PURDUE UNIVERSITY

PURDUE EXTENSION

AS-561-W

Animal Sciences

Parturition in Livestock

EXPERT REVIEWED

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Introduction

Parturition is defined as the process of giving birth. It occurs at the end of the gestation period, or pregnancy, as it is more commonly called, and it's a very critical management phase in the production cycle of livestock. Ensuring that parturition goes smoothly is the key to avoiding serious economic losses as well as maintaining the well-being of one's herd.

A majority of births occur without any incidents or problems; however, things can go wrong during parturition that livestock producers must be prepared to deal with when they occur. While the general process of parturition is similar for all mammals, it can vary from species to species, and those specific differences will be discussed later in this paper.

General Overview

Anatomy of Reproductive Tract

Parturition is the defining moment of the entire pregnancy that determines whether or not live offspring are produced. Before going into detail about the physiology of parturition, it is important to understand the basic anatomy of the reproductive tract. There are some differences between species, but understanding the basic structure of the reproductive tract aids in understanding parturition in the mammalian species discussed here, namely cattle, sheep and goats, and swine. Let's describe the reproductive tract going from the outside moving in (see Figure 1).

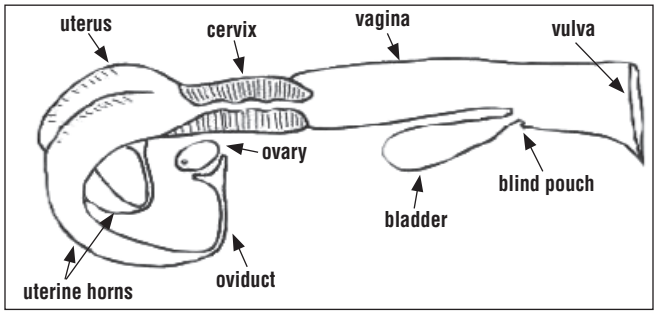

Figure 1: Anatomy of the cow's reproductive tract. Image courtesy of the article entitled "Reproductive Tract Anatomy and Physiology of the Cow," by T.D. Rich and E.J. Turman, of Oklahoma State University. Article can be found in the Beef Cattle Handbook.

The outermost portion of the reproductive tract, and the only external part, is the vulva. The vulva consists of a thick fold of skin that covers and protects the opening to the rest of the reproductive tract. Moving inward to the next structure is the birth canal, or the vagina. It is lined with epithelial tissue that serves to protect the rest of the reproductive tract from bacteria and other pathogens that may get inside the animal and lead to dangerous infections. During natural service, the vagina also serves as the deposition site of sperm, although this is not true in Artificial Insemination (AI). The vagina is also the fetus's passageway to the outside world. Following the vagina is the cervix. The cervix is the barrier between the vagina and the uterus. It serves to protect the more delicate and highly vascularized uterus from invasion by foreign

objects, and is also a tight seal that keeps the uterus closed during pregnancy. The uterus is a structure that consists of a body and two horns in livestock species. While it is very small in an animal that is not pregnant, during pregnancy it expands enough to house the growing fetus (or feti) until ready to be expelled from the body. At the end of each one of the uterine horns are the oviducts and the ovaries. The ovaries serve as the production site for ova, or eggs; the oviducts are the egg's path between the ovaries and the uterus.

Fertilization and Pregnancy

Parturition is preceded by two very important events: fertilization and gestation (pregnancy). Fertilization occurs after sperm has entered the uterus and travels through the reproductive tract until reaching the oviduct. When an egg is released from the ovary, it travels into the oviduct where it can be penetrated, and thus fertilized by the sperm. The fertilized egg then moves through the oviduct, the uterine horns, and finally, to the uterine body where it remains for the duration of pregnancy. Once the egg reaches the uterine body, it implants into the endometrium (the lining of the uterus), where it grows and develops until parturition. The fetus develops and grows in the uterus, and is surrounded by membranes and fluids known as the amniotic sac and the placenta. When it is fully formed and ready to exit the mother's body, it rotates in the uterus, and thus begins the process of parturition.

