

# Management of Calving on Large Dairy Farms

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Calving management has traditionally been approached in a passive manner. Calving problems are common, particularly in first-calf heifers. The most frequent cause of calving difficulty is simply a disproportion between the size of the calf and the dam, a calf that is too large to pass through the birth canal, or a birth canal that is too small for the calf.

On virtually all large dairy farms, calving assistance is given by herdsmen and farm employees with varying and, at times, limited experience. This first line of defense is important because early intervention not only prevents calf losses but also protects subsequent fertility. However, too often the first reaction when a cow is in labor is to immediately hook onto the calf and start pulling, frequently with a calf puller. The person assisting must be clean and should follow some simple guidelines to determine whether a calf can be pulled with reasonable force, or whether the delivery will require more drastic measures such use of a calf puller, fetotomy or cesarean section.

A secondary problem is that calving difficulty rarely occurs at a predictable or convenient time, when there is enough help. Unfortunately, both haste and delays lead to injuries to the calf or the dam, or to both.

The solution on large dairy farms is to develop a calving management program. This requires designated facilities and trained farm personnel. The latter should know what to look for and how to assess what level of assistance might be required.

## Calving Facilities

Ideally cows should calve on grass in a clean pasture which is free from standing water and which has shade. The pasture should also be close enough to permit regular and easy supervision. It must further be easy to take the cow or heifer to a calving stanchion for close examination and assistance. This working area should provide protection from the weather and must have running water and a cabinet for instruments and supplies. A maternity barn with well-bedded individual pens is a good alternative to a calving pasture, but the pens must be cleaned thoroughly between each use. Restraint is very important but must not consist of a standard squeeze chute since most cows go down during the actual delivery. A head gate with hinged side panels which swing away from the back end of the cow are excellent. There must be room for the cow to lie down plus room for the assistants to work behind the cow.

A regular chute can be used to catch the animal and put on a halter which is then tied low and long to the front of the chute. After this, the cow is released through the head gate leaving her tied. This arrangement requires lots of working space in front of the chute.

## **Signs of Calving**

Progressive udder development is one of the earliest signs of the approach of calving. Early enlargement occurs in heifers during the fourth month of pregnancy. In cows, enlargement of the udder may not become apparent until 2 to 3 weeks before calving. Just prior to the onset of calving, the udder secretion changes from a sticky serum-like substance to colostrum, a thick yellowish-opaque secretion. It is common to see udder edema in heifers that are ready to calve. The edema is nothing more than tissue fluid which accumulates in front of the udder around the navel, and at the rear attachment of the udder. Finally, the teats become turgid and lose their wrinkles. The lips of the vulva also become larger and softer, and lose their wrinkles.

At the same time the ligaments, which connect the various bones of the pelvis, begin to relax, giving the cow a somewhat unsteady gait. As the pelvic ligaments relax, the tailhead appears to become slightly raised. The onset of progressive relaxation of the ligaments coincides with the onset of softening and dilation of the cervix. Complete relaxation of the posterior border of the pelvic ligaments, the so-called bands, is generally followed by delivery within 12 hours.

Signs of discomfort and restlessness do not usually appear until the cervix has dilated sufficiently to admit a hand. Slight arching of the back is apparent at this time, but definite straining (the abdominal press) does not begin until the first water bag (chorioallantois) nears the vulva. Hydrostatic pressure by the fetal fluids contained within the intact membranes assists in complete dilation of the cervix. Stretching of the vagina causes reflex contractions of the abdominal muscles, and during one of these contractions the first water bag ruptures. Following rupture of this membrane, there is a temporary weakening or cessation of straining, which resumes as the second water bag (amnion) nears the vulva. The thick, slippery, slimy fluid contained in this bag provides lubrication for the delivery once it ruptures. The average interval between rupture of the first and the second water bag is about 1 hour.

Once the amniotic sac has burst, regular intermittent straining begins after a brief rest period. As a labor progresses, there is a gradual increase in the frequency and duration of the abdominal contractions, and straining sometimes becomes nearly continuous during the last few minutes before calving. The presence of the legs also contributes to reflex straining during this stage of labor. The greatest delay in expulsion of the calf occurs when the head reaches the vulva. At this stage little outward progression takes place during each series of contractions, and the calf frequently slips back into the vagina between bouts. This feature is most obvious in heifers, in which stretching of the vulva takes more time. Once the head of the calf has passed through

the vulva, the rest of the body follows rapidly. During hot and humid weather, cows can become easily exhausted and frequently give up. These heifers and cows require early assistance while the birth canal is fully dilated.

