TECHNIC FOR OBTAINING SPERMATOZOA FOR PHYSIOLOGICAL DAIRY STUDIES AND ARTIFICIAL INSEMINATION

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INTRODUCTION

Semen may be collected from the vagina of the recently bred cow with the hand, by aspiration, or with a sponge. Semen from the vagina is satisfactory for determining whether the bull has ejaculated normal active spermatozoa during the mating, but it is unsatisfactory for use in physiological studies of spermatozoa because it is mixed with the secretions of the cow. Furthermore, collecting semen from the vagina for artificial breeding is wasteful.

A method of obtaining semen from the bull by massage of the accessory genital organs has been developed in the Bureau of Dairy Industry's physiological laboratory at Beltsville, Md. It has not been determined, however, what effect the continuous practice of obtaining semen in this way would have on the health and usefulness of the bull.

REVIEW OF THE LITERATURE

Komarov and Nagaev designed a special rubber bag which they placed in the vagina of the cow. By careful technic in conducting the mating they were successful in obtaining a superior quality of semen as compared to that collected directly from the vagina with a sponge. Later, according to a report by Walton, these workers used an artificial vagina and a "dummy" animal, which they claimed worked satisfactorily.

Case in 1925 reported that "we procure the semen either by pressing on the seminal vesicles through the rectum, or from the vagina of the recently bred cow." In a letter to the authors in November 1932 Case described his method of massaging the seminal vesicles to obtain semen and also stated that he had used the method successfully 10 years ago in collecting semen for artificial impregnation.

ANATOMY OF THE BULL'S ACCESSORY GENITAL ORGANS

At Beltsville it was found that the seminal vesicles of the bull do not contain spermatozoa, but that the spermatozoa are in the ampullae of the ductus deferens.

The seminal vesicles and ampullae are easily identified and are so located that it is possible to manipulate the one without disturbing the other. It is more difficult to locate and manipulate the prostate of the bull because it consists of two parts and is protected by heavy muscle. The body of the prostate consists of a band which stretches across the neck of the urinary bladder and the origin of the urethra.

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FIGURE 1.—Pelvic urethra and urinary bladder slit ventrally and laid open: a, Openings of ductus deferens; b, openings of seminal vesicles; c, uretral orifices.
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It is about an inch and a half transversely and about half an inch in width and thickness. The pars disseminata surrounds the pelvic part of the urethra and is concealed by the urethral muscle (figs. 2 and 3).

As shown in figure 1 the ducts from the seminal vesicles and ductus deferens do not enter the urethra in a common opening; the ampullae of the ductus deferens have large lumen and the seminal vesicles have small tubules. The relation of these organs to each other is shown in figure 2.

METHOD AND RESULTS OF ITS USE

With a hand in the bull's rectum, from 7 to 10 inches, the seminal vesicles were massaged with backward strokes, and a turbid fluid flowed from the prepuce. It contained only epithelial cells in the majority of cases. In like manner the ampullae of the ductus deferens were massaged and a turbid fluid flowed out which contained only spermatozoa in the majority of cases. In some instances the ampullae were massaged first, but better results were obtained when the seminal vesicles were massaged first, because, while the ampullae were being massaged, the seminal vesicles released some of their fluid and both spermatozoa and epithelial cells were obtained. When the seminal vesicles were massaged first the epithelial cells came out, leaving only spermatozoa in the fluid obtained from the ampullae. Usually about 2 minutes of massaging gave excellent results.

In figure 3 the genital organs are shown replaced in the right half of a bull carcass. The weight of the urinary bladder has pulled the genital organs forward about an inch from the normal position in the live bull. The hand is shown massaging the seminal vesicles in figure 3, A, and the ampullae in figure 3, B.

Figure 4 shows the method of collecting the fluids as they flow out and figure 5 the comparative density of the fluids from the seminal vesicles and from the ampullae. Microscopical views of cells found in the two fluids are shown in figure 6.

Eighteen bulls ranging from 2 1/2 to 12 years in age were used in the first 100 trials to obtain semen by massage. Epithelial cells or debris were found in 100 samples of fluid from the seminal vesicles; and in 6 of these spermatozoa were found, always from bulls that had not been used for long periods. In these six cases it is probable that the ampullae were disturbed while the seminal vesicles were being massaged.

Of the 100 trials in massaging the ampullae 81 were successful and spermatozoa were obtained from 15 bulls. Thirty-one trials were made on one bull and each time enormous quantities of spermatozoa were obtained. No spermatozoa were obtained from the ampullae of three bulls. Two of these were tried only once and the other one twice. They were disposed of before further trials were made. Failure to obtain spermatozoa was experienced in 19 trials. It was assumed that the ampullae had been emptied just previous to the time of massaging. This was indicated by the volume and tone of the ampullae, the small flaccid tube yielding no spermatozoa and the large firm tube yielding many spermatozoa.

The quantity of fluid collected from the seminal vesicles at one time varied from 0.5 to 21 cc and that from the ampullae varied from 0.5 to 23 cc.

CONCLUSIONS

Massaging the accessory genital organs of the bull is a practical way of obtaining semen for physiological studies. For artificial breed-
Figure 2.—Dorsal view of the internal organs of a bull: a, Bladder; b, ureter; c, seminal vesicles; d, ampullae; e, body of prostate; f, pelvic urethra; g, bulbo-urethral (Cowper's) glands.
FIGURE 3.—Position of the genital organs of the bull and method of manipulating them: A, Massaging the seminal vesicles; B, massaging the ampullae of the ductus deferens. The organs are: a, Seminal vesicles; b, ampullae; c, body of prostate; d, pelvic urethra; e, bulbo-urethral (Cowper’s) glands; f, urinary bladder; g, pubis.
Figure 4.—Method of collecting semen with funnel and test tube.

Figure 5.—Material collected from (A) seminal vesicles and (B) ampullae.
ing purposes it is desirable to massage the ampullae, for from this organ will be obtained the greatest volume of semen containing active spermatozoa. The method is also useful with valuable breeding bulls that are unable to serve cows in the normal manner because of injury. Other advantages of collecting semen directly from the bull for use in artificial breeding are that it prevents waste of semen and produces semen free from extraneous matter.