Parturition

It is very important that during parturition the animal moves smoothly through the three stages of parturition in a reasonable amount of time to ensure a safe and normal birth.

The first stage of parturition is known as the Preparatory Stage. It is during this stage, as is evident from the name, that the female prepares to give birth. Some signs that parturition is near can be observed during this stage. These signs may differ slightly among species; but in general, the female becomes restless and may be seen raising her tail and separating herself from the herd. In addition, there may be mucus discharge from the vulva, decreased body temperature, filling of mammary glands with milk, and mild straining. Behavioral signs include nesting behavior and possibly stealing other newborns in the herd.

During the preparatory phase, the fetus rotates itself from the position that it has maintained throughout pregnancy into the position required for parturition. This position varies somewhat between different species, and the specific positions will be discussed later. The cervix starts to dilate during this stage, and the first part of the fetus enters the birth canal. Fetal membranes may be visible as they protrude out through the vulva at this time.

The second stage of parturition is the Expulsion Stage. It is at this point that the walls of the uterus begin to contract more frequently and with increased force, thus pushing the fetus into the birth canal. When the contractions become strong enough, the fetus is actually forced out of the female's body, hence the name the Expulsion Stage. Once an animal has entered this stage, delivery should occur fairly soon; otherwise, there may be difficulties preventing normal delivery. Again, the standard amount of time allowed for a normal birth can differ between species.

The final stage of parturition is the Cleaning Stage. It is at this point in the process that the afterbirth, or the placenta, is expelled from the body. In order for the animal to make a normal, healthy recovery from parturition, the afterbirth must be expelled. If the fetal membranes and fluid remain in the animal, they can become infected and lead to serious illness and possible death of the mother. Once the fetal membranes have left the body, and the uterine lining has been shed, the uterus can begin to contract back to the significantly smaller size that it maintains when the animal is not pregnant. The process by which the uterus shrinks back to its normal size is called "involution".

Specific Species and Common Problems

Cattle

In cattle, parturition is referred to as calving. Reproduction in cattle, as with other livestock, is of great importance. Large amounts of money and time are invested in producing new, healthy calves every year. Dairy and beef cows experience the same process as they go through pregnancy and parturition. Parturition occurs at the end of the gestation period, which lasts approximately 283 days. Heifers (young cows that have not yet calved) and smaller cows may give birth about 10 days before the expected parturition date, whereas older cows and larger breeds may have a 10 day increase in their gestation period. The entire process of calving should last approximately 8-12 hours.

Stage 1, where the cervix dilates and fetus rotates to its birthing position and moves to the birth canal,

should last from two to six hours. This stage may last longer in heifers. Stage 2 can last from 30 minutes up to 4 hours. Stage 3 should have occurred within 8 to 12 hours after the fetus is delivered. If any stage seems to be taking an abnormally long time, there could be a serious problem, and the cow should be thoroughly examined to determine what is causing the delay.

Usually, calving moves smoothly and quickly, with no problem, but problems at calving are not uncommon. The individual caring for cows at calving time needs to be aware that problems may occur and should know what to do. The most common problem at parturition is dystocia. Dystocia is the technical term that describes any difficulty during parturition.

In cattle, the most common cause of dystocia is a calf that is too large to fit through the birth canal and the opening in the cow's pelvis (see Figure 2). This is termed a fetal-dam disparity, and can be from a large calf, a small cow or heifer, or both. If a cow appears to

Figure 2: An example of "hip lock" in cattle. Note also the breech calf. Photograph courtesy of Dr. Larry Horstman, D.V.M., Purdue University School of Veterinary Medicine.

be straining for long periods of time, she may be trying to deliver her calf, but it may be "stuck" in the opening in her pelvis. The calf may simply be too large for a normal birth. Sometimes the calf's head, shoulders, and body may be in or through the pelvic opening, but its hips may be stuck, a condition known as hip-lock.

