# THE STERILITY OF COWS

ALBRECHTSEN

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# The STERILITY OF COWS

## *Its Causes and Treatment*

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# *Preface of the Author.*

In Denmark, as elsewhere, losses caused by the sterility of cows are the object of persistent complaints among stock-raisers. In my country especially, where the raising of milk cattle is one of the chief economical resources, this pathological condition is of prime importance.

Working as a practitioner with many cases of sterile cows, I was successful in working out a technique, which enables me to eliminate those losses to a considerable extent, even to make them insignificant.

This treatise contains my experience in the treatment of the sterility of cattle; it does not claim to be an exhaustive scientific elaboration on the subject, but intends only to incite others to further studies in this field, by making them acquainted with my observations and successes.

I would be glad indeed if the publication of this small volume should achieve this end.

Aakirkeby, Bornholm, Denmark.

J. ALBRECHTSEN, V. S.

# *Preface of the Translator.*

The ravages of the infectious abortion disease in the United States are well enough known to every man connected with the agricultural industry. This English edition of Albrechtsen's little book on the sterility of cattle is being undertaken in appreciation of the fact that the chief losses from infectious abortion are losses through the resulting sterility.

Albrechtsen, whose work has been widely recognized in Europe, is able to demonstrate the curability of the general sterility case; and, with the elimination of this phase of the trouble, the damages done by infectious abortion would be trifling compared with what they are now.

The translator believes, therefore, that he is rendering a service to the practitioner as well as to the stockraiser; and hopes that sterility cases will be approached with the same basical knowledge and confidence as any other well treated ailment.

He would especially like to point out the difference between Albrechtsen's conception of the real cause of sterility on the one hand, and the conception of Hess on the other. Albrechtsen defends his point of view very well, and I have little doubt that the experienced practitioner will find his own observations bearing out the former.

Washington, D. C., July, 1917.

DR. H. WEHRBEIN.

THE intense interest of veterinarians and farmers alike in the sterility question is the best indication of its importance. As a matter of fact, numerous cases of sterility in a herd not only diminish the milk production to a considerable extent, but render the whole business a questionable one from the standpoint of profit.

One has to take into consideration the increasing values invested in milk cows to understand the strenuous interest and effort with which the farmer tries to achieve a condition of regular pregnancy among his milkcows, as the only means to produce a large enough amount of milk, to make his investment profitable.

If cows do not become pregnant in due time, being persistently sterile, or conceiving only after a lapse of time, the milk production will be, sooner or later, lower than the standard. Generally the milk revenue will be also less if pregnant cows do not carry out their calves, that is, if they abort.

Anamnestic complaints from the farmers about sterility therefore have to be considered with the understanding that there is:

1. **Actual sterility**, where reproduction is impossible.

2. **Temporary sterility**, where an irregular length of time elapses between the periods of pregnancy.

3. **Abortion** in different stages of pregnancy.

Absolute sterility in cows is not so common as is generally supposed, most likely not occurring more frequently than among our other domestic animals.

Many animals which are being disposed of would certainly become pregnant if kept longer and treated properly. As it is now, these cows are sold as soon as their daily amount of milk has sunk to a certain minimum; if they are very valuable breeding animals they are kept longer, and then generally become pregnant again.

**Temporary sterility** is the form of sterility most frequently met with here. Abortion ranks next, and in many stables is the real cause of the irregularities.

The question arises of what is the significance of sterility in its different forms, and to what extent are the persistent complaints of the farmer justified.

I mentioned before that irregular periods of pregnancy cause a decrease in the milk production, but many other causes are cooperative in causing the decrease. Comparisons of different cases indicate that the loss can vary between fifty to several hundred crowns per cow and per year, when herds of equal size with an equal number of abnormal cows are compared.

It is a fact that the loss in milk production is the larger the more cases of abortion happen in the time of the year when the best and most abundant food is to be had which in Denmark is in the fall and winter. Furthermore a good milk cow is more steady in her productiveness than a poor one, who soon deteriorates after her last parturition.

There are reports from a few herds which are quite conclusive on this subject.

In the herdbook of Fuehnen and in the herdbooks of the red Danish cattle are many notes which prove that the temporary sterility of a cow is generally accompanied with a decrease in the milk production. This decrease often amounts to a half or more of the produce in normal years.

The following excerpt from the Fuehnen herdbook illustrates the relations very well; the cows 1, 4, 5, 11, 12, 15, 35, and 45 gave 183, 139, 158, 184, 126, 115, 109 and 187 lbs. of butter less in the year when they were sterile than in the preceding normal year.

The higher milk production which generally sets in in the year following the temporary sterility is not sufficient to compensate the loss. For example the cow "Thyra" of Bellinge gave in her sterile years only 144 lbs. of butter, while giving in the two preceding years 320 and 370 lbs., and in the two following normal years 442 and 409 lbs. Granted that this may be an extreme example, there are still the many corroborating reports of the farmers, that they are experiencing a loss of 2000 lbs. of butter or more, in the yearly production due to temporary sterility. Of course single or few cases are of no signifiance, especially not in the big herds; but if many herds and many cows in each herd are affected, it is a serious matter.

Another result of sterility is the difficulty of procuring the necessary offspring; a selection of the best calves for breeding purposes is then, of course, out of question, since one has to breed every heifer calf. Therefore in herds with a high breeding standard, sterile animals, even if only temporarily sterile, are a serious handicap.

The number of sterile animals in our country can be rather accurately ascertained through the books of the Breeders' Societies. It is shown there that about 11% of the registered cows have either aborted or been sterile during the year. That number is nearly constant from year to year, a good indication of its correctness.

Eleven per cent does not appear to be such a high percentage, but one has to bear in mind that many of the herds included in the records were entirely free from either abortion or sterility.

