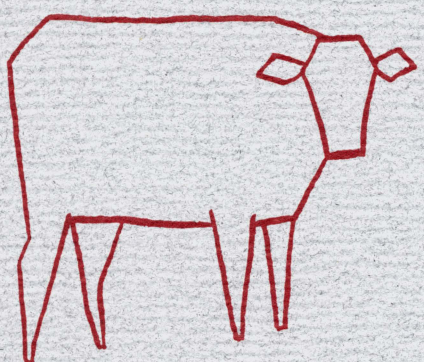
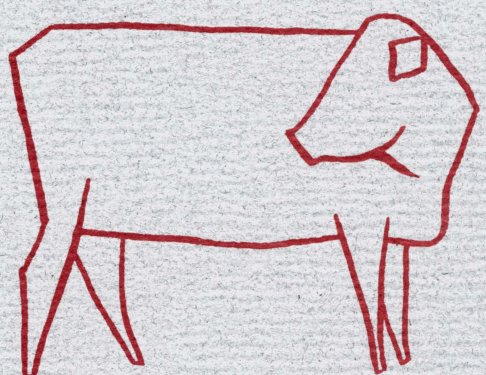


HEALTHY STOCKER AND FEEDER CALVES









TEXAS AGRICULTURAL EXTENSION SERVICE
THE TEXAS A&M UNIVERSITY SYSTEM
John E. Hutchison, Director, College Station, Texas

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HEALTHY STOCKER AND FEEDER CALVES

H. T. Barron and L. A. Maddox, Jr.*

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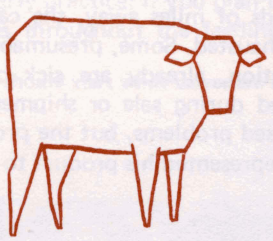


*Respectively, research veterinarian, Texas A&M University; and Extension beef cattle specialist, The Texas A&M University System.

Attempting a recipe for healthy calves is at best something like charting a quagmire, not only because of diversity and quickly shifting conditions between and within herds, but also because of restricted market potentials and varying production goals. The product uniformity desirable for today's mass beef production in the giant feedyards remains an unrealized dream.

Selection of breeding herds for reproductive capacity and offspring performance in terms of rate of gain, yield and cutability is relatively new. There is an increasing realization that dividends from these newly developed heritable qualities are dependent upon health. For our purposes health is defined as the absence of interference with the development of a calf to its fullest genetic capacity.

CAUSES OF HEALTH PROBLEMS

Possible interferences with maximum performance result from nutritional deficiencies or irregularities, physical and mental stresses, toxins and infections, usually in combination of two or more. We must systematically reduce the numbers and intensities of these interferences to increase profits.

Nutrition is important to the calf's ability to withstand stresses, accidents and invasions of all sorts. Not only does it largely determine susceptibility but also the ability to heal and to quickly mobilize such essential body defenses as antibodies in response to vaccines, bacterins and natural exposure.

Physical stresses may play upon a calf from the moment of conception but, aside from weather factors and accidents, are sharpest at birth, weaning and shipping. We assume, except at weaning time, that mental or nervous stresses develop in calves secondarily to physical agitation. They definitely influence energy depletion, nutrient intake and susceptibility to disease.

Toxins or poisons are increasingly polluting the environments in which calves are maintained. Their inadvertent intake or absorption must be prevented.

Infectious agents abound in the forms of bacteria, viruses, protozoa, molds, fungi and parasites. Most agents are opportunists, infecting calves only when something else has weakened their resistance. A few have been isolated and utilized in the production of vaccines. Systematic eradication programs have eliminated some infectious agents from this country. Most still lurk, prevented through vigilant application of principles of husbandry, sanitation and quarantine.

RECOMMENDATIONS TO THE PRODUCER FOR FEWER HEALTH PROBLEMS

For the Producer Who Markets Unweaned Calves

This producer must give attention to the health and productivity of the breeding herd and the specific requirements of calves based upon the market he is following. Vaccinate calves around 3 months of age against blackleg, malignant edema and leptospirosis to protect them until weaning time. This practice is advisable in most parts of Texas regardless of their destination. If the cow herd contains very high milk producers, also vaccinate calves against enterotoxemia, with Clostridium perfringens, types C and D toxoid.

