the Progressive Calf Feeder

Colostrum and The Newborn Calf

The newborn calf must start breathing as soon as the umbilical cord breaks. Remove mucus from the calf's nostrils and rub the calf vigorously with a clean towel. If the calf fails to start breathing, stimulate the breathing mechanism by inserting the handle of a small, clean spoon up its nostrils about 2 inches. Use your finger if no spoon is available. Rotate vigorously. This stimulates a nerve in the nostril that initiates breathing. Do not pound the calf on the chest or shake it by its hind legs. This usually does more harm than good.

Immediately tie off the navel cord about 2 inches from the body line to prevent bacteria from entering the broken umbilical cord. Use common household string kept in a clean glass jar with a solution of 70% rubbing alcohol or use special plastic clips available from veterinary suppliers. Use only the large clips and place them 2 inches from the body line. Tying the navel or placing a clip too close to the body may cause a hernia.

After tying the navel, remove the excess cord and any foreign material. Thoroughly disinfect the umbilical stump with a 7% tincture of iodine solution. Be sure the disinfectant gets into every crack and under any hair or other material. It is better to 'soak' the umbilical stump in the iodine solution rather than a quick 'dip' in the solution. Common household aqueous 1-2% iodine solutions are not strong enough to be effective disinfectants.

If possible, let the cow dry the calf. Otherwise, dry the calf with clean cloths or paper towels. Make sure the bedding is dry and do not expose the calf to drafts.

Colostrum and Transitional Milk

Bovine colostrum consists of a mixture of udder secretions and constituents of blood serum, notably immunoglobulins (antibodies) and other serum proteins which accumulate in the mammary gland during the dry period. Although colostrum is commonly defined as the secretions from the first 6 to 10 milkings, true colostrum is obtained only from the first milking. The secretions after the first milking for 4-5 days after calving are transitional milk. Both colostrum and transitional milk are excellent sources of the nutrients needed by the newborn calf. But, as shown in table 1, colostrum contains more total solids and significantly higher levels of immunoglobulins than transitional milk. By about the sixth milking, the composition of transitional milk is similar to that of whole milk.

Although table 1 shows colostrum containing about 24% solids and 6% immunoglobulins, the solids and immunoglobulin content of colostrum from different cows can vary considerably. The immunoglobulin level varies from 2 to 23%

Item	Milking number (cows milked twice daily) 1	2	3	4	5	11
	Colostrum		---Transitional		Milk---	Whole Milk
Total solids, %	23.9	17.9	14.1	13.9	13.6	12.9
Total protein, %	14.0	8.4	5.1	4.2	4.1	4.0
Casein, %	4.8	4.3	3.8	3.2	2.9	2.5
Immunoglobulins, %	6.0	4.2	2.4	0.2	0.1	0.09
Fat, %	6.7	5.4	3.9	4.4	4.3	4.0
Lactose, %	2.7	3.9	4.4	4.6	4.7	4.9
Minerals, %	1.11	0.95	0.87	0.82	0.81	0.74
Specific gravity	1.056	1.040	1.035	1.033	1.033	1.032

Table 1. Composition of colostrum, transitional and whole milk.

(whole milk normally contains less than 0.1%) and is directly related to its solids content, which varies from 17 to 36%.

The appearance of colostrum is an indication of its quality. Good colostrum containing a high percentage of solids, and thus a high percentage of immunoglobulins, will be thick and creamy. Thin and watery colostrum is low in both solids and immunoglobulins. Use of a colostrometer can assure that colostrum quality is adequate. This device estimates solids content by measuring specific gravity. Good colostrum has a specific gravity above 1.05.

Immunoglobulins

Immunoglobulins are antibodies that counteract infection. Each form of immunoglobulin gives a calf some immunity against a specific disease or infectious agent. The immunoglobulins in the colostrum from a particular cow are determined by the disease organisms and vaccinations she has encountered. A calf born and raised on the same farm as its dam is usually better protected against diseases on that farm than a purchased calf or a calf from a cow purchased shortly before calving. Additional exposure of older cows to disease organisms and infections also means that the percentage of immunoglobulins in colostrum from mature cows may be more than twice that in colostrum from first-calf heifers. For this reason, good true colostrum from older cows can be frozen and used for calves from 2-year olds.

Length of the dry period can influence the concentration of immunoglobulins in colostrum. A minimum of 40 days dry is considered essential to produce good quality colostrum. Since immunoglobulin concentration is highest at calving and begins decreasing soon after, a long delay before first milking reduces the amount of immunoglobulins as colostrum is diluted with newly synthesized milk.

The immunoglobulin content of the second milking is largely determined by how completely the cow was milked the first time. On average, the second milking contains 60-70% as much immunoglobulin as the first milking (table 1). Immunoglobulins in both the first and second milkings help a calf develop passive immunity.

Passive Immunity

A calf is born essentially without any immunity (resistance) to infections and diseases. A newborn calf acquires passive immunity when it absorbs intact immunoglobulins through the intestinal wall. And the degree of passive immunity is directly related to the concentration of immunoglobulins in the calf's blood.

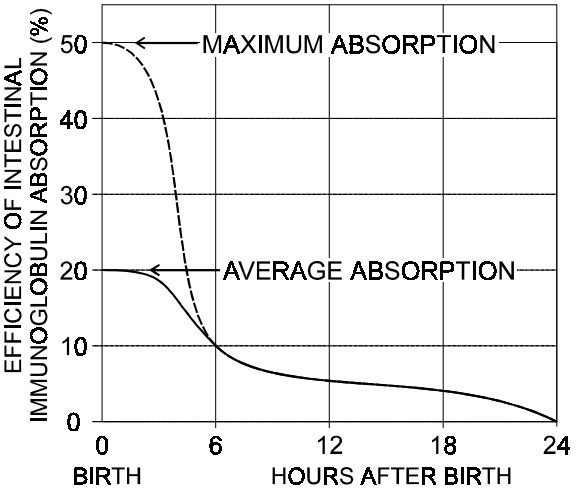

Figure 1. Intestinal absorption of immunoglobulin declines rapidly within 6 hours after birth.