Table No. 1.

| | Number of Registered Cows.. | Number of Abortions ..... | Number of Sterile Cows ..... (Temporarily) .. | Total..... | Percentage..... |
|---|---|---|---|---|---|
| Fuehnen and Langeland 1903-1904 | 23817 | 1292 | 1309 | 2601 | 10.9 |
| Fuehnen and Langeland 1904-1905. | 30680 | 1963 | 1549 | 3512 | 11.7 |
| Fuehnen and Langeland 1905-1906 | 33903 | 1934 | 1667 | 3601 | 10.6 |
| Seeland 1904-1905 ..... | 24000 | 1508 | 1284 | 2792 | 11.2 |
| Lalland Falster 1906 ..... | 13611 | — | — | 1434 | 10.0 |

Of the 2390 herds or stables in Fuehnen and Langeland 1301 were entirely free from these two troubles in the year 1905-1906; so the 3601 animals which were either sterile or had aborted belong to only 1089 farms or herds. There is still another point to consider; the very big herds where the state of affairs is much worse than in the medium sized or in the small herds, are not included in these records.

I admit that the percentage does not appear to be very bad, but if one actually works with these herds, and has a chance to examine many of the animals for irregularities in their sexual life, the proposition is a much more serious one. I do not have in mind those herds where most of the cows have aborted through infectious abortion, but I refer chiefly to those characterized by many cases of temporary sterility. It is nothing uncommon to find on may farms 20%, 30-50%, even 100% of the cows to be temporarily sterile. In the big herds, only exceptionally less than 10-20% are found.

**Causes.** Among laymen a number of reasons more or less popular, are held responsible for sterility in general.

There is, for example, the opinion that our modern dairy-cattle are overbred, and therefore less resistant towards certain noxious influences.

Very generally the bull was first held to be responsible and only after changing him several times attention was paid to the cows and an explanation sought there.

In the veterinary literature a number of probable causes were discussed and as many treatments proposed. The most complete work was done in Switzerland.

Zschokke (Zurich), who worked extensively on the question, gives a number of reasons for the sterility of cattle. He does not, however, specify the importance of the different causes.

I think it advantageous to discuss Zschokke's work in detail as he not only had a large amount of clinical material at his disposal, but also bases his conclusions on many diligent histological examinations.

Zschokke claims that sterility is in general an ailment of the cow, in a less degree of the bull. In the latter the following conditions are observed: 1. **Difficulties** in executing the mating act, due to obesity, pathological conditions of the penis, the legs or the feet; 2. **Disinclination to mate,** on account of malnutrition, lack of exercise, exhaustion by too frequent cohabitations and several other pathological conditions; 3 **Impossibility** to mate on account of the painful condition of the preputium or of the penis, paralysis of the penis, fracture of the penis or a rupture in the cavernous parts of it; 4. **Complete impotence** through pathological changes in the sexual glands.

Sometimes no lesions can be found in the sexual glands, even if a careful postmortem is made, which would explain the permanent or periodic impotence; in such cases a lessened motility of the spermatozooa is supposed. This form of impotence is specially often found in inbred animals and there again most frequently in pigs. In the most cases of complete impotence it is possible to demonstrate lesions in the sexual glands; there are innate and acquired lesions, the latter much more prevalent. The acquired lesions are of either traumatic or infectious origin.

So far as the sterility of cows is concerned, Zschokke discusses numerous conditions which generally disturb the regular estrum, or prevent pregnancy altogether.

The heat can be intermittent or entirely absent, it can be too weak or too irregular, or else it can be persistent.

The irregular or totally absent estrum has either causes of a more general nature, or is caused by lesions of the ovaries. The missing heat period can be caused through age. It is, however, known that a cow in England produced her twentyfifth calf in her twentyninth year. Other causes are the **passing** of the first **few heatperiods, obesity** and **phlegmatic temper.** Several fat cows were examined but no pathological changes of the ovaries could be found; however a too narrow cervix and an abundant amount of mucous discharge were noted. Zschokke concludes that in these cases the heat had been very mild and had passed by without being noticed. As a last general cause he mentioned **malnutrition,** due to a quantitative or qualitative misproportion in the feed.

As ailments of the ovaries he names: (a) **Fibrous tumors** on the surface of the ovaries. He found such in 8% of 300 examined ovaries, and most frequently in older cows, (b) **Congenital deformities,** where the ovaries are either entirely lacking or not enough developed. This was quite frequent in twins, where normal ovaries were found in only 70% of the heifer calves, (c) **Chronic oophoritis,** generally caused by tuberculosis, (d) **Sklerosis of the ovaries,** (e) **different tumors,** and (f) **corpus luteum persistens.** The yellow bodies do not atrophy if there is an abnormal content in the uterus. This may be a dead fetus, a retained placenta or a pathological discharge of the uterus. Sometimes, however, the yellow bodies are found without a corresponding abnormality in the uterus and then the feeding with malt, rye, corn or slop from sugar beets may be responsible.

Very mild heat symptoms may be an individual characteristic or may be caused by the feeding, by a continuous

confinement in the stable, or by a certain number of pathological conditions.

The irregular and too frequent heat which is typical of nymhomaniac cows has always an abnormality of the ovaries as its cause. Zschokke never found any other lesion of the genital apparatus causative for it. The postmortem findings in nymphomania are cysts of the ovaries. They can originate in the follicles, in the yellow bodies and in hemorrhages. The two latter forms, however, occur but seldom.

The first form can be solitary or multiple, generally is solitary however. Other pathological conditions of the ovaries are produced by edemas, atrophy and tuberculosis. One hundred and ten cows which had nymphomania during life showed the following postmortem lesions:

Large cysts in one or in both of the ovaries....74%
Multiple cysts ..... 8%
Central cysts with thick walls..... ..... .. 6%
Tuberculosis ..... 2%

In the rest atrophy, yellow bodies or carcinoma were found.

Is is very common that animals who have regular heat periods and who are regularly mated remain sterile. The following causes may be present: (1) Mechanical obstacles, as unrest of the cows during the mating act, a too deep situation of the vagina, abnormalities of the vagina, which can be too narrow or obstructed through tumors, scars, cysts or mucous matter, pressing after the cohabitation, and similar conditions. (2) A too early coitus in the heat period, when the cervix is not yet open. (3) Occlusion of the cervix by spasms or other pathological conditions. (4) A diseased uterus, since a conception is impossible if its mucosa is inflammed and covered with discharge.

He mentiones briefly **contagious abortion,** which apparently is not of much importance in Switzerland; finally he names follicular and vesicular vaginitis.

