A Method to Visually Observe and Photograph the Bovine Genital Tract In Situ

R. G. Elmore, C. J. Bigschwal, R. S. Youngquist, D. J. Kesler and H. A. Garverick

Abstract

The ovaries and tubular genital tract were observed through a plexiglass speculum inserted through a standard laparotomy incision in either the right or left paralumbar fossa of eight cows, each repeatedly. The observations were accomplished with the cows in the usual standing position restrained only by a head catch. The cows' feed and water intake were not restricted prior to surgery and none of the cows exhibited any adverse clinical signs post-surgically. The described procedure is simple and inexpensive.

---

*Journal Series No. 7927, from the Missouri Agricultural Experiment Station, University of Missouri-Columbia, Approved by the Director.*

*Theriogenology Section, College of Veterinary Medicine.*

*Department of Dairy Husbandry, College of Agriculture.*
In the bovine, ovarian function is commonly assessed by observing external manifestations of increasing and decreasing reproductive hormones, for example, signs of estrus including standing to be mounted, mucous flow from the vagina, changes in behavior, roughened tail head, etc.; by rectal palpation of the ovaries and tubular genital tract to determine the presence of corpora lutea, follicles, uterine tone, etc.; and by measurement of ovarian hormones in the systemic circulation, urine, or milk. In the normally cycling and normally behaving animal any one or a combination of these methods can be used to deduce in which portion of the estrous cycle a particular cow is at a particular time.

In abnormally cycling cows, for example anestrus cows or nymphomaniac cows, the true state of the ovaries cannot always be ascertained by the three methods already listed. For example differentiation of luteal or follicular ovarian cysts by rectal palpation and even by hormone analysis may be difficult by the listed methods of assessment. Usually a period of time lapses between treatment of any ovarian pathology and any palpably detectable ovarian change. Visual observation of the ovaries and the internal genital tract is an additional means of assessing ovarian function and/or early responses after treatment for genital tract pathology.

Various techniques to visually assess ovarian function in vivo have been reported for sows (2,17,18), ewes (3,4,5,9), does (6,10), women (16), non-human primates (6), mares (20) and cows (1,7,11,12,14,15,19). The reported techniques involved the use of various speculums (9), endoscopes (2,3,4,5,11,12), and laparoscopes (3,4,5,6,16,17,18,19). Many of the procedures involved extensive surgery and indwelling chronic peritoneal fistulas. None of the reported procedures proved satisfactory for our work in observing treatment responses after the administration of various drugs for bovine ovarian cysts. Therefore, we have designed and used a speculum that can be utilized satisfactorily to directly observe bovine ovaries in vivo repeatedly with a minimum of expense and effort.

Materials and Methods

A plexiglass speculum 63.5 cm. in length, 7.5 cm.
inside diameter, and with a wall thickness of .75 cm. was constructed (figure 1). The speculum was built to accommodate a Medical-Nikkor-Auto 200 mm f/5.6 lens attached to a 35 mm single lens reflex Nikkormat camera body. Built into the lens assembly was a ring flash to allow photography and a low intensity pilot light which allowed location of the ovaries and focusing of the camera. With the particular group of auxiliary lens utilized a one to three reproduction ratio was produced.

The ovaries and tubular genital tract were viewed through a standard paralumbar laparotomy incision just long enough to accommodate the diameter of the speculum either on the right or left side of the animal in the standing position (figure 2). By careful manipulation of the speculum either the right or left ovary or any portion of the tubular genital tract could be isolated and viewed through the speculum (figure 3). No other internal manipulation other than directing the speculum was necessary. Right or left paralumbar laparotomy incisions were equally satisfactory for viewing the whole internal genital tract. Anesthesia was accomplished by a paravertebral block of spinal nerves T-13, L-1, L-2 and L-3, with 2 percent lidocaine or by local infiltration of the incision site with lidocaine. The cows were restrained only by a head catch in the normal standing position. The same incision site was utilized when repeated viewing was desired during a short period of time, for example 5 to 7 days. Whenever the time lapse was greater than 5 to 7 days a new incision site was selected usually just anterior or posterior to the first incision or in the opposite paralumbar fossa. To overcome the problem of fogging of the camera lens due to condensation, the camera and speculum were warmed to approximately body temperature by placing the apparatus in front of a warm air hair dryer a few minutes before the observation period.

Results

The genital tracts of 8 cows, 3 Holsteins and 5 Guernseys, were examined by the described procedure. The genital tracts of 6 of the cows, 3 Holsteins and 3 Guernseys, were examined on day 1, day 3, and day 11 of the experiment. Therefore the tracts of these cows were observed in situ 3 times each. The genital tracts of 2 of the cows were observed on day 1, day 3, and day 11 of each of 2 experiments. Therefore the tracts of these 2 cows were observed in situ 6 times each.
The entire genital tract of each of the cows was examined and photographed at each examination. No manipulation of the ovaries or tubular tract was necessary other than that involved in placing the speculum. Placement of the speculum was accomplished entirely by external manipulation. There were no indications that our procedures caused alterations of any of the cows' estrous cycles or hormone balances. No adverse effects to the animals were noted during or after the procedures.

Discussion

The procedure described in this paper for observing the bovine genital tract in situ has many advantages the previously reported procedures do not have. Direct visual observation of the internal genital tract is impossible without some form of surgery. Even those procedures involving the use of a laparoscope or endoscope involve either a small incision or a trocarization of the abdominal wall or vaginal wall to insert the instruments into the peritoneal cavity. With the trocarization method rupture of the rumen, kidneys, urinary bladder, and cecum have been reported (3,4,15). These accidents did not cause long lasting problems but did necessitate the use of antibiotics and temporarily interrupted the experiments. Another problem encountered in the trocarization procedure is getting the trocar through the peritoneum. In occasional animals the peritoneum is not closely adhered to the body wall and tends to be pushed away from the trocar as it is inserted. Trocarization type incisions are often left unsutured or sutured only partially. This practice may predispose the cows to peritonitis.

Placement of the laparoscope or endoscope has proven to be difficult in our studies. It is difficult to guide the flexible laparoscope carefully past the greater omentum on either side of the cow. This problem has been minimized by elevating the rear quarters of the cow and insufflating the abdominal cavity with carbon dioxide or other gases. Many of the procedures describing the use of a laparoscope or endoscope involve restricting water and feed intake for 24 to 48 hours prior to the observation period to empty the rumen. This of course may affect the cow's production and subsequently cause alterations of the cow's endocrine balance.
Procedures in which the genital tract was exteriorized either through a cannula in the paralumbar foss or through incisions in the anterior vagina have been described (1,2,14). These involve extensive manipulation of the ovaries and have apparently in some instances resulted in altered ovarian function (2). It has been recognized for many years that manual manipulation of the tubular genital tract of the cow often causes milk let-down in the mammary gland. Apparently manipulation of the tract can alter endocrine levels. It has been demonstrated that if the uterus is vigorously manipulated, prostaglandin $F_{2\alpha}$ is released from the myometrium (13). Apparently injury to the broad ligaments of the uterus might cause disturbances of luteolysis (15). There was no evidence that our procedure caused altered endocrine function.

The procedure described in this paper does not have the disadvantages of the previously described techniques. The speculum described in this paper can be utilized satisfactorily to directly observe bovine ovaries in vivo repeatedly with a minimum of expense and effort.
References


Figure 1: The plexiglass speculum with photographic equipment attached.
Figure 3: Photographing the genital tract through the speculum