For Fat Calf Slaughter:

Move calves from their mothers to slaughter as quickly as possible when they have attained the desirable weight and finish.

For Stocker Calves:

It is customary for owners of calves sold "as is" through auction markets to haul them to market the same day they are taken from their mothers. They are purchased by order buyers, sorted, hauled to central collecting points and mixed with other cattle. Usually they consume little feed or water for several days because of sudden environmental changes, anxiety and unfamiliarity with feed stuffs and containers. When they arrive at growing pastures or conditioning lots, perhaps hundreds of miles away, the calves are hungry, thirsty and exhausted. Some, presumably lacking protection by vaccination, already are sick or incubating infections acquired during sale or shipment. The new owner has purchased problems, but the producer has been paid for all he represented his product to be.

Some reputable producers market stocker calves at a premium price based on the known quality and pride of their operations. They find it advantageous to market a quality calf that:

- Knows how to eat and drink from a trough.
- Is fresh from the pasture.
- Has not been overheated, chilled or exhausted from gathering and hauling.
- Has had calfhood vaccination for blackleg, malignant edema, leptospirosis and Pasteurellosis.

For the Producer Who Weans Calves

Calves weaned and grown to feeder cattle on the same farm or ranch usually produce the highest investment return. This production plan can eliminate the stresses of sorting, weighing and hauling at weaning time. Further, there is less exposure to respiratory pathogens because of their relative isolation from other calves during weaning. There also is less likelihood of interference with rumen function when shipment and weaning do not occur together.

To keep these calves as healthy as possible the rancher should:

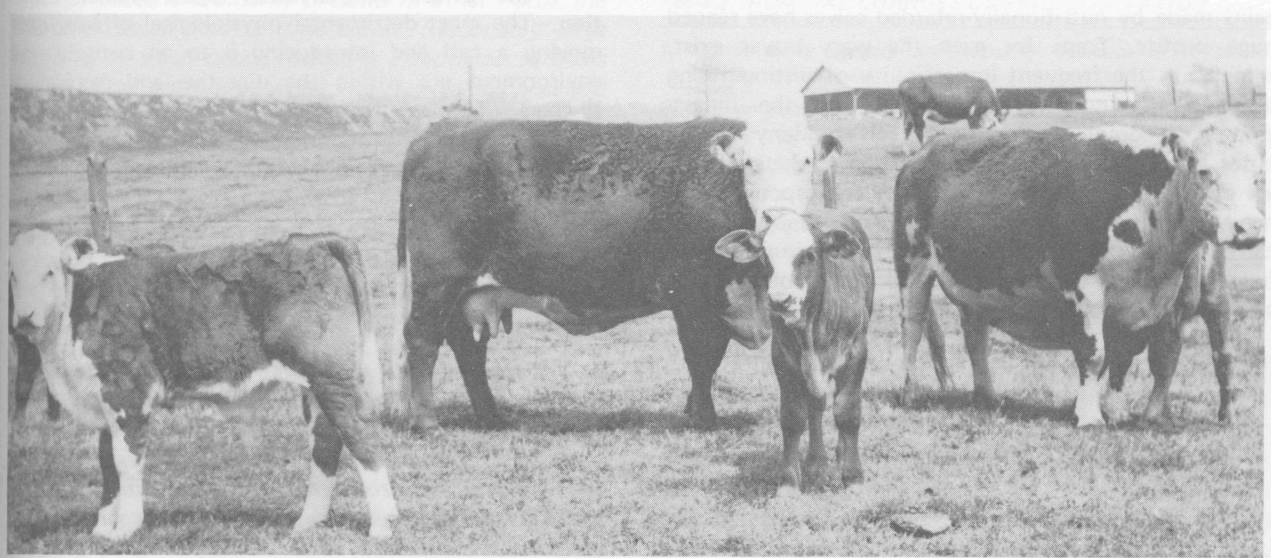
- Wean at 8 to 9 months of age when cows and calves have good nutrition.
- Brand, mark, vaccinate and castrate at least 30 days before weaning.
- Teach calves to eat from a creep or with dams before weaning.
- Handle calves as little and as quietly as possible to minimize fatigue, heating, dehydration, excitement and dust inhalation.
- When fences are adequate, wean calves on grass pastures rather than drylot.
- Feed hay and concentrates in troughs unless calves have learned to eat from self-feeders.