It can readily be seen that sterility comprehends a number of pathological conditions which can be of a more localised or of a more general nature. **Zschokke** does not emphasize what he thinks important and what of less significance, paying, however, most attention to the ovaries. Neither does he give any data on the treatment of his cases, or rather on the results of his treatments. In Denmark, not much in this line has been done, with the exception of the study of contagious abortion. This disease has, however, much significance for us, as it is very often the only cause of the sexual disturbances. We all agree, of course, that the greatest percentage of abortions in advanced pregnancy are caused by the abortus bacillus of **Bang** and **Stribolt.**

Aside from contagious abortion we have treated only a few of the conditions connected with sterility. They are especially: the stenosis of the cervical canal, causing continuous nonconception, the cystous degeneration of the ovaries in nymphomania, and finally the very frequent persisting yellow bodies. In a few cases we have treated too the follicular vaginitis. Most of the writers have restricted themselves to the study of these conditions.

**K. Nielsen** (Sorring) was the first to mention the corpus luteum persistens as a significant condition in the sterility of cows. He abandoned the old methods of cervix dilatation and uterus irrigation and treated the ovaries by pressing out the yellow bodies. He claimed this treatment to be successful in most cases of sterility.

**Martin Poulsen** (Ringsted) accepted the method, and states that pathological conditions of the ovaries are the most common cause of sterility in cattle. He has an experience of years, and has made systematic examinations of pregnant cows.

He pays much attention to the persistent corpus luteum and claims that nearly all cases of sterility are caused by it. It is as common in big herds as in small stables, and can be found occassionally in 70% of a herd, this being the highest

percentage observed. It is closely connected with infectious abortion, retentio secundinarum, metritis, but can be found also without these foregoing complications. Through his very numerous examinations of sterility cases in different environments he comes to the conclusion that the corpus luteum persistens is the most important and the most common cause of sterility in cows.

**E. Hess** gives a detailed report of his investigations in this line. He too contends that the most frequent cause of sterility in cattle are diseases of the ovaries. He pays more attention however to the cystic degeneration of the ovaries than to the yellow bodies. Apparently nymphomania is an ailment of much importance in his part of the country, for he gives all the symptoms, one of which is sterility, of course, and advises as a therapeutic measure the rupture of the cysts through the vagina. If heat is absent, he also finds quite often cystic degeneration (in which case the cysts are, however, of a more flaccid constitution), and frequently the persistent yellow body. It is remarkable that he treats pyometra also with the removal of the yellow body; he claims that this operation and the gentle massaging of the uterus are much more efficient therapeutic measures than the irrigation of the uterus.

**W. L. Williams** in his book: Veterinary Obstetrics, gives much space to the discussion of sterility in domesticated animals. He reconsiders the work of Hess, adds some of his own observations, and gives with many references a very complete review of the whole question.

We see that there is an inclination to connect sterility in cows primarily with pathological conditions of the ovary. Such a point of view can not be criticised if the consequent methods of treatment give practical results. It is not so important here that there are ostensibly other causes which may cause sterility, since we must strive to satisfy our clients with successful treatments, and not with the most plausible explanations.

Now, we acknowledge that the treatment of the ovarial conditions has been quite often a successful one in regard to the sterility of the animals, but there is also a number of reports where it was of very little or no use.

This is not to be wondered at; for just as the dilatation of the cervix, is quite often a very successful operation, without being a cure for all sterility cases, so the ovarial treatment has had many successes; but there are also cases with no improvement.

If one stops to consider the conditions which are prevalent, especially in the big stables, then one must come to the conclusion that the ovary treatment is too one-sided to be efficient. There are too many primary lesions to permit the treatment of the secondary lesions to be sufficient.

It is further very unlikely that such a percentage of animals should suffer from ovarial diseases as **Poulsen** reports. Neither women nor the domesticated animals are so afflicted nor is the ovary considered there to be the chief source of sterility troubles. Another fact to be considered is the frequency of metritis in cows, undoubtedly a cause of sterility. It is well known that cows which have suffered from septic metritis, retentio secundinarum, torsio uteri etc., very often become sterile. This is, of course, the result of a chronic metritis. Cows which have a metritis from the cause mentioned, are apparently quite common; if one adds the cows which have had infectious abortion, one will have a good percentage of animals, whose sterile condition can be explained quite easily. I have found that the permanent or temporary sterility of cows which have aborted depends very largely on the degree and the chronicity of the metritis generally connected with the abortus. The metritis again is much influenced by the retention or removal of the placenta, and by the treatment of the cow. I never paid any attention to the yellow body in cows which had aborted; I treated the metritis at once and never had any trouble. This method I

find superior to the treatment of the secondary lesion, the yellow body.

In old cases without a history of abnormal birth one generally can find pronounced lesions on the cervix or in the vagina, which easily explain the sterility, without the rather forced supposition of an ovarial lesion.

I admit that often pathological conditions of the ovaries are found in the rather rare cases where the cows have not been under treatment and without estrum, or failed to conceive for a long time. In these chronic cases yellow bodies or cystic ovaries develop. If one treats big herds where all the animals are under constant observation and regularly examined, the ovarial lesions quite disappear, and the inflammatory processes of the uterus and the cervix prevail.

In a meeting of veterinarians, February 1906, I explained why I paid more attention to the examination of the sexual organs in sterile cows, and stated that lesions of the metra are relatively frequent. In the following weeks of February and March I found in 1000 cases 331 cows with a metritis.

Since then I have worked in the same line and improved my technique. I am no longer satisfied with a rectal examination, but always draw the cervix into the vulva for an easier inspection of its mucosa, and, eventually, of the uterus.

Between February 1906 and February 1908 I examined together with my assistant **Nissen Petersen** four thousand cases. Most of the animals belonged to regularly inspected herds. In the vast majority of these cows I found a catarrhal affection of the uterus, generally connected with an enlargement of this organ and a pathologic excretion. In nearly all cases the cervix was affected, and in many cases preeminently so. Only a few had a discharge from the vagina, and then, as a rule, a pyometra was present. A few times the oviducts and their ligaments were found to be affected; often the vagina was the seat of various pathological processes. The ovaries, aside from the presence of yellow bodies, and if affected at all, showed most frequently cystous degeneration.