Dystocia can also occur when the calf is in the wrong position for parturition, this is called malpresentation. The proper position for a calf (as well as sheep and goats) exiting the birth canal is facing forward with its back up and its head resting between its front legs (see Figure 3). Any other presentation is considered malpresentation, and more than likely will lead to dystocia.

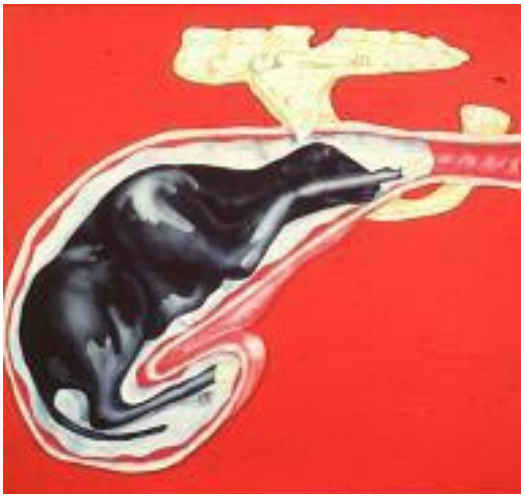

Figure 3: The normal birth position of a calf. Image courtesy of Dr. Larry Horstman, D.V.M., Purdue University School of Veterinary Medicine.

Assistance is required when a cow appears to be having problems giving birth. If the calf is in the wrong position, it is possible for a person to examine the cow and gently rearrange the calf so that is in the correct position and can be delivered. If the calf appears to actually be stuck, it may take some more effort on the part of the person, but it is possible to assist and deliver a healthy, live calf.

Before assisting a cow, the cow's vulva and the surrounding area should be cleaned, as well as the hand and arm of the person who will be assisting the cow. Any other equipment that may be going inside the animal should be disinfected and properly stored between uses. If bacteria gets inside the reproductive tract, infections may be deleterious to future reproductive performance. When everything necessary has been disinfected, it is critical that large amounts of lubricant are used before anything enters the birth canal. Products such as petroleum-based jellies or even solid cooking compounds can be used as lubrication. A lack of lubrication can cause serious tissue damage to the cow, which may endanger her reproductive ability in the future. There is some indication that assisting with parturition too early can interfere with the third stage of parturition.

When all of the necessary precautions have been taken, a long sleeve plastic glove should be worn to further protect the cow from bacteria. The hand and arm of the person can enter the birth canal through

the vulva and slowly find the calf. It is very important that the person assisting with the calving be able to visualize what it is that they are feeling inside the cow. In a normal position, one would be able to feel the head and both of the front legs and hoofs. Make sure that both of them extend back toward the rear of the cow. This would indicate that the calf is in the proper position. However, if this is not what the person feels, then further assistance is needed. Some of the more common malpresentations include a calf that has one or both forelegs back, its head back (see Figure 4), or the animal coming backward in breech position (see Figure 5). A breech calf is completely backwards in the uterus, with the back legs tucked under the abdomen

Figure 4: Malpresented calf with head back. Image courtesy of Dr. Larry Horstman, D.V.M., Purdue University School of Veterinary Medicine.

Figure 5: A breech calf in the uterus. Image courtesy of Dr. Larry Horstman, D.V.M., Purdue University School of Veterinary Medicine.

When calving assistance is necessary, there are a few methods that may aid in the eventual birth of the cattle. It may be possible in some cases, to push the calf back, very gently, into the uterus where it can be repositioned into normal position. In some cases, however, this may not be possible. The calf may still not come out easily. In the event that this happens, an experienced herdsman or a veterinarian will need to pull the calf.

