Breeding Soundness Examination of the Cow

Grant S. Frazer, *BVSc, MS, Dip.ACT.*
Veterinary Medical Teaching Hospital
College of Veterinary Medicine
The Ohio State University
Columbus, Ohio 43210

Treatment or prevention of breeding problems is only possible after making the correct diagnosis. The accuracy of this diagnosis is based on:

1. A detailed review of breeding records and compilation of an accurate history.
2. A thorough evaluation of the entire reproductive tract.
   a. external inspection.
   b. evaluation of internal genitalia per rectum (palpation and ultrasound)
   c. vaginal examination.

History

Like any thorough clinical examination, it is essential that a complete reproductive and medical history be obtained. I routinely request that the client bring a copy of the cow's breeding records, although these are often difficult to obtain and are not always accurately recorded (especially in large herds). The following questions should be asked:

* *Age?* If the animal is a heifer then the obvious question is whether she was a twin. Occasionally it may be possible that the male twin died in utero, resulting in the birth of a single freemartin calf. Heifers may have a range of congenital anomalies ranging from a persistent hymen to segmental aplasia. Older cows may be expected to have diminished fertility due to various wear and tear injuries such as cervical lacerations, chronic endometritis, salpingitis and/or hydrosalpinx.

* *Herd fertility status?* It is important to view the fertility problem of the individual cow in perspective with the remainder of the herd. If a high percentage of the herd is experiencing fertility problems then it may be a herd problem due to faulty management (eg. poor heat detection; ration imbalances). It is important to remember that herd size and infertility (incidence of repeat breeding) tend to be directly proportional.

* *Cow's general health; Vaccination history; Previous medications?* Animals that have had abdominal surgery for non-reproductive purposes (eg. LDA) may have adhesions. The author has diagnosed lymphosarcoma in several problem breeders. Lameness can be a major cause of heat detection problems. Drugs, dosages, and routes of administration should be determined.

* *Dates of previous heats and/or inseminations?* This information is used to calculate length of cycles. Irregular intervals may indicate poor heat detection, cystic follicles, or embryonic death. Insemination data from previous years may show that the cow was a problem in the past (eg. anatomical defect).

* *How long does the cow stay in heat?* How strong does she show heat ? The problem may be due to poor expression of heat (subestrus) or silent heat. There is tremendous individual variation in the duration and intensity of estrus. Cows with vague signs of heat are often inseminated at the wrong time and milk progesterone assays can be used to confirm whether the animal is actually in estrus.

* *What is the usual time of A.I?* The optimal time for AI is near the end of estrus. The success of the AM/PM rule depends on the accuracy of heat detection. If heat detection is poor, the benefits of the "golden rule" may be no better than once daily breedings. High fertility bulls are more forgiving. The quality of semen will have some bearing on this. Average and below average fertility bulls are more sensitive to the timing of AI than above average fertility bulls.

* *What is the quality of semen used in the cow?* High producing cows are most likely to be inseminated with semen from high P.D. bulls . Selection for milk yield in daughters does not ensure optimal bull fertility. Ensure that the semen being used was obtained from a reputable processor. Ensure correct handling of semen from time it leaves processor until it is deposited in cow. Anything that compromises the viability of the sperm will increase the importance of accurate heat detection and timing of AI. It may pay to examine 1-2 drops of semen from suspect straws. Note: Motility, Percent normal, and Concentration -> number of morphologically normal, progressively motile sperm.

* *What is the level of expertise of the inseminator?* Analysis of records may indicate that the onset of problems can be associated with a change in personnel. Retraining may be necessary. Sometimes difficulty in passing the insemination pipette is mentioned. Has the cow been exposed to a bull ?

* *Did cow experience problems at previous calving?* Vaginal or cervical prolapse; Uterine torsion; Twins; Dystocia (assisted delivery; fetotomy; cesarean section).