For the ultimate in premium calf production, the Preconditioning for Health Program outlined by the American Association of Bovine Practitioners begins before weaning and continues into the early stocker period. This is particularly practical if you plan to retain ownership of the calves throughout the feeding period by utilizing the services of a custom feedlot. This practice also is sound if you contract calves to a feeder-buyer at a premium price compensating for your extra work, expense and risk. The program serving as an attractive ideal is outlined as follows:

- Wean previously castrated and branded calves 30 days or more before shipment.
- Allow "trough and bunk" adjustment period before shipment. Supply ample, unmedicated clean water. Start calves on a 14 percent protein (total ration) at least 30 days before shipment.
- Immunization procedures:

  If calves were vaccinated for blackleg and malignant edema, leptospirosis and Pasteurellosis before 3 months of age, revaccinate about 30 days before weaning. Simultaneously vaccinate for "red nose" (infectious bovine rhinotracheitis), bovine virus diarrhea and parainfluenza 3 (SF-4). If no early vaccination was practiced, give these vaccines and repeat *at least* the Pasteurellosis vaccination in 3 weeks.
- Treat for grubs and external parasites by spray or pour-on.
- Check manure for worm eggs—worm all if any are infected.
- Upon moving to stocker pasture or to feedlot, observe the following:
  - o By rail 24 hours—then rest 12 hours.
  - o By truck 36 hours—then rest 12 hours.
- Certify above treatments with veterinarian's signature.

Fig. 1. Health programs should start while calves are still nursing their dams.



Following preconditioning, you may keep the calves at home through the stocker period, ship after 2 to 4 weeks to growing pasture or pen or sell in accordance with contracts. For the producer with a feed pen, who will finish his cattle for the packer market without intermediate shipment, all phases of preconditioning are pertinent except that virus vaccines may be necessary only if he adds outside calves to his lot, thereby risking exposure.

RECOMMENDATIONS TO THE BUYER/OWNER/MANAGER FOR FEWER HEALTH PROBLEMS

Obviously the buyer of preconditioned calves can reasonably hope for fewer health problems, but they are scarce and expensive, and he must consider many other factors. If he wants to buy for factors other than price, he will prefer:

- Fresh calves, just off the ranch or farm, alert and supple.
- Weaned calves, eating and drinking from a trough.
- Calves with conformation for health, particularly good heart girth, rib spring and body length.

Even though he well recognizes the importance of health and its effects upon costs and profits, the calf buyer or his competitor must also bid on the ragged and least desirable. Even with the added expense of treating sick animals, death losses and long periods with little or no gain in weight, the market for the less healthy, lower-grade calves has remained strong. Compensatory gains made by nutritionally-retarded calves have reaped huge profits. Traps for even the wary buyer exist, though, in the frequent impossibility of distinguishing between the nutritionally-retarded and the illness-stunted, incompletely recovered calves. Many of the latter travel a weary circuit of auction markets as they are culled by buyer after buyer. They are responsible for heavy losses and innumerable exposures of healthy calves to the infections they harbor. It is simple to say buyers should avoid them. It is no less axiomatic that stocker growers or feeders should cull them.

Other things the stocker grower or feeder may do to mimimize health problems include:

- Be prepared for the arrival of calves with good quality grass hay distributed in clean lots or pasture traps for first feeding.
- Unload calves promptly upon arrival and let them rest 24 hours.
- Provide fresh, clean, warm water 4 to 6 hours *after* feeding hay (if the calves have been on a long trip) to avoid water founder.
- Start feeding concentrates at the rate of ½ pound per 100 pounds of body weight after allowing the calves to rest and eat hay for 24 hours.
- Start medical treatments promptly when indicated (after the rest period usually).
- Vaccinate as soon after the rest period as practical, depending upon previous history and lot condition. Consider the same vaccinations as those recommended for preconditioning even though they will by now be too late for many of the calves.
- Eliminate parasites as soon as practical. Use approved dips, sprays or pour-on materials for grubs and external parasites; drenches, boluses or feed pre-mixes for internal parasites.
- Delay necessary surgical procedures for 2 weeks or more if practical.
- Utilize veterinary services to evaluate the overall health program and plan specific modifications and specialized needs, recommend vaccinations, treatment methods, drug selections and other unpredictable details.