Pulling a calf needs to be done very carefully and gently. It is done best and most safely either with obstetrical (pulling) chains, or a calf puller. When chains are to be used, they should be first disinfected and then looped around each leg of the calf at least twice. The chains should be slid up the front legs so that they are around the cannon bones and are two to three inches above the ankles and dew claws (see Figure 6) to protect the delicate tendons in the pasterns. The best way to pull the calf is to alternatively pull on each leg and gradually and gently "walk" the calf out until the shoulders have gotten through the pelvis. Pulling should always be done in a downward arcing motion, toward the hocks of the cow.

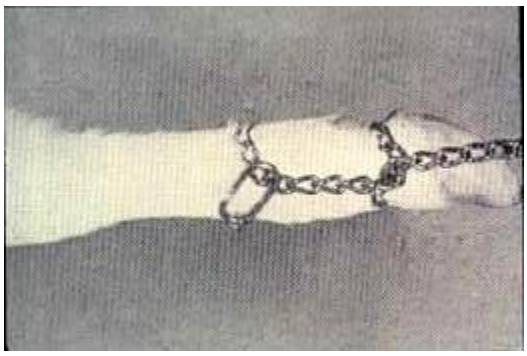

Figure 6: The proper way to attach pulling chains to a calf's foreleg. Photograph courtesy of Dr. Larry Horstman, D.V.M., Purdue University School of Veterinary Medicine.

An alternative method to deliver a calf is through the use of a calf puller or calf jack. This is an instrument that can effectively have the pulling force of seven full-grown men. These should be used only when necessary, and should be used only by experienced herdsmen or veterinarians. If calving is still not moving smoothly, or other problems are encountered, a veterinarian should be contacted, as a Caesarean section may be necessary to get the calf out alive. Whatever the situation, ultimate care must be taken to avoid doing any harm to the cow. Pulling the calf can cause its hooves to scratch against the uterine tissue, causing dangerous rips and tears in the lining of the uterus or the vagina. Pulling too hard can also tear the cervix or the birth canal, further endangering the cow, not to mention harm the calf.

Difficult calvings cause significant economic loss in the cattle industry each year. In order to combat these losses, a system of calving-ease scoring has been developed in order to allow producers to better predict which mating will result in a difficult birth. This system rates dams on a scale of 1 to 5, with 1

being the score of an unassisted birth, and 5 describing extremely difficult calving. Dams are scored after each calving, and the scores are compiled and reviewed to determine the likelihood that a sire will cause a dam to have difficulty giving birth. These scores are a useful tool for breeders because they allow them to see which sires are more likely to cause difficult births, and they can then choose to avoid those sires if desired. These calving ease scores are most important in choosing mates for heifers that have not yet calved.

Once the calf has been brought safely into the outside world, there are still a few steps that need to be taken to ensure that it survives. First and foremost, it is necessary that the calf begins to breathe. Tickling the inside of the calf's nostril with either a piece of hay or straw will induce the calf to sneeze, thus clearing the mucous from its airway and allowing it to begin breathing by itself. The mucous also can be cleared by gently swinging the calf upside down by its hind legs for a short period of time to allow the fluids to flow out of the lungs and airways and out of the body.

The second step is to ensure that a newborn can ingest its mother's first milk, the colostrum (see Figure 7). The colostrum contains important antibodies and nutrients to make the calf immune to many infectious

Figure 7: A newborn calf up and milking shortly after parturition. Photograph courtesy of NorwellMA.com

diseases that it is susceptible to in the early stages of life. Dairy calves are not allowed to get colostrum directly from their mothers. They are instead given 2 quarts of colostrum manually in their first hour of life. They should have at least 4 quarts by the time they reach 6 hours of age. This is done with dairy calves in order to ensure that they get an adequate amount of colostrum, and also to protect the calf from Johne's disease, which can be transmitted to calves by bacteria on teats. Finally, it is a safety precaution to disinfect the calf's umbilical region with tincture of iodine or another disinfectant (such as a Nolvasan solution) to prevent any infection from entering the bloodstream through the navel.