* *Was postpartum period normal?* Uterine prolapse. Acquired anatomical defects and uterine infections can often be traced back to calving problems. Retention of the fetal membranes is frequently accompanied by metritis, delayed involution and persistent endometritis.

I don't believe that the timing of the exam is critical, and usually don't request that the cow be presented on any particular day of the cycle. However, it may be helpful to request presentation several days after the last perceived estrus if there is some question about the accuracy of heat detection. Although palpation of a corpus luteum is the ideal, ultrasonographic imaging can increase the accuracy of detection, and the ultimate confirmation is an elevated progesterone assay. I prefer not to examine cows that have been recently bred as it precludes any transcervical diagnostic procedures. On several occasions I have been presented with an "infertile" cow that was found to be pregnant either by palpation or by ultrasound.

External examination

Although it may not always be necessary to perform a thorough physical examination on a healthy cow that is being presented for infertility, an evaluation of the whole animal is appropriate. Body condition has a marked impact on fertility. The amount of udder development, milk production and body condition score should be noted. Elevation of the tail head and a "beefy", masculine appearance may be associated with chronic cystic ovarian disease. Both paralumbar fossas are closely examined for the presence of linear scars (cesarean section; LDA), and the ventral body wall is checked for evidence of a midline cesarean section scar.

The remainder of the examination focuses on the reproductive tract. The hindquarters and underside of the tail are inspected for evidence of discharges. Dried, white or yellow secretion may indicate vaginitis, cervicitis, or endometritis. Metestral bleeding may indicate whether heat detection was accurate. The external genitalia are examined, noting vulvar tone and apposition of the labia. Perineal lacerations are suggestive of trauma from previous calvings. The sacral area is examined for rub marks (standing to be ridden).

Internal Genitalia

It is very important to be careful and methodical so that no minor abnormalities are overlooked. I have made up a cow BSE form based on the one routinely used for mare reproductive evaluations. This serves as a concise record of the entire examination.

I always perform an examination per rectum first and any potential anomalies within the perivaginal area can be noted and later confirmed by visual inspection of the vagina. Furthermore, if there is any fluid within the uterine lumen then retraction and palpation of the horns increases the likelihood that some exudate will be visible at the external os. Pneumovagina is present if an air-filled vagina is encountered. Evidence of perivaginal trauma (adhesions; abscesses) are indicative of dystocia. If an imperforate hymen is present then mucus will accumulate in the vagina cranial to the membrane, and in extreme cases the tissue may bulge through the vulvar lips. Caudal retraction of the cervix can be used to determine whether there is fluid accumulated on the vaginal floor (eg. urine pooling).

The dimensions of the cervix should be noted. Obviously the cervix tends to become larger with increasing parity. It should be freely movable. If cervicitis is present then the cervix will be enlarged with the external os being most pronounced. This must be differentiated from prolapsed annular rings or a double external os. A double cervix will not cause problems with natural service but a true double cervix can cause problems with AI if the semen is deposited into one horn and the follicle is ovulated off the contralateral ovary. In this case each cervical canal joins an individual uterine horn due to failure of fusion of the lower paramesonephric duct. It is very important to note such abnormalities on the individual cow record. Permanent occlusion of the cranial vagina/cervix (eg. scarring post-dystocia) is followed by accumulation of uterine gland secretions which can be palpated within the uterus (potential for confusion

with pregnancy). In freemartins it is possible to detect rudimentary vesicular glands, segmental aplasia of the uterus, and small ovaries.

It is essential that the uterus be fully retracted into the pelvic cavity. Abnormal conditions may be missed if the uterus is not fully retracted so that both horns can be examined over their entire length. A common impediment to retraction are adhesions resulting from abdominal surgery, peritonitis, severe metritis and dystocia. In some cases cervical forceps can be used to aid retraction of an extremely pendulous uterus. The uterus is examined for size and symmetry of the horns, consistency and thickness of the wall and for possible content. An estimate of uterine horn diameter (just anterior to the external bifurcation) should be made. Asymmetry and thickening of the wall suggest inflammation but endometritis is difficult to diagnose by palpation per rectum alone. Occasionally a fetal remnant (eg. claw of an autolyzed fetus) is palpable in the uterine lumen.

