Maternal and fetal abnormalities during gestation in the cow
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Introduction
The focus of this presentation is to describe several noninfectious complications of gestation in the cow. The emphasis will be on the diagnosis, prevalence, and prognosis of various accidents of gestation. Included will be hydramnios, hydrallantois, cervico-vaginal prolapse, and torsion of the uterus for the cow, and Schistosomus reflexus, hydrocephalus, incomplete twins, mummification and maceration for the fetus. Illustrations are included via a direct reference the Bovine Reproduction Guide, a web atlas.

Keywords: Abnormal gestation, hydrallantois, hydramnios, cervico-vaginal prolapsed, uterine torsion

Hydrallantois/hydrops allantois
Excessive accumulation of allantoic fluid is seen sporadically in dairy as well as beef cattle. Hydrops allantois may be progressive after mid-gestation. As much as a 10-fold increase in allantoic fluid volume, up to 200 liters, has been reported versus a normal near-term volume of 8 to 15 liters.

Cows show bilateral distension of the abdomen. They are distressed, anorectic and have no rumen activity due to compression of the rumen. Dehydration and constipation follow and eventually the thin, distended cows become recumbent. Palpation per rectum reveals a very tight uterine wall, too tight to identify fetal parts or placentomes.

Placental dysfunction is evident by the occurrence of adventitious placentation which is characterized by a reduced number of placentomes (normal range 75 to 120) and the development of a more primitive villous placentation. Nutritional deficiencies have been reported to cause hydrops allantois near Zacatecas, Mexico in Criollo cattle owned by small holders, and raised on poor soil during the long, severely dry season from December to May, with a prevalence of up to 30%.

Salvage slaughter is generally recommended because of the underlying adventitious placentation which is a permanent alteration of the caruncular structures of the endometrium. Gradual drainage by repeated trocarization is possible when supported by oral fluid therapy. Parturition can be induced if the cow is reasonably close to term (within 2 to 3 weeks), provided she is simultaneously treated with large amounts of electrolytes per os. When the accumulation of fluids is the result of nutritional deficiencies, as reported in Mexico, improved nutrition will help if the condition is diagnosed early. The prognosis for future fertility is guarded in cases of adventitious placentation, and favorable when due to nutritional causes.

Hydramnios/hydrops amnii
Excessive accumulation of amniotic fluid can be the result of fetal anomalies such as impaired deglutition or renal dysgenesis or agenesis. Hydramnios is a very rare condition. The increase of amniotic fluid is gradual. When viewed from the rear, a cow with hydramnios has a pear-shaped abdomen. Nutritional deficiencies have been reported to cause hydramnios near Zacatecas, Mexico in Criollo cattle owned by small holders, and raised on poor soil during the long, severely dry season from December to May, with a prevalence of up to 30%.

Hydramnios results from the mating of an American Bison bull with a domestic cow have caused hydramnios as a result of an immunologically compromised placenta. The fetus is invariably defective and nonviable. Placentation is normal. Parturition and labor may be induced with glucocorticoids and prostaglandins, or the cow may be allowed to go into labor spontaneously. The prognosis for future breeding of the dam, to a different bull, is good.

Cervico-vaginal prolapse
Elevation of the plasma estrogen concentration during late gestation predisposes the cow to cervico-vaginal prolapse. Contributing factors are pluriparity, obesity, Bos indicus breeding, large calves, and occasionally hilly terrain.

Development of the prolapse is progressive and starts with the exposure of some of the vaginal mucosa. The prolapsed mass moves in and out as the cow gets up and lies down. The membranes dry out upon exposure and become irritated which leads to straining and greater exposure of the mass. Edema is the result of, and leads to further circulatory impairment and more swelling. Ultimately the cervix and occasionally the bladder may become involved.

Diagnosis is obvious, based on the appearance of an angry looking soiled mass protruding from the vulva. However, the mass may be mistaken for fetal membranes containing bloody fluids, hematoma of the vulva, cystic vestibular glands and tumors.
Treatment depends on the severity of the condition and varies from simply elevating the hindquarters of the cow with a platform in a tie stall, to the placement of retention sutures or prolapse pins in the vulva [bags79.jpg]. In non-pregnant animals a deep purse string suture (Buhner) can be placed under epidural anesthesia [bob251 to bob268.jpg].

The prognosis also depends on the severity. As most of the prolapses occur during late gestation, the cow must be observed for signs of impending parturition to allow for timely removal of the prolapse pins or sutures. There is no correlation with prolapse of the uterus after parturition. Vaginal prolapse is like to recur during the next pregnancy, whereas uterine prolapse usually does not recur.