After the calf is up and nursing (only beef calves are allowed to nurse), the process of parturition is nearly complete. The final stage is the cleaning stage, where the cow must expel the placenta, or afterbirth, from her uterus so that the uterus can return to its normal, very small size in a process called involution. Keeping cows calm after delivery can aid in the response of the uterus to the hormone oxytocin that helps the uterus contract and expel the fetal membranes. The cow should be observed closely over the next 12 hours, or so, to make sure that the afterbirth has been expelled. If a cow fails to clean within 12 to 24 hours after delivery, a veterinarian should be contacted. A retained placenta can lead to very serious infections.

Sheep and Goats

Sheep and goats are very similar to cattle in the process that they go through when giving birth. In sheep, the process of parturition is called "lambing," and it is referred to as "kidding" in goats. The gestation period in sheep and goats are very similar, with sheep giving birth after 144-150 days, and goats kidding at around 150 days.

When a ewe (female sheep) or a doe (female goat) is about to give birth, there will be certain signs that may indicate she is ready for parturition. Just as in cattle, the female will appear restless and uncomfortable. She may paw the ground, begin breathing heavier and faster, or separate herself from the other females in the herd. Her physical appearance may change, with key indicators being the filling out of the udders and the caving in of her sides. The mucus plug may be expelled from her vulva, and the shepherd may notice that the female's water broke.

Once it is evident that a doe or ewe is about to give birth, it is extremely important that she be observed closely to make sure that the process of parturition moves smoothly (see Figure 8). The stages of parturition are the same in sheep or goats as they are in cattle; however, they are shortened significantly in duration. After the obvious signs of impending parturition have been observed, the female should be watched closely to see when her water breaks. After the water breaks, labor should begin smoothly and progress without complications.

Figure 8: Sequence of a ewe giving birth. Photograph courtesy of the Purdue Sheep Page.

The normal birth position in lambs and kids is just as it is in cattle, with the head resting between the forelegs (see Figure 9). The most common cause of dystocia in sheep and goats is malpresentation of the fetus or feti. As mentioned previously, the normal presentation of the fetus is with the head resting between the forelegs. Common malpresentations

Figure 9: Normal presentation of a lamb in utero. Image courtesy of Dr. Nolan Hartwig, D.V.M., Iowa State University.

include lambs or kids that have their head turned backwards (see Figure 10) and breech presentation in the uterus (see Figure 11), where they are completely backwards. They can also have one or both of the front legs back, the hind legs coming first, or four feet at once. It is common for a ewe or doe to have multiple lambs or kids, and in this event, it is possible that two lambs or kids could enter the birth canal at once. This situation can lead to a new group of possible malpresentations, including two heads and four feet, four feet and one head, four feet and no heads, or one lamb facing forward and one facing backward.

Figure 10: A malpresentation of a lamb, with its head back. Image courtesy of Dr. Nolan Hartwig, D.V.M., Iowa State University.

Figure 11: A lamb in breech presentation. Image courtesy of Dr. Nolan Hartwig, D.V.M., Iowa State University.

If the ewe or doe has not made any progress in half an hour to an hour after her water breaks, assistance may be necessary in order to produce a live lamb or kid. Before any assistance is given to a ewe or doe, everything that will come in contact with the female must be cleaned and disinfected. Pregnant women and women of child bearing age need to be careful when handling sheep or goats because some reproductive diseases can be passed on to humans.

After equipment has been cleaned and disinfected, a long-sleeve OB glove should be worn and large amounts of lubricant used before the person puts their arm inside the ewe or doe. Be very careful not to jump to conclusions and rush to assist a lambing or kidding. Forcing the cervix open can cause rips and tears that can endanger her reproductive future. Once it has been determined that a ewe or doe needs assistance with parturition, it is easiest to lay the female on her side. While it is possible to allow the female to remain standing while assisting with parturition, she is likely to lie down immediately after force is applied to the lamb or kid.