It is a matter of daily observation that metritis causes sterility, and the authors who have treated the question admit it, of course, as one of the causes; but they do not pay as much attention to it as to the diseases of the ovaries, considering, as a matter of fact, only the very distinct cases with much discharge and large accumulation of exudate, and overlooking the more chronic and less impressive conditions.

**Zschokke** notes as obvious that a fecundation is impossible if the uterus mucosa is infected and covered with purulent discharge; the estrum too is generally absent under a catarrhal condition of the metra. It is possible that even very slight and otherwise quite insignificant infections produce sterility by an acid or toxic exudate, which renders the spermatozoa immobile. There is further the possibility that sometimes the uterus mucosa is destroyed through a protracted inflammatory process; it is known that cows which have suffered for a long time from a metritis do not conceive again even if they recover and have estrum periods again.

**Wapt** has found that 40% of all cows with a cured metritis remain sterile and **Fiorentini** made the diagnosis of catarrhal **metritis seventeen** times in fifty cases of sterility. **Zschokke** several times found calcification of the cotyledones, atrophy and sklerosis of the uterus mucosa, all of which is generally the result of a chronic metritis. **Martin Poulsen** states that diseases of the uterus are not infrequently the cause of sterility, but he does not pay much attention to them and thinks the secondary lesions of the ovaries to be the by far most important cause.

**K. Nielsen** (Sorring) considers the granular venereal disease as the predominant cause of sterility in cattle, and employs a corresponding treatment.

The contentions of Poulsen and of Nielsen are based on clinical observations and not on histological examinations, as it is very difficult for the practitioner to work in that line. It is also difficult for the practitioner to procure the material

for these investigations, and nearly all histological research made on the genital organs of cows have had another object. **Tuff** was the first to make histological sections on a big scale, to clear up the cause of sterility in cattle.

He examined the genital organs of ninety-seven sterile cows and found sixty-four times pathological conditions in the vagina, in the os uteri, in the uterus proper, in the oviducts or in the ovaries. The uterus lesions were the most frequent, being found in fifty-eight cases, mostly catarrhs, and quite often of little intensity. In one case, tuberculosis of the uterus was noted. In the vagina he found cysts of the Gärtner ducts, follicular vaginitis and scar formations. Six times the oviducts were the seat of inflammatory processes, four times in connection with a catarrhal metritis. Yellow bodies were found in sixty-eight cases, thirty times connected with cyst formation; in fourteen cases only cysts were found.

The lesions of the uterus are of different nature, according to their location and intensity if only the mucosa is affected, the lesion is called an endometritis; if it is more penetrating, a metritis, and if involving the serosa, a peri- or parametritis.

The most frequent form to come up for treatment in sterility cases, is the chronic endometritis and the pyometra.

**Tuff** found that an **interstitial endometritis** can exist with or without defects of the uterine glands, which may be present in smaller or larger numbers. If the first condition is present, the uterus will be of normal size, the mucosa of normal appearance or slightly injected, covered with much mucous matter, the uterine glands normal, the connective tissue increased, poor in cells and disposed in strong fibrous strands, the walls of the blood vessels thickened.

Those lesions were found seventeen times. In the cases of interstitial metritis where the number of the uterine glands are diminished, which were found twenty-four times, the lesions are more distinct; the horns of the uterus are

assymetric, the mucosa very hyperemic and covered with an abundant often bloody, exudate, which often also contains pus flakes. The number of the uterine glands is decreased, and they are found singly or in bundles, separated through strong fibrous bands which transverse the mucosa in all directions. The glands proper are dilated, corkscrew shaped and have a ragged margin. The tissue between the glands is infiltrated with roundcells, which very often are so dense that they resemble an abcess. Endometritis without histological lesions was found nine times, in five cases of which the uterus was enlarged, asymmetrical, its mucosa hyperemic and containing much mucous matter and pus flakes. The other four uteri were not asymmetrical, but contained exudate and were hyperemic. In purulent endometritis with large accumulations of exudate, different changes in the mucosa are found by **Kitt.** In recent cases the mucosa is injected and infiltrated with roundcells, the surface epithelium and the epithelium of the uterine glands is largely necrotic. In other cases the mucosa shows a dirty grayish discoloration from old hemorrhages and, together with the whole uterus wall, becomes atrophic through the expansion of the uterus. Sometimes the walls are not much thicker than paper. In still other cases a thickening of the mucosa is found, together with necrosis. These thickened walls are of a grayish red or of a grayish white color. A few times cysts in the walls of the uterus were observed.

The real chronic metritis does not seem to be very frequent. **Tuff** found it only four times among his sixty-four cases with lesions of the uterus, and **Kitt** says that a metritis which becomes chronic generally becomes catarrhal.

In the four cases mentioned by **Tuff** the uterus was twice considerably enlarged and filled with a yellow, thick pus. In this pus streptococci were found in pure culture. In the two other cases the uterus was thicker but not longer than normal; the uterine walls were thick and hard, forming a narrow tube and containing a yellow pus. The mucosa was much

thickened, and its surface layers partly obliterated with bands of connective tissue.

**Tuff** demonstrates with his histological sections that diseases of the uterus are quite frequent, and that most of these affections are catarrhs. Only three cases of cervical trouble were found. These findings confirm the opinion of **Kitt** who says that the diphtheric, croupous, ulcerating, hemorrhagical and phlegmonous metritis is generally of an acute character, while the chronic cases are more catarrhal or purulent. It is certain that many of these chronic cases are slight inflammatory processes, which do not produce any permanent change in the attacked mucosa. Many of them show only hyperemia and swelling of the mucosa, and hypersecretion of sometimes quite normal exudate. Such conditions are hard to recognize in a postmortem examination, but are nevertheless capable of producing sterility if they are prevalent in the time of the estrum.

If the veterinarian examines carefully the genital organs of sterile cows per vaginam, per rectum and by drawing back the cervix, he will in most of the cases find a pathologic condition of the uterus.