Pipette abscesses may result from insemination accidents. Injudicious passage of rods to perform uterine infusions can easily puncture the uterine wall. These lesions typically involve the dorsal wall of the uterine body and although they make palpation difficult, aren't necessarily a cause of infertility. Congenital defects include uterus unicornis and segmental aplasia. A cow with uterus unicornis (complete absence of one horn) may have had calves but will have a history of irregular estrous cycles and repeated inseminations. Ovulations on the side with no horn obviously can't result in conception, and the resulting corpus luteum is not lysed by the countercurrent prostaglandin system. This ovary should be surgically removed. If segmental aplasia is present the cranial portions of the tract (ovaries, uterine tubes, and cranial uterine horns) are usually normal, with maldevelopment of the paramesonephric duct occurring in the region of the uterine body, cervix or vagina. In some younger animals it may be difficult to definitively palpate the anomaly. In these cases I routinely pass an ET catheter and infuse saline. Failure of one horn to distend confirms the diagnosis. Older animals will accumulate endometrial secretions proximal to the occlusion and the thin-walled, fluid-filled uterus may simulate a pregnancy. Uterine neoplasia in cattle is uncommon, the most likely being lymphosarcoma, and occasionally leiomyoma. Lymphosarcoma may be detected as multiple firm, smooth, spherical masses palpable in the uterine wall. Often there will be enlargement of iliac and inguinal lymph nodes as well. Ultrasonographic examination can reinforce the diagnosis. This condition can develop quite rapidly.

The oviducts are barely detectable by palpation. In my opinion if the oviduct can be felt distinctly then it is most likely abnormal. Occasionally small cysts may be noted in the mesosalpinx. Subtle deviations are only found on post-mortem examination. Extensive hydrosalpinx or pyosalpinx is relatively easy to diagnose. Normally the ovarian bursae are freely distendable and should permit insertion of 3 fingers. If difficulty is experienced in elevating the ovary for palpation then pathology is probably present. The ovary may be completely surrounded and adhered to the bursa. Localized peritonitis and ovarian bursitis may develop as an extension of severe metritis. Some clinicians believe that estrogen therapy may cause retrograde movement of infectious material up the fallopian tubes. Although less common today (prostaglandin preparations), in the past manual enucleation of the a corpus luteum could lead to hemorrhage and adhesions. Likewise, GnRH treatment has replaced forceful rupturing of ovarian cysts as a mode of therapy. If a thin walled follicular cyst ruptures as the ovary is being grasped for palpation it is unlikely that any significant hemorrhage will occur. Occasionally it is not possible to evaluate the ovaries and uterus completely due to the extent of adhesions or pelvic masses. In these cases a flank laparotomy or laparoscopy will permit direct visualization of the reproductive tract. A more accurate prognosis may then be offered. If the bursal adhesions are minor and/or unilateral the cow will be subfertile, but extensive bilateral, obstructive adhesions will make conception impossible. If unilateral salpingitis/hydrosalpinx is diagnosed then an ovariectomy is indicated to force all future ovulations onto the patent side.

In cases of ovarian hypoplasia the uterus will be anatomically normal but small, and the ovaries will be very small. If ovarian hypoplasia is suspected then karyotype evaluation of lymphocytes should be offered. Chronic cystic ovarian disease is a common diagnosis in both beef and dairy cows presented for reproductive evaluation. In most cases the animals have been treated repeatedly with GnRH, and in some instances with human chorionic gonadotropin and progestogen implants as well. Some of these cases will have a thin-walled, fluid-filled uterus (mucometra). Although uncommon in cattle, a granulosa theca cell tumor may explain the erratic cycles and failure to respond to hormonal therapy. Depending on the hormone levels produced by the tumor, the cow may show nymphomania or anestrus, and develop an elevated tail head or masculinization. Elevated inhibin levels from the tumor will block gonadotropin release such that the opposite ovary becomes small and inactive. The affected ovary may be solid or have a honeycomb appearance on ultrasound. Several other extremely rare types of ovarian tumor may be encountered.