Amount fed (lbs)	Number of herds	Average mortality (%) (calves 7 - 180 days of age)
2 - 4	18	15.3
5 - 8	16	9,9
8 - 10	26	6.5

Table 2. The effect of colostrum intake on calf mortality.

Most immunoglobulin absorption occurs within the first 4 hours with absorption efficiency decreasing rapidly over the next 20 hours (figure 1). For these reasons, immediate feeding of an adequate quantity of good quality colostrum is one of the most important steps to increasing calf health and survival. Feed colostrum within 30 minutes after birth in an amount equal to 4-5% of the calf's birth weight. This first feeding should be followed by two more feedings of the same amount within 24 hours of birth. Table 2 summarizes research relating colostrum intake during the first 12 hours after birth and calf mortality.

As shown in figure 1, absorption of the available immunoglobulins through the calf's intestine averages 20%, although it can vary from 6 to 50%. At an absorption efficiency of 20%, a 90-pound calf fed 4.5 lbs of colostrum at each of the first two feedings will absorb about 60 grams of immunoglobulin (table 3), enough to provide an adequate level of passive immunity.

Calves may not acquire passive immunity when:

- they are not fed enough colostrum;
- they are fed colostrum containing low amounts of immunoglobulins;
- they are not fed colostrum within 30 minutes after birth;
- they lack the ability to efficiently absorb immunoglobulins.

Milking	lbs /feeding	% Ig	grams of Ig	% absorbed	grams absorbed
1	4.5	10	204	20	40.8
2	4.5	5	102	20	20.4
Total grams of Ig absorbed					61.2

Table 3. Typical immunoglobulin (Ig) absorption by a 90-pound calf at the first two feedings.

Occasionally a calf's intestines may become impermeable to immunoglobulins immediately after birth. Others may secrete excess hydrochloric acid into their stomach (abomasum) which can break down immunoglobulins. Both of these conditions are difficult to detect and may account for some of the unexplained death losses of young calves.

Passive immunity normally lasts for about 2 months after birth; long enough for a calf to begin producing its own antibodies. A calf may continue to benefit from the protection of immunoglobulins in the intestinal tract as long as it is fed milk containing immunoglobulins.

Start the Calf Right

Some prefer to leave the newborn calf with the cow for a period of time ranging from a few minutes to several hours. Others remove the calf immediately after birth. Both methods have proven successful as long as a calf is fed the correct amount of good quality colostrum soon after calving.

Time (hours)	Number of herds	Average mortality (%) (calves 7 - 180 days of age)
2 - 6	13	5.2
7 - 12	35	9.3
13 - 24	32	10.7
25 - 48	24	20.5
48+	35	14.4

Table 4. Calf mortality increases with the length of time they remain with their dams.

Research shows that calves left with cows have higher levels of serum immunoglobulins than those removed from cows immediately and fed the same amount of colostrum. However, calf mortality tends to increase when calves remain with their dams for more than a few hours (table 4).

Leaving the calf with the cow may increase risk to both. Nursing calves risk contact with disease organisms if udders are not properly cleaned. And a calf left with a cow for more than 12 hours may butt and damage the cow's udder.

If the newborn calf is left with the dam, don't assume that colostrum quality and intake will be adequate.

Milk the cow, inspect the colostrum for normal appearance, weigh out the recommended amount and feed it to the calf. Do this at each scheduled feeding. The calf may nurse between scheduled feedings, but do not depend on the calf to consume the recommended amount of colostrum within 30 minutes after birth or to obtain adequate amounts during the first 12 hours.

If a calf is too weak to drink, force-feed colostrum with a stomach tube or esophageal feeder. These can be purchased from a veterinarian or veterinary supply store.

Teaching Calves to Drink

Calves may be fed from a nipple bottle, nipple pail or an open bucket. Nipple feeding forces calves to drink more slowly and there is some evidence that it helps reduce gulping of milk which may lead to digestive disturbances. Make sure that the nipple and the pail or bottle are clean. Otherwise, nipple feeding may cause more problems than if calves drink milk rapidly from a clean, open pail.

Raise the nipple or open bucket while feeding so the calf must keep its head up while it nurses or drinks. Training to drink from an open pail is easier if the newborn calf is immediately removed from the cow. Newborn calves that have never nursed are quick to learn. A good procedure for teaching a calf to drink is to:

- back the calf into a corner and straddle its back;
- dip two fingers into the warm milk and gradually draw the calf's head down to the milk while it sucks your fingers;
- remove your fingers when the calf starts drawing milk into its mouth.

Avoid Stress

Avoid heat stress on newborn calves. Heat stress due to hot weather during the first 24 hours after birth reduces a calf's serum immunoglobulin levels and increases calf mortality rates. Provide shade for cows that calve outside during warm weather and make sure buildings are properly ventilated if cows calve indoors. Increased calf mortality during cold weather is caused by drafts, wet conditions or other poor management practices rather than any decline in immunoglobulin levels.

Freeze Extra Colostrum

Cows may be milked out completely after they calve. Remove at least some extra colostrum from older cows that have produced good quality colostrum. Save this extra colostrum for calves from other cows that produce abnormal (mastitic, bloody or watery) colostrum. Freeze colostrum in containers which hold an amount needed for a single feeding (1.5 - 2 litres). Before colostrum is needed, remove it from the freezer and let it slowly thaw to room temperature. Do not heat it to high temperatures since this destroys immunoglobulin value.

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