Before entering in the description of these lesions I think it opportune to give some diagnostic hints about the normal and the diseased, the pregnant and the sterile uterus. Intimate knowledge of these conditions is absolutely necessary, as the treatment depends entirely on the ability to make the proper diagnosis. It is specially important to differentiate between an early stage of pregnancy and certain pathologic conditions of the uterus.

The normal nonpregnant uterus is of different size, according to the animals age; it is relatively longer and thinner in young animals than in old ones which have had several calves, but much variation is found.

**Zschokke** states that the normal body of the uterus in a nonpregnant stage is 2,5 cm. long and the horns up to 25 cm., with a thickeness of ¾ cm. The cervix is on the average

6/8 cm. long, but can reach a length of 17 cm. The horns are symmetrical and quite substantial, though soft and fleshy, and smooth to the touch. The dimensions of the normal uterus are rather variable, and it is impossible to determine clinically the dividing line between the still normal and the incipiently pathological uterus. The uterus with a chronic metritis is as a rule symmetrical and a little enlarged, its walls are thickened, and contract so that one can feel the horns as hard thick cords, which never is the case in a pregnant uterus. During the estrum the uterus can be enlarged in all its dimensions; the walls become hardened, and one can feel contractions. This conditions can be easily recognized through the other symptoms of the estrum and from the clear mucous exudate present. It is, however, possible that cows with even marked lesions of the uterus and with purulent discharge show the regular heat symptoms; in such cases the uterus is even more enlarged than outside of the estrum and the discharge is even more abundant.

A pregnancy can be recognized from the size of the uterus, the nature of its walls, its fluctuation and the appearance of the cervix.

In the first five or six weeks, however, the diagnosis can not be made absolutely; after that time it is quite possible.

In the first month of pregnancy the uterus does not change enough to permit the condition to be recognized by a rectal palpation. If normal conditions are found, however, there is a more or less well founded probability of pregnancy. The most valuable symptom at this time is the appearance of the cervix; it speaks for pregnancy if it is tightly closed and without any secretion; but if it is swollen, hyperemic, covered with discharge and showing an irregular canal, pregnancy can be in nearly all cases excluded.

In the second month the changes of pregnancy are so pronounced that a diagnosis can be made on their strength. The pregnant horn begins to be bigger than the other one in the fifth or sixth week. The walls become soft and rather

thin and in one place fluctuation can be made out. In the latter part of the second month these symptoms are so prominent that the pregnancy can be rather safely recognized per rectum, if a normal uterus is present; this is not always the case, as there are many deviations, from the normal just at this time.

There are also, of course, the fluctuations in the size of the organ, so that two uteri in the same stage of pregnancy are not always of the same size. As I mentioned before, an asymmetrical uterus can be found also in cases of metritis; neither is the thickness of the uterus walls a reliable sign, as there may be pregnancy in a uterus with rather thick walls. The best symptom is the fluctuation, which is, however, sometimes difficult to feel before the eighth week, especially when the horns are long, curved and thickwalled. It is apparent that the fluctuation depends very much from the size of the horn and from the thickness of its walls, and it is therefore necessary to palpitate its whole length. If one is unable to make sure, it is advisable to put a sharp hook in the cervix and to draw it into the vulva. In this manner the horn is fixed in its position, and with it the ovum; even a very slight fluctuation can now be felt. With proper consideration of all the circumstances, and specially noting the appearance of the cervix, one can make the diagnosis of pregnancy as soon as one is able to find a distinct fluctuation. Mistakes, however, may happen, and the fluctuation is then not caused by pregnancy but by a pathological fluid. I found once in a postmortem examination an asymmetrical horn with fluctuation and a completely closed cervix, corresponding entirely to a two month pregnancy, but containing only a thin, clear exudate. Veterinarians who work in abattoirs inform me that findings of that kind are not rare.

So the criterial symptom which differentiates the asymmetrical pathological uterus from the pregnant uterus is the muscular contractions which the latter never shows except during an abortion. Aside from that, the appearance of the

cervix is of much importance. Sometimes a diseased uterus with an open and inflamed cervix is found to be pregnant, but then abortion is the sure outcome.

By a careful examination, and considering all irregularities which may complicate the second month of pregnancy. one will be able to recognize a pregnant animal with sufficient exactness. **Broholm** is justified in saying that it is easier to make the diagnosis of pregnancy than to describe it; he was the first to publish his technique. After examining more than a thousand cows he states that, so far he knows, he never mistook a three month pregnancy; according to him it is also possible to make a reliable diagnosis in the 7th-8th weeks of pregnancy. His chief symptom is the palpitating of a fluctuating oblong body in the asymmetrical horn.

**Martin Poulsen** believes that it is possible to make a diagnosis of pregnancy in the 4th-5th weeks, and a safe diagnosis after the sixth week. He is also able to determine the age of the pregnancy, viz. whether the fetus is six, eight, ten or twelve weeks old. His indications also are the asymmetry of the horns and the fluctuation of the larger horn. He claims that in a pregnancy of six weeks the uterus is situated entirely in the pelvis and can be wholly encompassed with the hand. After eight weeks the uterus is said to protrude slightly over the symphysis and can still be clasped in the hand. It is quite incomprehensible to me that an expert like Poulsen has been so deceived as to the situation of the uterus, which depends so very much upon the varying bulk of the abdominal organs. The non-pregnant uterus is situated in the abdominal cavity proper, so that the cervix is just above the symphysis, and the pregnant uterus cannot be in the pelvis entirely if not forced in it by the intestines.

The discrimination between the pregnant and the pathological uterus is no longer difficult after the middle of the third month, as then the size and the fluctuation of the organ are distinct characteristics. Besides, the cotyledons and the fetus proper can be felt then.

There are, as a matter, of fact, only the purulent and the mucouspurulent metritis which can be mistaken for pregnancy. Under these pathological conditions, however, the uterus is generally thickwalled, and there is a discharge from the vagina. Only once I had difficulty in making the proper diagnosis in a pregnancy of three months. The uterus was situated far from the abdominal cavity, so that it could not be completely made out by the hand, the walls were thickened, and there was a fluctuation in the apex of the right horn; the cervix was swollen, injected, a little secernating, and so wide open that I easily could go in with a large catheter. In spite of intense treatment, as repeated douching, the cow did not abort until twenty-eight days later.

