Problems of Calf Feeding

Substitutes for milk not satisfactory in young calves

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When can a farmer discontinue feeding milk to his calves? Directions which accompany so-called milk substitutes frequently suggest discontinuing the milk when the calf is ten days to two weeks of age, while most dairy husbandry bulletins recommend six months. How far can we “lean to the left” in these days of limited rations, and still obtain normal mature animals?

Calf starters which are made largely from plant foods contain many of the same nutrients found in milk. Likewise, crude oil contains the same elements as gasoline, and yet no one expects the ordinary automobile engine to handle crude oil, or even kerosene. In other words, the “carburetor” of the calf, that is, the upper portion of the intestinal tract, isn’t equipped to refine plant foods—to segregate the digestible from the indigestible portion. With suitable care, the calf does acquire this ability in a surprisingly short time.

Milk Most Desirable

Milk is, for a number of reasons, the most desirable feed for young calves. It is the natural source of certain agglutinins needed by the newly-born calf to protect it from disease. Although these antibodies are seldom referred to as a nutrient, they are transferred from the dam to the calf through the milk as surely as any nutrient. The thing to remember is that as soon as the calf begins secreting digestive juices, the globulins which are very closely associated with these antibodies are digested in the intestinal tract and the antibodies destroyed. This means that the antibodies found in colostrum can only enter the bloodstream through the digestive tract during the first day of the calf’s life (or at least for a very short period). Of course, blood transfusions from dam to calf will accomplish the same results. The antibody titre of milk from cows milked to relieve congestion a week or two before parturition.

Fat Content of Milk

Milk is also high in fat. Although any plant fat should provide as much energy as milk fat, workers at the Minnesota Station found that calves do much better on natural milk than on certain filled milks. Skim milk in which 3.5 per cent soybean oil, corn oil, cottonseed oil, coconut oil, or peanut oil had been emulsified was used in the experiments. The calves on filled milk developed a severe dermatitis, but it has never been proved that calves suffer from the fatty acid deficiency disease of rats which is sometimes spoken of as vitamin F deficiency. In fact, linseed meal used in most calf starters should provide ample amounts of linoleic or linolenic acid.

In addition to being a carrier of certain fat soluble vitamins, fat has other roles in calf nutrition. For instance, the Wisconsin workers found that the lactose in skim milk is very poorly utilized unless a certain percentage of milk fat is present. After two or three weeks, fats, other than

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milk fat, will prevent this loss. After the calf begins ruminating, plant fats and animal fats are interchangeable in many ways in calf feeding.

**Why Milk Is Desirable**

What then, are the principal reasons for feeding milk to calves until they are a month or two old and preferably until they are six months old? (Skim milk is almost as satisfactory as whole milk after the first six weeks.) The two principal reasons are: (1) very young calves cannot handle the fiber present in milk substitutes, and (2) milk has certain physical qualities not provided by any other feed. Since ruminants have no digestive enzymes which can efficiently digest cellulose or any polysaccharide more complex than starch, it is necessary for them to eat a low fiber ration or depend on bacteria to provide the necessary enzymes (cytases). In order for the bacteria in the rumen to efficiently digest fiber containing feeds, the rumen should be of such a size as to allow for a fermenting period of at least two days. At birth the fore-stomachs, rumen, reticulum and omasum, of the calf are relatively too small to allow for normal fermentation of the feed. True, in adult animals, much of the soluble material in the feed normally escapes from the rumen in a few hours after ingestion and some fiber may slip out at the same time. But no cow could live on the average dairy ration if the rumen were emptied two or three times a day as it is in the young calf. At first a calf needs around three-fourths of a pound of milk daily for each 10 pounds of live weight. This amount is at least twice the capacity of the rumen at birth. Besides, the calf soon begins to secrete considerable saliva, and it may drink a little water, most of which enters the rumen first. The rapid in and out movement of these fluids all tend to prevent a heavy bacterial flora from becoming established in the rumen.