HEALTH PROBLEMS THAT MAY DEVELOP

Many health problems, in addition to those infectious conditions for which vaccines are available, may arise near weaning or shipment time. A few of the most common include:

The Effect of Starvation Upon Rumen Function.—The most detrimental physiological effects upon moving a calf and introducing it to an entirely new environment are within the digestive and respiratory systems. The whole process of gathering, sorting, hauling, selling, resorting, reloading and hauling to other destinations nearly always results in animals consuming little or no feed for 48 to 72 hours.

Effects of starvation upon ruminant functions are described by Dr. R. L. Baldwin in the Preconditioning Seminar, Oklahoma State University, 1967.

The rumen is a big fermentation vat in which many different types of bacteria and protozoa live together in a dynamic balance similar to the balance which exists in nature. Under normal conditions, the bacteria and protozoa break down feedstuffs to form products which the animal can use, thus providing a service to the animal. The animal, in turn, provides

conditions in its rumen which assure microbial survival and the maintenance of an appropriate balance among various bacterial and protozoan species. One of the most important contributions the animal makes to the maintenance of a proper microbial balance is the periodic consumption of food with the resultant release of nutrients necessary for microbial growth and survival. Many types of rumen microorganisms are very sensitive to the severe depletion of nutrients that occurs in the rumen during long periods of starvation. When the starvation period extends to 48 hours and the supply of nutrients in the rumen is essentially zero, many types of bacteria and protozoa die.

One of the most dramatic things first noted upon microscopic examination of rumen contents from animals starved for 48 hours or so, is the almost complete lack of protozoa. Normally, at low magnification, one can fine 25-30 protozoa per microscopic field. Many times dozens of fields can be examined without finding any protozoa in rumen contents from starved animals, although sometimes 3-4 protozoa per field may be observed.

Based upon specific measurement of DNA—a measurement directly related to bacterial numbers—we have found that the concentration of bacteria per milliliter of rumen contents is reduced to 25-50 percent of normal after starvation. Couple this observation with the fact that the volume of rumen contents is reduced to less than one-half normal after 48 hours starvation and it is obvious that the number of bacteria in the rumen is reduced to 10-25 percent of normal by starvation. This dramatic reduction in numbers is significant in itself; however, a more important observation is that the surviving bacteria represent only a few of the many types of bacteria ordinarily present. In other words, the microbial death loss is differential. Reasonably large numbers of small cocci, including Streptococcus bovis remain after starvation, while very few large cocci and pleomorphic rods are observed. These observations are important to a later discussion of lactic acid production and utilization, because S. bovis is a lactic-acid producer while the primary lactic-acid utilizers of the rumen, Peptostreptococcus elsdenii and the selenomonads, are large cocci and rods, respectively. The spirochetes which are so obvious in normal rumen fluid and, as noted above, the protozoa are almost entirely absent after starvation.

In addition to examining microscopically, the changes in the rumen microflora that occur during starvation, we generally use quantitative criteria to assess changes in fermentative activity and capacity. The effects of starvation upon two measures of fermentative capacity are presented in Table 1. It can be seen that, after 48 hours starvation, the capacity of the rumen microorganisms to ferment added sugar is reduced to about 10 percent normal. Gas productions in the presence of nonlimiting amounts of energy nutrients (substrates) is similarly decreased after 48 hours. The apparent increase in fermentative capacity after 24 hours starvation is a reflection of the fact that water passes from the rumen more quickly than do the bacteria, resulting in higher bacterial numbers per milliliter of rumen contents.

Gas production in the absence of added substrate is used as an index of actual microbial activity in the rumen. Fermentative activity is reduced to zero by starvation for 48 hours. This reflects the total depletion of nutrients in the rumen, which, in turn causes the dramatic decreases in protozoa and bacteria in the rumen, as discussed above.

The effects of starvation on the rumen are summarized in Table 2.