A second time I misjudged a pregnancy of three ar half months, and had the cow slaughtered. I had treate cow in January, April and June, first for a septic met and later for an enlargement of the uterus. In July the came in heat, and in October I examined her again. I fou the cervix unchanged, the uterus enlarged, but did not thi of pregnancy.

In the fifth month of pregnancy the uterus can be so down in the abdominal cavity that it is impossible to rea it with the hand. One feels only a more or less heavy cor which goes from the cervix towards the adbominal cavity.

Pregnancies in the left horn, torsio uteri in an early stage, death or mummification of the fetus are rare and easily recognized.

It is always important to make the diagnosis: **pregnant or not pregnant,** and in the latter case, to determine what is the pathological condition. The exact time of pregnancy is of far less importance in the daily routine. Besides, the time of the last estrum is a good enough indication for that.

**Poulsen,** however, pays much attention to this point, and gives a lot of indications for the exact determination of the time the pregnancy has progressed to. He gives data for 8-10, 10-12, 14-16, 18-20 weeks, and then month by month.

His indications are the length of the uterus, its width expressed in centimeters, and its contents approximately expressed in liters and in grams. The measurements are taken according to the length of the arm and the width of the hand.

When one considers that the uterus of a three months old pregnancy in one cow may be larger than the uterus of a three and a half months old pregnancy in another cow, that the intestines exercise a strong influence over the situation and the shape of the pregnant uterus, that the time of conception may differ even if the mating has taken place at the same time, and that the duration of pregnancy may be between 210 and 321 days, then it becomes evident that exact calculations of the age of pregnancy are rather vain. It is possible, anyhow, to pay so much attention to the dimen- of the genital organs, if one has to examine about 50 in one hour.

It is generally possible to find pathologic conditions in ws which are sterile or have irregular estrum periods. The ions may be present in different locations, as in the uterus, he cervix, in the os uteri, in the vagina, in the ovaries, in oviducts or in the surrounding tissues.

Examining per rectum one will often find the uterus enlarged to a variable extent, its walls more or less thickened or edematous, and containing a thick exsudate. In the quite frequent cases of accumulations of pus in the uterus, this organ is as a rule very much enlarged and protruding into the abdominal cavity, its walls are thickened sometimes, however, thinned, and one can easily feel fluctuation. Generally discharge from the vagina is present.

In the majority of cases one will not find contents in the uterus, but only an enlargement of the organ and thickened walls. The horns of the uterus are generally asymmetrical and rather long; they protrude into the abdominal cavity and are felt as uneven, knotty cords; they can also be short, and then more thick. Under the palpitation they contract, which is specially noticeable in the diseased horn.

Per rectum the abnormalities of the ovaries and of the oviducts can be made out, also tumors, adhesions, etc.

Examining the vagina, and pulling the cervix into the vagina with a sharp hook or with a big forceps, one generally will find that the cervix is the seat of considerable affections. It is more or less swollen, injected and, as a rule, secernating.

The normal cervix is a cone of 2-3 cm. length which protrudes into the oral part of the vagina. On its apex is the os uteri which is surrounded by even folds of the pink mucosa. (Fig. 1.) Under normal conditions the cervix is dry without any considerable secretion and the os uteri is

Fig. 1—Normal Cervix and Orificium Extern.

tightly closed. During estrum a hyperemy is present, and the mucosa is moderately, but distinctly, injected; the os uteri and the cervical canal is then so far open that a finger or a large catheter can easily penetrate; an abundant, thin, glassy and mucous exsudate is discharged.

The cervical canal is 6-17 cm. long and has a mucosa without glands. **Zschokke** says is has a stratified squamous epithelium, **Martin**, that is has a simple columnar epithelium, sometimes with ciliar cells. The mucosa has vertical folds which form in three places heavy rings, partly through an enlargment of the folds, and partly through a thickening of

the surrounding muscular layers. These rings are situated on the os uteri externum and internum and approximately in the middle between the two. The longitudinal folds become heavier near the os uteri externum and form a rosette of 2-3 cm. in the vagina. On account of these folds the cervical canal can open up considerably during the heat period; it can be passed then in a straight line. Under normal conditions the canal is closed tightly.

The changes of the cervix consist of a more or less prominent swelling of the portio vaginalis and of the mucosa inside the cervical canal. Through these pathological conditions the whole cervix, and, with it the canal, change in regard to position. The direction of the canal deviates from the normal, as does the condition of the os uteri externum and internum. Sometimes these changes involve the muscular layers also; then the cervix appears to be longer and much thicker, hard and rigid to the touch.

The portio vaginalis can be swollen to a more or less great extent, sometimes attaining a size equal to two fists and more. Very frequently the portio is irregular, according to the seat of the swelling on one side or the other. The surface can be ragged or labiated, according to whether the diametrical folds are swollen in different degress or only partly. There is then present a number of little ridges varying in thickness and arranged radially. Sometimes the folds are of a rather even size and pass smoothly over in the mucosa of the cervical canal, but in other cases they are quite uneven, and form the most irregular ragged swellings. I mention the following examples:

Cow from Bonderup (Fig. 2), had a calf in the fall 1906. In April 1907 the uterus was enlarged, the portio vaginalis swollen and labiated. The folds of the portio were as thick as a finger, very close together, and covered with a dirty, viscous, and greasy exsudate. The cervical canal was open, its mucosa swollen and injected; there was an abundant muco-purulent discharge coming out of it.

Cow No. 126 of Tranekjär Slotsladegaard demonstrated the same conditions in a more distinct way. She had a calf on December 19, 1906 and was in heat on April 5 and 29, 1907. On April 16 the uterus was enlarged, the orificium very much swollen, injected and ragged. There was a profuse discharge. Treatment with alcohol and iodine. On June 17 the uterus was again normal, the orificium of normal pink color, but swollen, labiated and open. There was still a discharge.