## **Calving Assistance**

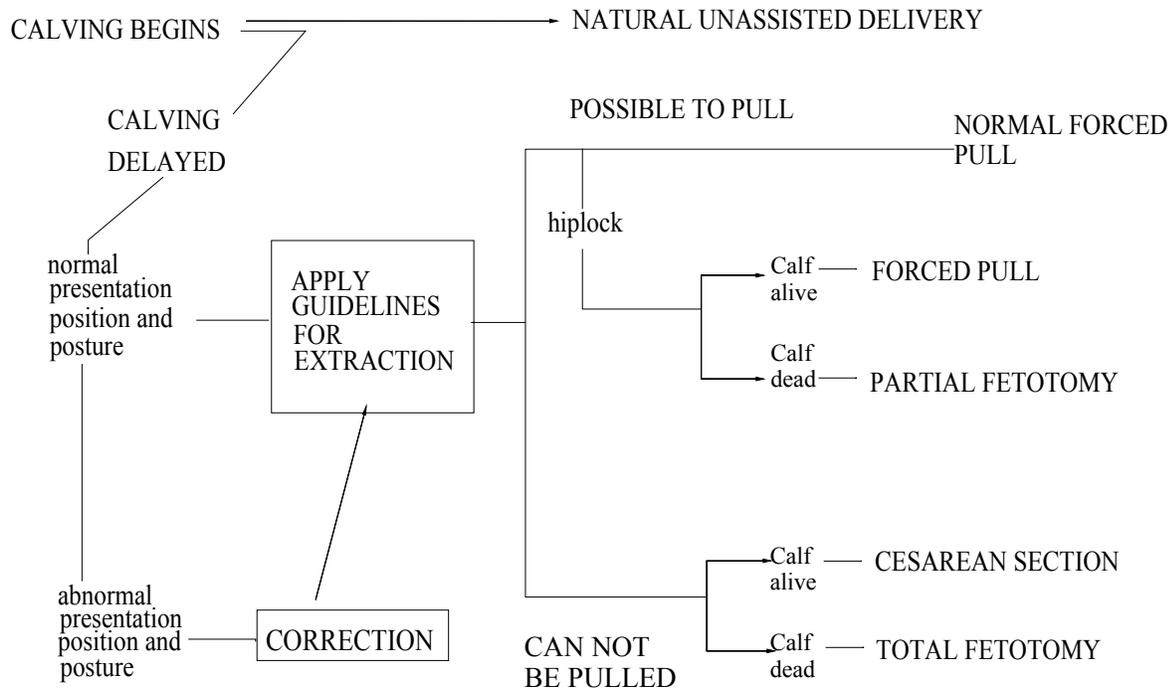
The minimum supplies needed to provide assistance at the time of calving are, a ready supply of clean water, two buckets, soap, lubricant, two obstetrical chains plus handles, oxytocin, and 7 percent tincture of iodine. In addition it is helpful to have available a curry comb, a supply of frozen colostrum, a nipple bottle, an esophageal feeder and at times a calf puller. When there has been no visible progress for 2 hours after the appearance of the membranes, the cow should be examined to determine the cause for the delay as well as the type of assistance she may need. Heifers are slower to dilate and should be given more time than cows. However, there should be evidence of progress. The calf will often live for 8 to 10 hours in the uterus after the beginning of true labor which begins with the rupture of the first water bag.

The golden rules of obstetrics are CLEANLINESS and LUBRICATION. Before the cow is examined internally the tail should be tied to her neck, and the anus, vulva and the pinbones should be washed thoroughly with soap and water. Next the hands and arms of the person assisting should be washed with soap and water, and lubricated. Soap or detergents must not be used as lubricants because they de-fat and remove the natural lubrication from the walls of the birth canal. Mineral oil and vaseline make very good, lasting lubricants, as does Crisco. They should be frequently reapplied to the arms and hands during repeated entries into the birth canal.

It takes from 2 to 6 hours for the cervix to completely dilate in the average cow, and from 4 to 10 hours in the average heifer. The actual expulsion of the calf takes from 1 to 4 hours in the cow and from 2 to 6 hours in the heifer. The fetal membranes (afterbirth) are normally delivered in 1 to 8 hours. They are considered retained if not delivered within 12 hours.