Determine the position of the fetus before making a decision to pull a lamb or kid. The person assisting should gently insert their hand inside the ewe or doe and feel the lamb or kid in order to determine its position. Experience and practice enables someone to correctly identify the lamb's or kid's position inside the birth canal. When in any doubt, seek professional help to avoid causing any danger to the lamb or the ewe. Proceed to pull the lamb or kid once it has been decided that the ewe or doe needs assistance. The first step in pulling a lamb or kid is getting it into a position where it will come out fairly easily. Ideally, the lamb or kid should be repositioned so that it is in normal birth position; however, this is not always possible. A lambing snare may be useful to keep the lamb or kid in the position once the lamb or kid is in the best possible position. It may be difficult to hold it there because the birth canal is wet and slippery. Once the snare has been placed on the animal, gently pull, in a downward motion, until the lamb or kid is in a place where the uterine contractions of the dam can push it the rest of the way out of the body.

It is fairly easy to pull a lamb or kid that is backwards in the birth canal if its rear legs are pointing backwards. In this presentation, the hind legs can be used to pull the lamb or kid gently out of the birth canal. However, if the lamb or kid is in complete breech position with the hind legs facing the front of the uterus, some serious rearrangement is in order. The lamb or kid must be gently pushed forward in the uterus, and then one of the rear legs grabbed and pulled gently into the birth canal. Be aware of the location of the hooves of the fetus: they can cause serious injury to the lining of the uterus and the birth canal.

When assisting a ewe or doe that is suspected of having more than one lamb or kid, the person assisting must make sure that the legs and head they are pulling belong to the same lamb or kid. If they do not belong to the same lamb or kid, gently push back and rearrange the legs and head in the uterus until they are in a correct position. After the lambs or kids have been rearranged, it is possible to pull them out in the same fashion that a single lamb or kid can be pulled.

If pulling a lamb or kid is not possible, a Caesarian section may be necessary to get the lamb or kid out alive. Contact a veterinarian. The main consideration in the lambing or kidding process is to make sure things go quickly. Prolonged labor can inflict serious strain on the ewe or doe, as well as extended attempts in pulling the lamb or kid can cause some serious infections of the reproductive tract.

It is important that their airways are cleared so that they can breathe properly once the lambs or kids have been delivered. As with cattle, tickle the inside of the lamb's or kid's nostril with a piece of hay or straw, or swing the lamb or kid upside down by its hind legs to clear the mucous from its airways (see Figure 12). It is also critical that the lamb or kid get the colostrum from its mother. If the ewe or doe does not have good quality colostrum available, a replacement from a dairy cow, another doe, or another ewe may be given.

Figure 12: A newborn lamb being held upside down to clear its airways of fluid and mucus. Photograph courtesy of James and Jo Rider, East Penrest Organic Farm.

Swine

Swine parturition is called farrowing. The main difference between swine and sheep, cattle and goats is the size of the litter. Cattle normally only have one calf, and sheep and goats may have twins (anything more is fairly unusual). Sows, on the other hand, give birth to an average litter of about ten piglets; although, this can vary substantially (see Figure 13). Swine also have the lowest rate of problems during parturition, with dystocia occurring in less than 1percent of all farrowings.

When a sow is reaching the end of her 114th day gestation period, she begins to show obvious signs of impending parturition. At three days prior to farrowing, the vulva will swell and redden, and the mammary glands begin to develop. Two days before farrowing, the individual mammary glands become visible. On the day directly prior to parturition the sow becomes restless and may begin nesting and rooting behavior. She stops eating, and milk may be visible coming out of the nipples.

Figure 13: A litter of piglets. Photograph courtesy of Purdue Pork Page.