Table 1. EFFECTS OF STARVATION ON FERMENTATION

Period of starvation (hours)	*Glucose[1] utilization*	*With[1] substrate*	*Without[2] substrate*
2	*100[3]*	*100*	*100*
24	*115*	*140*	*70*
48	*10*	*15*	*0*

[1] *Fermentative capacity.*
[2] *Fermentative activity.*
[3] *Data expressed as percent of 2-hour values.*

Table 2. RUMINAL CHANGES DURING STARVATION

1. *Fermentative activity and capacity decrease to 10 to 15 percent of normal.*
2. *Rumen protozoa dramatically decrease, often to essentially zero.*
3. *Rumen bacteria numbers decrease to 10 to 25 percent of normal.*
4. *Balance between microbial species is disrupted by differential death loss.*

Other factors that have severe effects on the digestive system are water overfill and immediate feeding of high energy rations.

Excessively thirsty calves may overfill if offered fresh water before feeding. This overfill may cause critical disturbance of the digestive system and reduce feed intake necessary to restore normal rumen function.

Fig. 2. Cost of stocker gain depends on a quick healthy transition from a nursing calf to one that grows efficiently as a weaned calf.

Avoid this by first filling calves with good quality grass hay.

When excessively hungry calves are suddenly fed high energy rations certain rumen bacteria, usually streptococci and lactobacilli, rapidly increase and result in over-production of acid. Excessive acid causes inflammation of the rumen lining which may result in diarrhea, dehydration and reduced feed intake. This further increases the time necessary to restore normal rumen function. Once inflammation has developed, the administration of antacids, antihistamines, stimulants, propolylene glycol and high quality roughage may be indicated.

Increased Susceptibility to Respiratory Diseases.—Effects upon the respiratory system are less immediately apparent, but no less devastating. Cessation of feed and water intake may be related to drying of the upper respiratory tract because of reduced salivary and mucous gland secretions attending dehydration. Similar effects result from wind movement in transit, alternate heating and chilling, and the higher altitudes and lower humidity usually experienced. With a decreased lubricity of the tubular respiratory system there is irritation and a loss of available antibody in the epithelial cell cover and secretion lining the system. Additionally there may be the noxious effects of exhaust or other fumes encountered enroute or shortly after arrival. Animals exposed to ammonia gas, which may build significant concentrations in stalled vehicles or dirty pens, develop anorexia, photophobia, nervousness, head-shaking, salivation and susceptibility to respiratory disease. Add these effects to fatigue and exposure to viral and bacterial pathogens, always present where animal populations are concentrated, and there are no missing ingredients in the recipe for respiratory disease.

Further, loss of fluid from the digestive tract of unconditioned calves during handling and shipment is far in excess of normal because of fear and nervousness, thus similarly increasing susceptibility of mucous membranes to infection. Filling calves on good quality grass hay before loading is always helpful in alleviating this nervous diarrhea.

Anaphylaxis.—When vaccinated, particularly with bacterins they may have received previously (sometimes on the original injection as well), the calf may show anaphylactic shock, usually dizziness and hard or rapid breathing, often leading to sudden death. Ephinephrine and antihistamines are helpful. A similar reaction may be shown to penicillin or immune serum.

Pneumonia-Scours Complex.—This is an extremely complicated problem from the standpoint of overriding and interacting causative agents.

The incubation period for many infections is often shorter than the meandering journey from farm to feedyard or pasture; some calves arrive sick. Others exposed to infection enroute sicken soon after arrival. Rapid breathing, depression, scouring, coughing, lacrimation and nasal discharge are the usual symptoms, but a single case seldom shows them all. The variation in symptoms is so great and the problem so frequent that unless something else is readily apparent, sick new arrivals are assumed to be suffering from this complex. Individual cases are usually moved to hospital pens and treated with antibiotics, sulfonamides, antihistamines and astringents, unless it is apparent that practically all the pen or shipment is becoming infected. Then, only the worst cases may be treated individually, the remainder of the pen being medicated through feed or water for several days.

During the first 3 or 4 weeks in the feedlot or on wheat pastures, many of the put-together calves, particularly the smaller ones, may break three or four times with minor or major "colds." They may show concurrent scouring. Most of the outbreaks will require treatment; without it death losses from pneumonia would be very high. There are many spontaneous recoveries, but experience has demonstrated conclusively that treatments usually are necessary. Acute pneumonia death losses are very real and frequent.