## **The Plan**

It is very important to not start to pull, by trial and error, on the first exposed part of the calf. Figure 1 represents a flowchart of the sequence of events and what to do at each step.



**Figure 1.** Plan for determining how to deliver a calf (Adapted from Schuijt and Ball, 1980).

## Examination

The first step is to thoroughly wash the cow as well as the hands and arms of the operator with soap and water; the next step, to use ample lubrication. The internal examination is aimed at determining whether the calf is presented head first (cranial presentation) or tail first (caudal presentation) and whether the head and neck and both limbs are present and fully extended. At the same time it is decided whether or not the calf is alive. If the head is accessible, a swallowing or gagging reflex can be stimulated by sticking a couple of fingers into the mouth. Pushing the claws of one foot apart causes the calf to pull its foot back, unless it is jammed too tightly in the birth canal, leading to a false negative response. Thirdly, pushing on the eyeball makes live calves blink. When a calf is in a caudal presentation, the claw reflex can also be used, with the same limitations. Alternatively, the pulse can frequently be felt in the umbilical cord by reaching along the belly of the calf. Finally, inserting a finger in the anus will elicit a puckering reflex in a live calf. If the head and neck are turned back along the side of the calf, the abnormal posture must first be corrected before the calf can be extracted. Abnormal posture is most common in calves which are weak or dead, or extremely large. Correction is generally made by pushing the entire calf back into the cow to make room for manipulation and retrieval of the retained part. It will depend on the experience of the operator and the degree of retention whether the help of a veterinarian is needed at this time. There is no extreme urgency to immediately pull the calf. In fact, it will save time and reduce stress on the calf to first properly prepare the

dam. Finally, the decision must be made whether there is sufficient room for the calf to be delivered.

### **Guidelines to Determine if There is Room**

The following guidelines are those used at the obstetrical clinic of Utrecht University, The Netherlands, to determine whether or not vaginal delivery of the calf is possible (Schuijt and Ball, 1980).

Cranial presentation (head first). The entire head resting on the knees and both feet must be presented into the birth canal. Chains are looped around each foot just below the dewclaws with the large link on top so the pull comes off the dorsal surface. There will be sufficient room to pull the calf, if one person can pull the first leg until the pastern is 15 centimeters outside the vulva and, next while holding the first leg in this position, if again one person can pull the second leg equally far outside the vulva. At these distances both shoulders of the calf will have passed the bony entrance of the pelvis. The diameter of the calf is greatest at the points of the shoulders.

Caudal presentation (backwards). Perhaps 10 to 15 percent of the time calves are born backwards. This presents two problems: 1) the blunt shaped hindquarters are less efficient in dilating the birth canal than the cone shaped head and neck, and 2) the umbilical cord becomes compressed against the pelvic inlet while the head is still inside the dam. Again, chains are looped around each foot below the dewclaws with the large link at the front of the foot so the pull comes off its dorsal surface. If, with the cow lying on her side, it is possible for two people to pull both hocks on a rotated (see below) calf far enough for the hocks to appear at the lips of the vulva, then it will be possible to deliver the intact calf by way of the vagina.

### **Preparation of the Cow for Pulling the Calf**

While the cow is still standing, she should again be washed with soap and water, and the degree of dilation of the soft tissues of the birth canal should be evaluated. With folded fingers, both well lubricated arms are inserted into the vulva and vagina like a wedge; next the tissues are stretched by pushing the elbows outward. Up to 20 minutes may be required in some heifers to fully dilate the vulva and the vulvo-vaginal sphincter. The preparation will not only minimize tearing but it will also speed delivery once the process of extraction is started. Next the cow is cast. She can be laid down by tying her head low to the ground to a post and by tying a long rope around her neck with a nonslip knot and then by placing two half hitches around her body. The first half hitch is placed tightly just behind the front legs, the second just in front of the hindlegs and in front of the udder. By pulling on the free end of the rope straight behind the cow, she will be made to lie down and can then be rolled onto her right side. The advantages of laying her down are: 1) she can angle her pelvis more favorably by bringing her legs forward and she can slightly spread her legs, 2) the people pulling can sit on the ground

and exert more pull, 3) the calf does not have to come up out of the abdomen against the force of gravity, and 4) she does not fall down in the middle of the extraction process.