Now, before going any further with a discussion of the comparative merits of milk and calf starters, let us see if the manner of ingesting milk has any effect on its utilization. Naturally we would expect Nature's method to be best, and it doubtless is. When the calf nurses the cow, the milk is ingested comparatively slowly, a squirt at a time. Milk in the mouth causes a nervous reflex which changes the esophageal groove into a more or less completely closed tube. As a result of the change in the esophageal groove, the milk by-passes the fore-stomachs and enters the abomasum at once. Here is where the high rennin content of the calf's stomach comes in handy. Just as soon as the warm milk strikes the stomach wall, it coagulates. The whey is quickly pressed out by syneresis and by peristaltic action of the stomach walls which leaves a milk concentrate (the curd) for the calf "to nibble on" between meals. Even if the calf is overfed, rarely will it go off-feed when nursing the cow. Any time the calf becomes hungry between meals, the gastric juice begins to flow and the curd mass begins to melt away like an all-day sucker in the mouth of a child. In spite of these "lunches" between meals, the stomach (abomasum) of the young nursing calf is rarely, if ever, empty. This is not true after the calf is a few weeks old.

**Pail-fed Calves**

Now contrast this procedure with what takes place in the stomach of the pail-fed calf. To begin with, the milk, when fed from a pail, is seldom fed at the optimum temperature. The milk rushes down the esophagus of the calf in such volume that it forces the esophageal groove open and lands almost in the middle of the rumen. This has been observed many times by inserting a light into the rumen through a fistula, and watching the milk enter. Usually the rumen is partially filled with liquid (saliva and whey, or water). The dilution of the milk with these fluids prevents the milk from coagulating when it begins to spill over into the abomasum. In the absence of digestive enzymes in the rumen it would be rather serious if it did coagulate before entering the abomasum. This milky solution then escapes from the abomasum into the small intestine without the usual breaking down of

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As to the future of the school, there can be no doubt that advances and improvements in its conduct will continue to be made. Certain ideas are at present under consideration, and it is certain that after the war changes will necessarily be made to meet the demands of a new era.

Presented by Dean Charles Murray, July 14, 1943, before the members of the Junior Chapter of the American Veterinary Medical Association, Iowa State College.

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the proteins by pepsin and hydrochloric acid. A flooding of the small intestine with these undigested proteins may easily throw calves off-feed. Some calves with stomachs functioning perfectly do very well on milk fed by the pail method, but other calves need to be babied. Calves that digest their food inefficiently partly because of a hyposecretion of the digestive juices are usually weak, and naturally, milk which is so dilute that it cannot be concentrated by coagulation of the casein in the stomach is more difficult for them to digest than undiluted milk. This also helps to explain why milk should never be diluted when fed to young calves except under extraordinary conditions. For clearness, I'll mention one “extraordinary” condition. Some calves seem to do better on milk from the high fat producing breeds if it is diluted one-fifth. This is probably because the milk is too rich in solids and forms a very tough curd in the stomach. Milk containing 5 per cent fat contains 40 per cent more calories than milk containing 3 per cent fat, and should be fed accordingly—that is, in smaller amounts.

Linseed “tea” is much better than water for diluting milk. Linseed “tea” is made by boiling linseed meal vigorously for an hour or so, and then straining off the liquid portion. A sugar sack makes an excellent strainer for this purpose. The “tea” should be thick enough to form a semi-jell when cold. This gelatinous material reduces the toughness of the milk curd and at the same time seems to prevent scouring. This action is probably due to the hydrophilic properties of the glycoproteins. Lime water is probably the next best diluent for rich milk.

A word should be said about the use of nipple pails. Nipple pails cause the calf to drink slowly, mimicking somewhat the conditions obtained during nursing. Of course, if one is not careful, the milk in the bottom of the nipple pail may be almost cold before the calf swallows it. One of the greatest objections to nipple pails is that they require longer to feed the calves than open pails, and the pails are difficult to clean.