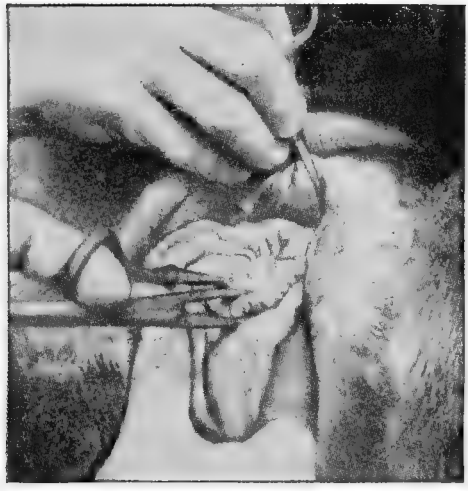

Fig. 2—Cow from Bonderup.

In some cases the folds of the cervix are quite thin and flat, with spaces in between, which are often filled with a greasy and mucous secretion. Sometimes these folds are transversely interrupted, and then the surface of the cervix looks as if covered with many little cones of different size. In still other cases the folds of the mucosa, which are generally arranged radially, are not very distinct and form a little ring in the middle of which the edematous and often enormously swollen mucosa of the canal proper is seen.

Cow No. 86 of Marienborg had a normal parturition on November 6, 1906. On May 6, 1907 the uterus is very much enlarged and contains several liters of a purulent excretion, which is removed. On July 8 the uterus is a little larger than normal, has thick and hard walls and contains a small amount of secretion. The os uteri externum is much larger than usual, open, injected and secernating. The mucosa of the canal is so swollen that it forms a cone which again is surrounded by the folds of the cervix mucosa. The latter in

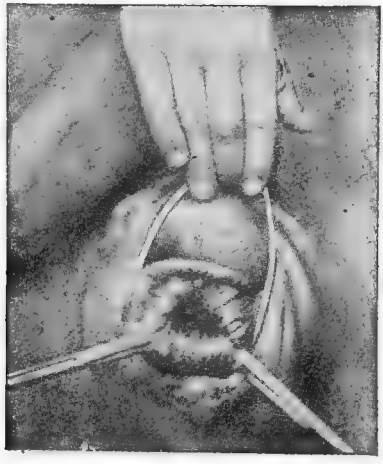

Fig. 3—Cow from Marienborg.

this case is not very much increased in size, and its folds pass smoothly into the mucosa of the vagina. (Fig. 3.)

Cow No. 32 of Wilhelmsborg demonstrates the same conditions very well. She had a calf in the spring 1907 and pretty soon after was regarded as nymphomaniac. On July 2 the uterus was a little enlarged, the portio vaginalis very much swollen and the cervical canal wide open. Its mucosa formed a cone in the opening of the orificium and was surrounded with the radial folds of the cervix. There were cysts in the ovaries. (Fig. 4.)

In other cases the folds of the cervix are scarcely increased in size and of nearly normal color, but the mucosa of the canal forms a large swelling of a dark red color and covers the os uteri externum completely.

Cow No. 21 of Bygaden had a calf in the winter of 1905-1906; before the first examination on July 12, 1907 she had been a nymphomaniac for over a year; the vulva was swollen, the uterus nearly normal, the orificium increased in size, and its folds hyperemic, partly injected and covered with

Fig. 4—Cow from Wilhelmsborg.

mucous matter. The mucosa of the cervical canal was swollen, and protruded in the form of a dark red, egg-sized tumor. There were cysts in both ovaries.

The cow from Almindingen (Fig. 5) had a calf on Christmas 1906, followed by a septic metritis, necrosis of the cotyledons and a pyometra; the contents of the uterus were twice removed and the discharge ceased; she was twice in heat the following spring. On July 29, 1907 the uterus is normal, the os uteri externum swollen and secernating, the

radial folds of the cervix are also swollen, but of normal color; in the midst of these folds the mucosa of the canal is seen as a dark red, egg-sized tumor. So far as one could see the mucosa of the canal was of this color and swollen.

I have met with this condition quite often; the cases are, however, not so pronounced as they are seen in the illustrations. The portio vaginalis is generally of normal color, but in the middle of it is to be seen the swollen mucosa of the canal, which contrasts by its dark red color from the pink

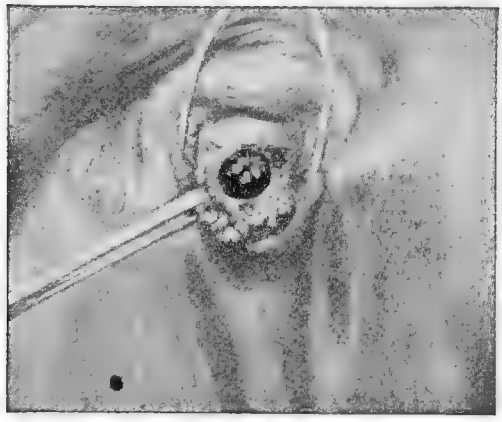

Fig. 5—Cow from Almindingen.

color of the vaginal mucosa. The tumor of the mucosa generally obstructs the lumen of the cervical canal.

In other cases the radial folds of the cervix are obliterated, and the portio vaginalis consists of an irregular mass of tissue with a secernating and injected surface which bleeds on the slightest provocation.

Fig. 7 is a case of this kind. The cow had delivered a calf of January 25, 1907, and was in heat on March 9 and on April 5. On April 16 the uterus was normal, the orificium increased in size, hyperemic and secernating. The radial

folds were indistinct, their surface like granulations, easily bleeding. There was an abundant discharge. After treatment with iodine the cow was in heat on June 9. On August 17, the uterus was normal, the vaginal portio nearly normal of color, but still swollen and open. There was still discharge, and there were cysts in the ovaries. (Fig. 6.)

Fig. 6.

On the whole, the changes of the portio vaginalis are very varying. One needs only to compare the following illustrations with the appearance of a normal cervix to realize this.

Fig. 7 is taken from a nymphomaniac which had delivered a calf in spring and had shown nymphomaniac symptoms since May. The picture was taken in August. The orificium was then much swollen, labiated and secernating. Despite of careful treatment the cow could not be cured.

Cow. No. 56 (see Fig. 8—Cow from Myregaard), had calved on October 24, 1906, and was a nymphomaniac during the winter. She quieted down during the summer after two treatments, but still had sunken pelvic ligaments and an edematous vulva. In September 1907 the orificium was very much enlarged and secernating.