## **Rotation of the Calf**

A cross section of the entrance into the bony pelvis (pelvic inlet) of the cow is shaped like that of an egg with the small end down (Fig. 2A). This means that the opening is taller than it is wide, and wider near the top than near the bottom. On cross section, the pelvis of the calf is wider at the hip joints (which are located below the hooks), than it is tall (Fig. 2B). Therefore, rotation of the calf allows its widest portion (the hips) to come through the greatest diameter of the pelvic inlet. However, the calf must be rotated before its hips contact the pelvic inlet (Figs 2C, 2D). The operator positions himself on his knees next to the rear legs and udder of the cow. For a calf in cranial presentation, rotation is started as soon as the head is outside the vulva. The operator passes his arm nearest the cow between the legs of the calf and above the neck. The other hand and arm are passed completely underneath the calf, and the fingers are locked near the base of the neck. The head can then be pulled toward the knees of the operator who rotates the calf while traction is applied. Prior to this traction the two assistants should exchange chain handles so that the person on the right pulls on the left leg of the calf, and vice versa for the other person, which further aids in rotating the calf.

When the calf is in caudal presentation, rotation must be started as soon as the operator has access to the legs, that is, before the fetal hips have entered the pelvic inlet. Again the cow is laid on her right side. Everything should be ready before the final pulling is started because once the umbilical cord is pinched the oxygen supply to the calf is shut off. Handles should be attached close to the calf so they need not be moved when the calf is halfway out of the cow. Once the hips of the calf have passed the pelvic inlet, the back of the calf is rotated back to line up with the back of the cow and the calf is pulled in a direction parallel to the hindlegs of the cow.

All pulling is done intermittently and only while the cow strains, upon command of the operator. This allows the cow, the calf, and the assistants brief periods of rest before the next maximum effort. The only exception to this rule is when the hips of a calf that is coming backwards, have just come through the vulva. These calves cannot breathe because the head is still in the uterus and their oxygen supply via the umbilical cord has been cut off. Continuous traction is applied until such a calf has been delivered.



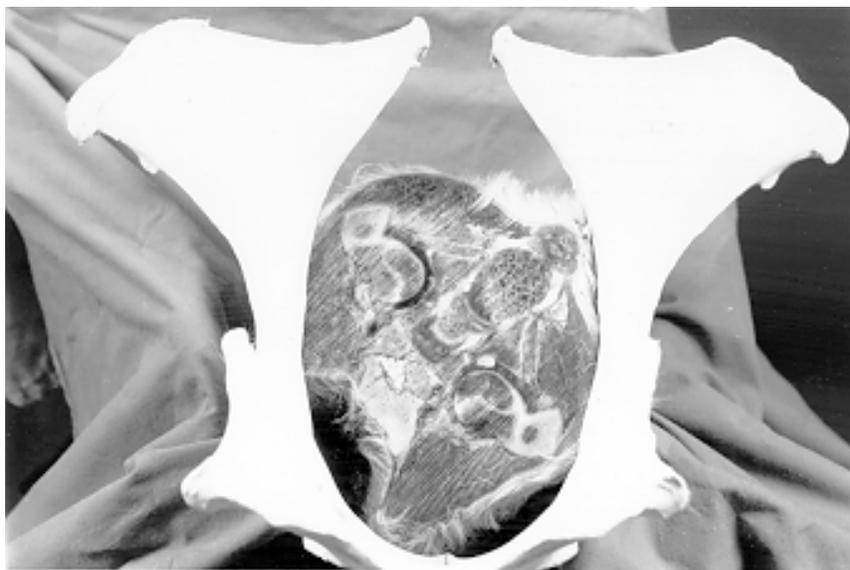
**Figure 2A.** Diameters of the pelvic inlet; Vertical diameter of the pelvic inlet is greater than the horizontal diameter (taller than wide).



**Figure 2B.** Cross-section of the fetal hips; Horizontal diameter of the fetal hips is greater than the vertical diameter (wider than tall).



**Figure 2C.** Hip joints of calf too wide to pass horizontally through pelvic inlet.



**Figure 2D.** Hips rotated to permit passage through the bony pelvic inlet.

## Care of the Calf Immediately After Delivery

Delayed passage through the birth canal in the face of a faltering placenta compromises oxygenation of the calf. Although the calf is able to breathe as soon as its nose passes the lips of the vulva, expansion of its chest is restricted by the narrow birth canal. This situation is made much worse when continuous forced traction is applied. As soon as the calf's head has passed the lips of the vulva, traction should be interrupted, the nostrils cleared of mucus and cold water applied to its head.