The sow will become restless on the day of farrowing. She repeatedly gets up and down and claws and chomps on her bedding. A large proportion of sows farrow at night, so it will be necessary to begin observing the sow overnight. When the sow is approximately ten minutes away from giving birth, fluid can be seen passing from the vulva, along with switching of the tail and apparent pain and straining. At this point, the first piglet should be delivered. The normal birth position of piglets varies about half and half between facing forwards and facing backwards (see Figure 14). The piglets should be delivered at the rate of one every 10 to 20 minutes after the first one is delivered. When parturition is complete, the sow stands and urinates, and then she'll lie down and allow the piglets to nurse. The placenta should be passed within approximately four hours after the last piglet is delivered.

Figure 14: An example of the normal presentation of piglets in the uterus. Image courtesy of Dr. Wayne Singleton, PhD, Purdue University.

While difficulties in farrowing are rare, and occur in less than 1percent of all farrowings, problems can arise. There are some obvious signs that indicate a sow is having trouble farrowing. There may be blood tinged fluid visible from the sow's vulva, her eyes may appear red, and there can be a grayish discharge from her vulva. She may appear to be straining, but without any luck delivering a piglet. The sow may be breathing very fast and appear to be thoroughly exhausted. If more than an hour has passed since the birth of the last piglet, and her abdomen still appears full, this may also indicate that the sow has more piglets, but can not get them out.

In the event that problems occur, the methods of assisting a sow with delivery and assisting a cow, ewe, or doe are somewhat similar. The most important step is to make sure that the vulva and surrounding areas are clean and disinfected. Whenever a hand is moved inside the sow, it should be cupped so as to avoid scratching or tearing the walls of the birth canal and the uterus. Once the position of the piglet has been determined, the piglet can be pulled either with a hand or a snare. If the piglet is facing the birth canal head first, it can be grabbed by the snout and pulled out by that (see Figure 15). If the piglet is breech, and its hind legs appear to be coming first, the hind legs can be pulled and the piglet can be delivered hind feet first. A snare can be used in place of hands in either of these instances to help get the piglet out safely (see Figure 16).

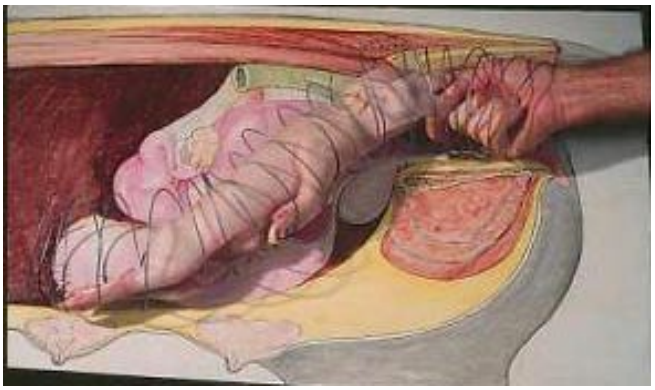

Figure 15: A piglet being pulled by hand out of the birth canal. Photograph courtesy of Dr. Wayne Singleton, PhD, Purdue University.

Figure 16: A piglet being pulled out of the birth canal by a snare. Image courtesy of Dr. Wayne Singleton, PhD, Purdue University.

Immediately after delivery, remove membranes from around the nose so the piglets can breathe. The navels of all of the piglets should be disinfected with iodine to reduce the risk of infection and possible septicemia. After all of the piglets have been delivered and are nursing contentedly, it is critical that they be kept warm. Piglets need to be kept at about 85°-90° Fahrenheit, about 20° warmer than the sow. This difference in heat can be obtained by using infrared lamps or heated pads in a place where only the piglets can reach them. This allows the sow to remain cool while the piglets are kept warm.

Conclusion

Parturition is the most important event of an animal's life. For livestock producers, it is a key event that can either lead to economic gains, or to a loss should problems occur. By understanding how parturition occurs, it is easier for livestock breeders to know when a problem occurs and what to do if an animal needs assistance. Although a large emphasis in this paper is placed on giving assistance at birth, it is not to be implied that every animal will need assistance with every birth. It is not uncommon for an animal to give birth to healthy offspring without any human intervention.

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