**Uterine torsion**

Cows are predisposed to torsion of the uterus because the broad ligament is attached ventrally along the lesser curvature of the uterus. This leaves the greater curvature free. In *Bos indicus* the ventral attachment changes from ventral at the body to dorsal at the tip of the horn. As cows get up on their hind legs first the (gravid) uterus is temporarily suspended. The broad ligament is looser and longer in pluriparous cows. The abdomen is capacious from ventral at the body to dorsal at the tip of the horn. As cows get up on their hind legs first the (gravid) uterus is temporarily suspended. The broad ligament is looser and longer in pluriparous cows. The abdomen is capacious.

The diagnosis is based on a history of advanced pregnancy. Per rectum, the orientation of the broad ligaments is distinctly different. Depending on whether the torsion is to the left or the right, the respective broad ligament is pulled tight across the uterus. Anorexia, rumen stasis, constipation, increased pulse and respiration are usually present.

When the uterus is rotated, there is evidence of abdominal pain and discomfort due to stretching of the broad ligament. Anorexia, rumen stasis, constipation, increased pulse and respiration are usually present.

The diagnosis is based on a history of advanced pregnancy. Per rectum, the orientation of the broad ligaments is distinctly different. Depending on whether the torsion is to the left or the right, the respective broad ligament is pulled tight across the uterus. Spiral folds can be palpated per vaginam. Most torsions are to the left (counter clockwise), as, in general, the uterus rolls toward and over the nongravid horn. About 60% of all pregnancies in the cow are in the right horn. Thirty-four percent of uterine torsions occur anterior to the cervix and there is no vaginal involvement in those cases. Forty-five to 90 degree torsions are common and are not diagnosed per se. Of the severe torsions, 20% are 90 to 180 degrees, 57% are 180 to 270 degrees, and 22% are 270 to 360 degrees.

Depending on the degree of torsion, the fetus may be in dorso-pubic presentation. With severe torsion circulatory embarrassment occurs.

Torsion depends on the degree of the torsion. With rotations of 90 degrees or less, the fetus can frequently be manually rocked into a normal dorso-sacral position when the cow is in labor and the legs are presented into the birth canal. Greater rotations can be corrected by rolling the cow around the fetus which is kept in place by a plank in the flank [bags98.jpg]. Briefly, the cow is cast with ropes to lie on the side in the direction of the torsion. A long plank is placed in the paralumbar fossa of the cow and an adult person stands on the plank above the paralumbar fossa. Next the front legs of the cow are tied together and likewise the hind legs and they are pulled up and over the recumbent cow. In intractable cases a cesarean section must done to deliver the fetus, suture the uterus, and manually untwist the uterus. The prognosis depends on the degree of severity and largely on the extent of vascular compromise. The latter may cause rupture of the fragile uterus [bags95.jpg].

**Fetal complications**

The occurrence of congenital anomalies and fetal monsters is uncommon in the bovine, which makes it difficult to study their etiology. Two major categories are genetic influences and toxic effects. A short, random list of conditions that may lead to dystocia is hereby presented.

*Schistosoma reflexum* literally means split body that is bent back on its self [bter75.jpg]. This aptly describes a fetus with a wide open abdominal cavity and free flowing viscera, and a vertebral column that has doubled back on itself [bter10.jpg]. These fetuses survive until term and then present a problem in delivery because of the awkward conformation. The diagnosis presents a challenge when encountered for the first time. The condition is rare and the etiology is obscure. A cesarean section is contraindicated because of the severity of the abnormality. A single cut with the fetatome through the curvature of the spine is sufficient to reduce size of the two halves. If the fetus is alive, its umbilical cord may be severed prior to the fetotomy.

*Perosomus elumbis* is characterized by a lack of development of the hindquarters, either a total absence of the pelvis and hind legs [bter55.jpg], or a rudimentary pelvis with short hind limbs [bter56]. The latter may prevent spontaneous delivery. They can be removed by fetotomy.

Hydrocephalus is a condition marked by excessive cerebrospinal fluid resulting in dilation of the cerebral ventricles. This may result in enlargement of the cranium and atrophy of the brain [bter29.jpg]. The grossly enlarged skull may be too large to pass through the birh canal, hence cause a dystocia. A cesarean section is contraindicated due to the condition of the fetus, which can readily be delivered after the soft, fluctuant skull [bter22.jpg] has been incised, and drained.
Identical twins are formed when one or more of the early totipotent cells become separated from the inner cell mass of the embryo, and develop into two individuals. When the separation is incomplete two partially developed calves and conjoined twins result. At other times, only certain regions of the twins are duplicated, as in the cases of a calf with two heads (dicephalus) [bter39.jpg], or a calf with two sets of hindquarters. Other examples include the occurrence of a parasitic (extra) limb [bter58.jpg]. Extreme examples of incomplete twins are the formation of a globosus amorphus, a spherical mass, with its own vascular connection to the placenta of its normal twin [bter64.jpg].