Vaginal Examination (Vaginoscopic and digital)

Ideally this follows thorough palpation per rectum as any uterine fluid may have been massaged out through the cervical canal. Clear mucus at estrus should

correlate with uterine tone and follicular activity. Cloudy or mucopurulent secretion is suggestive of endometritis (especially if coming directly from the external os). Abnormal secretions may be due to vaginitis or may come from a recently ruptured perivaginal abscess. Infectious pustular vulvovaginitis (IPV) is an acute erosive disease (white necrotic plaques) caused by bovine herpesvirus type I (not the respiratory form). Granular vulvitis is characterized by a mucopurulent discharge and granules/papules in the vulvar mucosa (raised red-brown lesions). This condition may occasionally be associated with infertility, and the condition has been associated with *Hemophilus somnus, Ureaplasma diversum*, and *Mycoplasma bovigenitalium*. It should be remembered that these organisms can be isolated from the genital tracts of fertile animals.

Pneumovagina may follow obstetrical trauma. If the condition is present then no air is heard to rush in as the speculum is introduced (vestibular sphincter defect). Frothy secretions may be noted and the vaginal and cervical tissues are hyperemic. The condition may be amenable to correction by a Caslick's procedure. Urovagina is confirmed by a pool of urine on the vaginal floor. The condition may be an intermittent finding in the same cow and is most likely to be seen near the time of estrus. Chronic urovagina is characterized by vaginitis. The cervix is often dropped over the pelvic brim and the external os is inflamed and edematous (cervicitis). A urethral extension may be indicated in some cases. However, if the pneumovagina or urovagina are due to sagging of vaginal tissues, in conjunction with a horizontal orientation of the vulvar lips, then surgery may be of little benefit. Congenital abnormalities such as a double os cervix are readily detected. Gartner's ducts (persistent mesonephric ducts) may be seen on the vaginal floor, but are not a cause of infertility. Likewise, Bartholin's gland (vestibular gland) cysts may be noted in the vestibule but these are not a cause of infertility either. If freemartinism is suspected there will a shortened vaginal vault.

If cervical trauma is present then the index finger may be passed though several annular rings. These cows are most certainly predisposed to ascending uterine infection. I typically verify cervical incompetence by passing an ET catheter and then attempting to remove it with the cuff inflated.

Additional tests

It should be remembered that often no abnormalities will be detected even after a thorough examination of the entire reproductive tract. Small defects may exist that can only be found at necropsy, and often no defect is detected even then. If I am unable to explain the infertility after the clinical examination I will offer the client a therapeutic flush. Each horn is lavaged individually with 500 to 1000ml sterile saline (ie. sham ET flush). I routinely centrifuge the returning fluid for a cytoprep, and culture the sediment both aerobically and anaerobically. Some infertile cows will conceive and maintain pregnancy after uterine lavage. Endometrial biopsy has not been a useful procedure in my hands. It is difficult to obtain sufficient endometrial tissue unless a special biopsy instrument is available, and often the pathologists are not experienced at interpreting the histologic changes of the bovine endometrium. A common mistake is to interpret the findings as if the tissue were an equine endometrium.