If death does not intervene within the first 24 hours after symptoms, response to combinations of broad spectrum antibiotics, sulfonamides, detoxicants and antidiarrheals is usually good. A certain percentage of the calves treated (perhaps 2 or 3 percent), do not recover. They eat little, cough a little, scour a little, stand around tucked up and caved in laterally, breathe shallowly and frequently with a grimmacelike tightening of the face and neck muscles. On postmortem they show small to large areas of lung gangrene, pleuritis, ulcerative abomastitis and enteritis. Individually there may be dozens of other additive lesions in various organ systems, including peritonitis, abscesses and throat lacerations. It is apparent that many of these result from errors in drug administration. There is no effective treatment for these "quinines."

Anaplasmosis.—This problem is often detected in southern calves. Symptoms blend with those of the pneumonia-enteritis complex, to which anaplasmosis cases are markedly susceptible. Anaplasmosis tends to respond to the "regular treatment." Primary uncomplicated cases do occur, usually shortly after arrival. Older cattle seldom develop it in feedlots, even in the presence of plentiful vectors. Perhaps this is because of the custom of feeding low level tetracycline to control rumenitis and liver abscessation and to stimulate growth.

Infectious Enteritis.—Enteritis may occur as a separate entity from the pneumo-enteritis complex. In some cases it occurs independently, more often as a complicating factor in coccidiosis or stomach worm disease. Salmonella and organisms such as Arizona, Proteus, Klebsiella, Aerobacter and Escherichia (the Enterobacteriasae Group) are thought to be actual or potential pathogens providing the final blow to a sensitized gut wall. Whatever the demonstrable organisms, there is profuse diarrhea (with or without blood), dizziness, weakness, stumbling, convulsions and death. Gut walls are edematous, with a fibrinous, diphtheritic lining that may produce an intact "snake skin" cast from stomach to rectum if the case survives long enough. Sickness rates in affected pens are high and deaths will be also unless treatment is prompt, with -major reliance on intravenous antibiotics, sulfonamides and glucose. Orally, antihistamines, demulcents, detoxicants and antibacterials may help.
antibiotics, sulfonamides and glucose. Orally, antihistamines, demulcents, detoxicants and antibacterials may help.

Recovered cases are permanently affected, proving to be expensive to feed from standpoints of rate of gain and feed conversion efficiency. These effects often appear in pen mates escaping clinical manifestations.

Disturbances of the Central Nervous System. Diseases of differing causes are reflected in disturbances of the nervous system. Nervous symptoms are common in every season among stocker and feedlot cattle. Calves with convulsive seizures always indicate trouble.

Convulsions and mental derangements in cattle are caused by a variety of inorganic biochemical toxins and, perhaps, even by circulatory absorption of excessive quantities of some elements normally considered nutrients. Failure of significant metabolic or excretory functions inevitably leads to accumulations of toxic intermediate or waste products of metabolism. Ill effects are manifested by nervous function interference, which often leads to death because of the general impossibility of providing the physical environment conducive to recovery. Simple remedies readily available to the human victim, such as shade, cool water and fanning are the least available, as is the ready surveillance that might effectuate them. Consequently, convulsions are serious threats, however sporadic, especially in hot weather when a relatively minor irritant may lead to heat building seizures and heat prostration. The latter is itself a producer of seizures of eclampsia-like intensity.

Many infectious agents, and the exotoxins of others, have a predilection for nerve tissue. The most common ones encountered in cattle include Listeria, Hemophilus, Streptococci, Salmonella, the Enterobacteriaciae and many viruses. The protozoan toxoplasma always seems to be present, as is coccidiosis. Viruses thought to be involved include rabies and pseudo-rabies, sporadic bovine encephalitis, bovine viral diarrhea, para-influenza III, bluetongue, malignant catarrhal fever and infectious bovine rhinitis.

A separate entity thought to be a toxic or anoxic syndrome of unknown cause is polio-encephalomalacia, a condition in which there may be gross or microscopic liquification necrosis of the brain. Death often occurs so rapidly that affected animals are found dead without observed illness.

Thrombo-embolic-meningo-encephalitis (TEME) is considered the most common encephalitis of feedlot and stocker cattle, and it apparently is caused by brain infarction resulting from emboli, clumps of debris and bacteria that block blood vessels. Hemophilus or other

septicemias are thought to be primary, Half of such cases are found dead, but a few are able to survive indefinitely as "sleepers." Broad spectrum antibiotics have been effective in reducing death loss, especially when administered on a pen or pasture basis to clinically normal exposed cattle.