Now, a word about gruel feeds. The gruel enters the rumen in a fine state of suspension. In that no digestive juices are present in the rumen of the young calf and no bacterial flora has developed in the young calf, the gruel must be washed over into the true stomach before it can be attacked by enzymes. The results are disappointing. Much of the nutrient material is enclosed in a cellulose membrane and cannot be attacked by the digestive juices. Before long it escapes into the intestine where the same difficulty occurs again. These high fiber feeds when eaten in excessive amounts soon irritate the intestinal mucosa and unless one is a careful feeder, may result in scouring. Pelleted feeds are ingested more slowly but otherwise behave as a gruel feed. As far as the writer is aware, the pellets disintegrate in from 5 to 15 minutes after entering the rumen.

Rumen Development

As soon as the calf begins to eat hay regularly, the farmer can be sure that the rumen is developing rapidly and that a more or less permanent bacterial flora has become established. This is especially true of the nursing calf whose liquid food, for the most part, by-passes the fore-stomachs. Although calves grow more rapidly if fed liberally on milk for six months, one can begin substituting plant foods, such as calf starters, for milk when the calf begins to show a relish for some kind of roughage. The calf is usually two or three weeks of age when it begins to eat hay. As soon as the calf will eat enough hay
and grain to supply its needed nutrient requirements, milk can be discontinued. Usually some milk, as small an amount as a pound a day in the growthier calves, and larger amounts for weaker calves, should be fed until the calf is 6 weeks old if one wishes to keep it growing and have it develop into a good cow. These recommendations are for raising calves on the minimum milk plan.

Chopping the roughage is inadvisable. Whole hay seems to offer the ideal medium in which the bacteria can develop in the rumen. Chopping also causes greater leaf loss and probably results in greater carotene loss. This latter point is of considerable importance in calf nutrition. Since the rumen of the calf empties rapidly, it is quite important to keep the hay racks full at all times so that the partially digested contents of the rumen can thoroughly inoculate the incoming feed. Although bacteria multiply rapidly it is very important, for maximum efficiency, that the rumen contents be changed at as uniform a rate as possible.

In closing, I should like to mention the importance of sanitation. Many calves probably would not have succumbed to certain contagious diseases if they had been properly fed; on the other hand, the farmer cannot hope to control calf diseases by feeding alone. Even washing the calf pails thoroughly is of little value if the calf can pick up infection from the bedding in its stall or from another calf. In fact, it seems a bit ridiculous to emphasize sterilizing calf pails if the farmer afterwards is going to feed sick and healthy calves out of the same bucket or group of buckets, and use other unsanitary practices. The farmer must be taught the importance of being consistent. If he wants to raise good calves, he must have them well-bred, well-fed, and conscientiously cared for. The veterinarian can cooperate in each of these steps.

LITERATURE CITED

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...the foot and subsequent wound treatment, neurontomies, tenotomies, and trephining.

“The table is equally as good for cattle as for horses. Lump jaw in a large bull, for example, is often a problem out on the farm but he can be put on the table as well as a horse. Other examples of good table cases in the bovine is the amputation of a claw or treatment of a severe nail wound. One of the most satisfying table cases in cows is that type of teat injury in which the milk duct is open. They can usually be closed successfully if one maintains the strictest surgical asepsis without which many are doomed to failure. Such asepsis can be carried out very satisfactorily on a table in a good clean room.

Facilities Convenient

“We have even had several bad obstetrical cases in which confinement either on the table or in the stocks was very gratifying. Further satisfaction was to be had in the convenience of having one’s entire stock of obstetrical instruments at hand in addition to plenty of warm water as well as being able to work in heated quarters, especially if it happens to be one of those severe winter days or nights that Iowa can offer occasionally.

“Methods of casting and restraining the large animals have been devised that are fairly satisfactory if carried out cautiously and prudently but too often the operator may try to hurry the procedure either to impress the owner or because of an actual lack of sufficient time which will result in a vexing predicament. Then too the owner confronted with his animal grunting and groaning in an awkward position and tightly bound with ropes may experience apprehension and anxiety lest the distress of the animal is placing it in peril of permanent injury. With harness restraint the animal is cramped and uncomfortable and the surgical procedure must be hurried in order to shorten the duration of the confinement. Frequently