Although there is some debate about the merits of the oviduct patency tests, I will perform these if the owner is interested in pursuing all options. I use the PSP (Phenolsulfonphthalein) dye test which is based on the fact that the dye is not absorbed across the intact endometrium, and if the oviducts are patent the dye will be passed out into the peritoneal cavity. Here it is readily absorbed into the systemic circulation and excreted through the kidneys, giving the alkaline urine a noticeable reddish-pink color. The bladder is catheterized, emptied and a urine sample stored as a control. The catheter is then plugged and left in place. One uterine horn is catheterized and the cuff inflated enough to seal the horn without rupturing the endometrium. The PSP solution is then infused into the horn and the catheter clamped. Urine samples are collected every 30 minutes and placed in a vial (10ml urine with 0.2ml of 10% trisodium orthophosphate buffer). In a normal, diestrus cow the dye will appear in the urine within 30 minutes. If there is occlusion the dye may not appear for at least 2 hours. The test can be repeated on the opposite oviduct the following day. I have not used the starch granule test. If time permits, an alternate approach is to flush the uterus for embryos 7 or 8 days after superovulation and AI. Each horn should be flushed separately. While recovery of embryos or ova confirms patency, failure does not constitute a diagnosis of a blocked oviduct.

Prognosis

The cow's fertility depends entirely on the severity of the abnormalities found. For example, the prognosis is poor for cows with extensive periovarian adhesions. The owner must decide whether to keep inseminating or to stop breeding and cull once milk production falls. Many repeat breeders can't be characterized and their reproductive problems can't be identified clinically or physiologically. We are often forced into a trial and error approach in endeavoring to achieve pregnancy.

In older cow's which have had several calves in the

past there is always the possibility of resorting to assisted reproductive technologies (follicular aspiration and IVF) or perhaps using the problem breeder as an embryo recipient. In valuable show heifers with no obvious anatomical defects I counsel against the use of reproductive technology as I firmly believe that we should not be perpetuating what may well be genetically related subfertility. If a congenital defect is detected then the decision is much more difficult as it is impossible to know whether the anomaly is genetically based. Certainly animals with uterine unicornis are able to conceive and carry a calf to term.

Suggested further reading

Drost M., Repeat Breeders In: *Cow Manual*, Journal of the Society for Theriogenology, Vol XIV pp 47-55. Society for Theriogenology, Hastings, Nebraska. 1987. Wolfe DF., Management of the Repeat Breeder Female, In: Howard JL(ed) *Current Veterinary Therapy 2 - Food Animal Practice*. pp785 - 790. WB Saunders Co, Philadelphia. 1986. Roberts SJ., *Veterinary Obstetrics and Genital Diseases*. 3rd ed., Woodstock, VT: published by the author, 1986. Farin PW and Estill CT., Infertility due to Abnormalities of the Ovaries in Cattle. Veterinary Clinics of North America: Food Animal Practice. 9:2:291 - 308 (1993). Youngquist RS and Braun WF., Abnormalities of the Tubular Genital Organs. Veterinary Clinics of North America: Food Animal Practice. 9:2: 309 -322 (1993).

Abstract

Conservative and surgical treatment of tibial fractures in cattle

A. Martens, M. Steenhaut, F. Gasthuys, C. De Cupere, A. De Moor, F. Verschooten
Veterinary Record (1998) **143**, 12-16

Ninety-five cattle with tibial fractures, all but one with a unilateral fracture, were examined between 1990 and 1994. The feasibility of repairing the fracture was assessed radiographically, also taking into account the bodyweight and value of the animal. Twenty-two cattle were slaughtered. Conservative treatment with stall confinement and/or a splint or cast was applied in 18 cases, with satisfactory results in eight of them (44 per cent). They were fattened to normal bodyweight, but they all had a severe deformity of the affected leg. In 55 animals, the fractures were fixed externally with Steinmann pins and methylmethacrylate bridges under image-intensified fluoroscopy. Ten of them could not bear weight on the affected leg and were slaughtered before the pins were removed. In the remaining 45 animals the pins were removed after a mean (sd) period of 71 (14) days. Four animals re-fractured the affected leg shortly after the pins were removed and six others were slaughtered prematurely because of inadequate weight bearing. The results were successful in 35 cases (64 per cent). Slight deviations of the affected leg and/or the contralateral leg were often observed. The overall survival rate of the cattle with tibial fractures was 45 per cent.