Thiamine is apparently beneficial in the treatment of the relatively few polio-encephalomalacia cases found alive, and would not be contra-indicated in TEME. Clinical differentiation of these two and other brain conditions before death, on the basis of the first few cases discovered, is impossible. Progress characteristics, symptomology and gross and microscopic post-mortem lesion observations are necessary for differential diagnosis.

Spherophorus Infections.—Foot rot and typical diphtheria cases occur sporadically and respond well to traditional treatments, including penicillin and sulfapyridine. An atypical diphtheria or diphtheria-like condition constitutes a growing problem on which research is urgently needed.

Coccidiosis.—Coccidia appear to build populations in irregular waves, especially during periods of prolonged dampness. Pen size and crowding affect dampness, as does pen or pasture drainage, but it is difficult to correlate these conditions with outbreaks. Many clinical cases appear to continue eating and gaining well and might recover spontaneously, but treatment usually is instituted as a precaution. A few affected cases develop convulsions; these are usually fatal.

Stomach Worm Disease.—Calves usually arrive with stomach worms which, if untreated, tend to increase in inverse proportion to how well the calf does nutritionally. Sick calves are hurt by an expanding population of stomach and intestinal worms and, on pasture, they contribute to a degree of larval infestation that may overwhelm even healthy calves, especially if the grass gets short. Worm with such relatively harmless anthelmintics as thibendazole or l-Tetramisole and coordinate with pasture rotation and conservative stocking practices, as well as adequate nutritional programs.

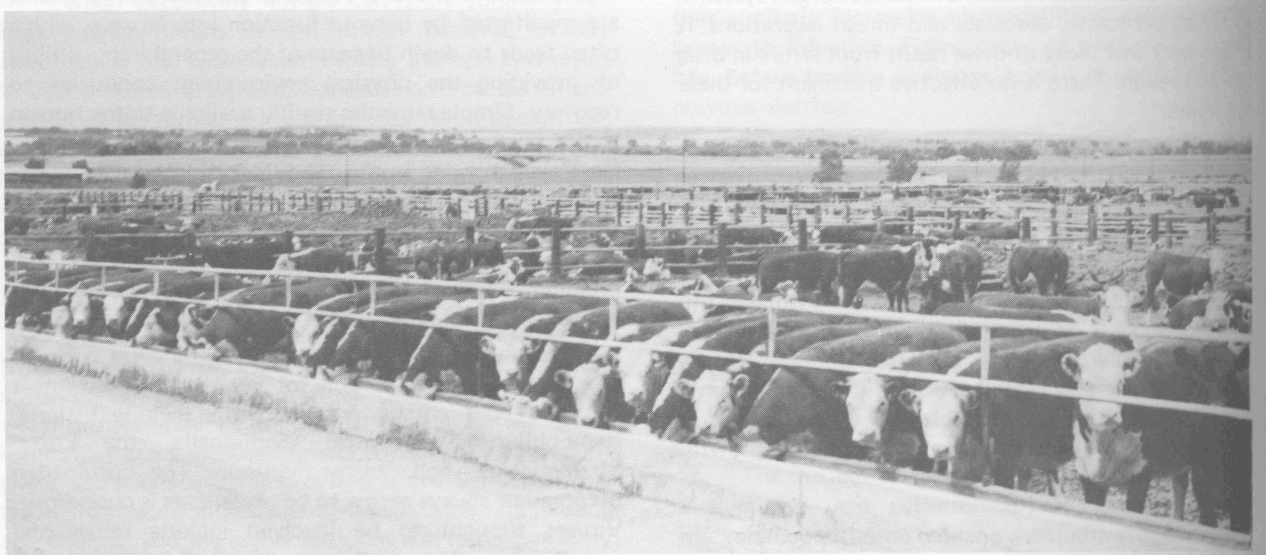


Fig. 3. Efficient performance in a feedlot depends on good animal health. *(USDA Photo)*

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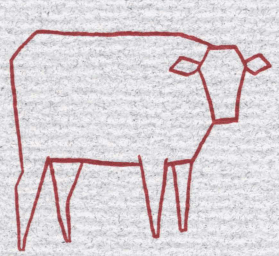

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