Again, when the calf is completely delivered, immediate first attention is directed toward establishing respiration. Mucus and fetal fluids should be expressed from the nose and mouth by external pressure of the thumbs along the bridge of the nose and the flat fingers underneath the jaws, sliding from the level of the eyes toward the muzzle. The common practice of suspending the calf by the hindlegs to "clear the lungs" must be questioned. Most of the fluids which drain from the mouth in these calves come from the stomach, and the weight of the intestines on the diaphragm makes expansion of the lungs difficult. The most effective way to clear the airways is by suction.

Respiration is stimulated by many factors, but only ventilation of the lungs, cooling and certain drugs allow us to render help immediately. The best stimulus for respiration is ventilation of the lungs. Cooling is a very important respiratory stimulus that can be achieved by simply pouring cold water over the head of the calf. Cold water elicits the gasp reflex which aids in the expansion of the lungs. Brisk rubbing of the skin or tickling inside the nostril with a piece of straw also has a favorable effect. The phrenic nerve can be stimulated with a sharp tap on the chest slightly above and behind where the heartbeat can be felt.

## Artificial Respiration

The calf is placed on its side and the mouth and nostrils are cleared of mucus. An assistant holds the mouth open and extends the tongue of the calf to allow air to pass freely. While kneeling behind the chest of the calf, the operator uses one hand to grasp the upper part of the top front leg, while the fingers of the other hand are hooked underneath the last rib. Next, the chest wall is elevated by lifting the front leg and the edge of the ribcage until the calf is almost lifted off the ground; this expands the chest. During a short pause the lungs are given the opportunity to expand. This expansion is slow because the lungs are still "wet", never having been inflated. Next the chest walls are firmly compressed with flat hands. These movements are repeated approximately once every 5 seconds, whereby the major effort is aimed at the inspiration.

As a rule, no expiratory sound will be heard until after several resuscitatory movements. Initially, very little air will be aspirated as the lungs begin to expand. This treatment may be maintained for 15 minutes while other methods to stimulate respiration are employed, such as cold water or drugs. When spontaneous respiratory

movements occur after a few minutes, they are immediately supported, after which the rhythm of the artificial respiration is resumed.

The major advantage of this prompt intervention is that the lungs are supplied immediately with oxygen. In addition, the heart is massaged, and a pumping action is exerted on the large vessels of the heart, stimulating circulation.

After the frequency and depth of spontaneous respiration have reached an adequate level, the calf is briskly rubbed dry. The calf is then placed on its chest with the front legs extended and spread out and the hindlegs in a dog-sitting position extended alongside the body; this facilitates expansion of the chest. A handful of straw may be placed in each of the armpits to keep a weak calf from failing over.

Once respiration has been established, the umbilical stump is disinfected and dried by submersion in a clean cup of 7 percent tincture of iodine.

## **Colostrum**

Early ingestion of colostrum is essential for the newborn calf. The protective effects associated with the transfer of colostral immunoglobulins have been demonstrated repeatedly, both in the field and experimentally. The composition of colostrum changes rapidly to that of normal milk during the first 3 days of lactation.

The calf should receive at least 8 percent of its body weight in colostrum within 12 hours after birth; 2 liters within the first 2 hours. If the calf is reluctant to nurse, the colostrum should be given by esophageal feeder or stomach tube. Slightly bloody colostrum can safely be fed to calves if it is otherwise normal. Grossly abnormal colostrum, such as from a cow with acute mastitis, must be discarded. Providing adequate amounts of colostrum will not necessarily prevent diarrhea, but it will aid in the prevention of subsequent septicemia and decrease mortality. Immunoglobulins (Ig) are absorbed from the intestine for only a short time after birth, and the efficiency of absorption decreases lineally with time. Furthermore, "shut down" of absorption is different for each class of immunoglobulins. IgG can be absorbed for 27 hours and IgA for 22 hours, but IgM is absorbed for only 16 hours. Thus, a calf that nurses for the first time at 10 to 12 hours of age could still acquire high levels of IgG and IgA, but little IgM. As a consequence, such calves are very susceptible to colibacillosis.

## **Literature Cited**

1. Schuijt G and Ball L. 1980. Delivery by forced extraction and other aspects of bovine obstetrics. In: Current Therapy in Theriogenology. 1st Ed. D.A. Morrow (Ed). W.B. Saunders Co. Philadelphia, p 251.

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