**Mummification**

Mummification of the fetus is a curious and interesting event which fortunately does not occur very often. The etiology of mummification is generally obscure. There are several prerequisites for the process of mummification, the fetus must be dead, there must be no air (oxygen) in the uterus (the cervix must be tightly closed), and no bacteria should gain access to the uterus via its blood supply. This makes certain viruses suspect (enteroviruses, BVD) which can kill a fetus quickly without causing further contamination and irritation.

Mummification is most common at end of the first and the beginning of the second trimester of pregnancy in the cow [bags75.jpg]. After the fetus dies, the fetal fluids are gradually resorbed and the fetus itself becomes progressively more dehydrated. The wall of the uterus shrinks tightly around the fetus, ultimately even into the empty eye sockets as the eyeballs have completely shrunken up. The caruncles disappear completely as well. The fetus slowly compactly and attains a leathery texture. The entire process takes several weeks depending on the age of the fetus at the time of its death.

Meanwhile the cow behaves normally but she does not cycle. Frequently the first indication that something is wrong is when the cow shows no udder development near the time she is expected to calve, and indeed she fails to calve. Examination at that time by transrectal palpation reveals a uterus that is devoid of fluids and that is drawn tightly around a small, firm fetus with a bird-like head. The empty sockets are usually readily recognized.

Treatment is relatively simple though questionable for economic reasons, hence the cow should be sent to slaughter. The cow is generally already dry and it will require a minimum of ten months for her to conceive again and deliver her next calf. When given a single injection of 25 mg prostaglandin F$_2$α i.m. she will come into heat in 3 to 5 days at which time her cervix relaxes, her uterus contracts and the mummy will be presented in the birth canal. Because of its sticky, dry nature it is best to examine the vagina 3 to 5 days after the injection to check for the presence of the odorless, rat- to cat-size mummy and aid in the delivery if necessary. The occasional large mummy for which the uterine contractions are too weak and for which the cervix does not dilate sufficiently, may need to be delivered by cesarean section [bags37.jpg]. After expulsion of the mummy the uterus quickly regresses in size. Its lumen is not contaminated, the caruncles are already involuted, and hence the cow may be bred back at the next heat with a good chance of conception.

**Fetal maceration**

While fetal mummification occurs when the fetus quietly dies in the uterus in the absence of air and bacterial contamination, and the cervix remains tightly closed, fetal emphysema and maceration occur when the cervix is open and miscellaneous bacteria invade the uterus from the vagina. Fetal maceration follows incomplete abortion but it is not common. The latter may be the result of an only partially dilated cervix or the abnormal presentation of a fairly dry fetus which causes it to be retained in the uterus.

With the dead fetus incubated at body temperature, bacterial multiplication is rapid and the fetus putrefies. Initially it becomes distended with gas and it subsequently decomposes. The wall of the uterus becomes thick and surrounds the disintegrating fetus like a capsule, as if to wall off an abscess [bags32.jpg]. This helps explain why the cow does not become seriously ill. After about the third month of gestation fetal bones resist maceration. Sharp pointed bones such as the fetal ribs may deeply embed themselves in the uterine wall. Occasionally a bone perforates the uterine wall and becomes encapsulated by adhesions. The rare finding of a small bone free in the abdominal cavity of a cow at slaughter can be explained in this manner.

Meanwhile, the cow may have shown only vague signs of intermittent straining accompanied by a foul, grayish-red vaginal discharge which may contain some of the smaller bones. She may run a fever, go off feed, and act depressed. These changes are usually noticed in the lactating cow as her milk production also drops, but they are easily overlooked in heifers, dry cows, or beef cows. The diagnosis is readily made by palpation per rectum. The uterus feels thick-walled and firm, fluctuation is largely absent, and in advanced cases crepitation of the fetal bones can be felt [bags32.jpg]. There is usually also a slight, purulent vaginal discharge.

The prognosis for future fertility of the cow is very poor because of the damage done to the uterine wall. For economic reasons treatment is therefore not advisable. The cow should be sent to slaughter. If the individual
value of the animal nevertheless warrants treatment, prostaglandins can be used to evacuate the contents of the uterus. It must be realized that some bones may be partially embedded in the wall or lodged sideways preventing their expulsion. As a last resort such bones can be removed surgically [bags67.jpg]. Surgery is best performed via a midline incision in the abdomen to provide optimal access to the small, contaminated uterus.

References

Images
Illustrations of the various conditions may be viewed in the Bovine Reproduction Guide under the heading Accidents of Gestation. To view an individual image, select Search on the Home Page and enter the file name (e.g. bags48.jpg), or enter the name of the condition.