Other abnormalities of the portio vaginalis are frequently met with, for example rents, which are generally located on the sides of the canal.

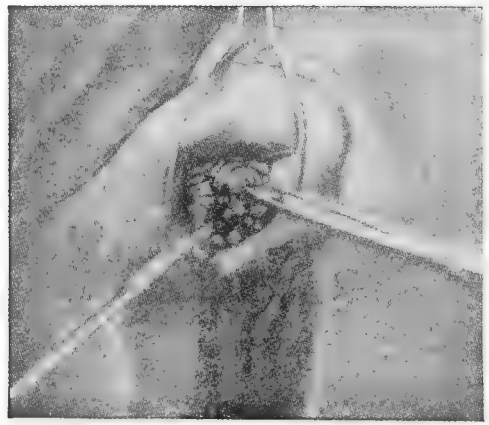

Fig. 7.

At the parturition the cervix quite often is ruptured, but generally the lesions heal completely; sometimes, however, infection results, and the wounds do not close. The cervical canal remains inflamed and a fissure of variable extent persists.

This is nicely demonstrated in the cow from Wallensgaard. (Fig. 9.) The cow calved in May 1906, and was regularly in heat since then. On February 15, 1907 the uterus was a little enlarged, and its walls were thick and hard; the orificium was swollen and hyperemic, the os externum wide open ,and its walls ragged and red. On the right

side was a rent with smooth walls, which was 3½ inches long and reached to within about one inch of the os uteri internum. The cervical canal was wide open, and only a little narrower on its inner end. There was an abundant purulent discharge, and the uterine wall was involved. During the summer of 1907 cystic degeneration of the ovaries set in, and the cow did not become pregnant.

Fig. 8—Cow from Myregaard.

Sometimes bands of connective tissue are met with; they may cover the entire portio, and grow from the sides. Their size varies; the smaller ones, from the size of a leadpencil to the size of a finger, most likely do not interfere with fecundation nor with delivery.

Fig. 10 shows a remarkable abnormality of that kind. The cow had a calf in the winter and was examined in May of the following year. She had cystic degeneration of the

ovaries, and pronounced symptoms of nymphomania. A bridge of connective tissue passed from the fundus of the portio over the orificium and then joined the vaginal mucosa. It was 5 cm. wide and 2cm. thick, and passed in a vertical direction over the os externum. On both sides there were little openings through which the orificium could be reached. in Figs. 10 and 11, the band can be seen; in Fig. 12 it is cut.

Fig. 9—Cow from Wallensgaard.

I cannot say whether this abnormality is inherited or acquired. I have never found it in heifers, however. Even if such an obstacle is not able to prevent the delivery, it certainly leaves not much chance for the fertilization, as the two little openings on the sides are by no means equal to the normal orificium.

I saw a similar case in a cow with nymphomania in Marienburg. The cow had calved for the sixth time two years

ago and had not become pregnant again. A band over the orificium prevented the fecundation completely. The portio was very much enlarged, and the openings on each side of the band were so small that I could not put in my finger on either side without tearing or dilating the opening. The band was 1½ inches thick.

As I mentioned before, the cervical canal can vary in regard to its direction, its width and the quality of the

Fig. 10—Cow from Bonderup.
Note the sinewy band covering the orifice.

mucosa. The width of the os uteri externum and internum also differs very much. On account of the frequent swellings of the mucosa the orificium can change its location in every direction and can be of varying size. Sometimes it is hidden through the swollen mucosa or through one of the above mentioned bands of connective tissue; it can have the shape of a round and wide hole or of a mere slit.

In sterile cows the cervical canal is generally so wide that

one can introduce the large catheter of **Bozemann** with ease. There is nearly always a discharge which, according to the case, is prevailingly mucous or purulent and often mixed with flakes or little clumps. In many cases the discharge is restricted to the cervical canal, which is specially the case in cows with nymphomania, so that the canal and the orificium are covered with a whitish viscous and greasy secre-

Fig. 11—Cow from Bonderup.
The sinewy band is stretched with the finger.

tion. The whole canal can be filled with a thick and very tough discharge which protrudes from the orificium like a prop; in one case I found the whole uterus filled with it.

If the secretion is chiefly mucous it is formed in the cervix; the more purulent secretion, which also contains pus-flakes, is a product of the uterus.

The inflamed mucosa bleeds very easily.

In the cervical canal sometimes cysts are found which obstruct the lumen.

In the vagina cysts, tumors, wounds, adhesions and strictures may be present, which, however, very seldom are the cause of sterility.

The majority of endometritis and metritis cases in chronically sterile cows are caused by:

(1) Acute, more or less septic metritis which becomes chronic;

Fig. 12—Cow from Bonderup.
The sinewy band is cut through.

(2) Benign and at once chronic and subdued processes with no or only little discharge;

(3) Infection through the copulation, which, however, is very rare.

The history of many cases, and a large number of examinations on cows, made one month after the last parturition, have convinced me that nearly all cases of endometritis are caused by an infection during the last delivery. These infections are the reason for inflammatory processes of differ-

ent degree and nature, depending on the condition of the organs through wounds and lesions, and on the quantity and the virulence of the introduced infections material.

These assumptions agree with the observations of Kitt who says: that abnormalities of this kind are seldom found in animals which never have been pregnant; they are mostly derived from an abnormal delivery, with its apparent chance for infections of different kinds. Diseases of the genital organs connected with exsudation can nearly always be traced to an infection. Even the more chronic lesions, where only a benign and mucous or muco-purulent exsudation exists, are apparently caused by different micro-organisms. That the more septic forms of metritis are produced by very virulent bacteria is generally admitted.

The etiology of the acute and septic metritis which is marked by a thin, discolored, and evil smelling secretion, and its influence on the general conditions and wellbeing of the animal, is well known. Dystocia, torsio uteri, death or decomposition of the fetus are generally the causes. We know how common such cases are, and are not surprised if the patients show afterwards irregularities in their sexual life.

The causes of endometritis mentioned are, however, all together not so important as the retentio secundinarum, which is so very frequent as to deserve the most careful consideration.

In this connection, again, we wish to call attention to infectious abortion, which is so often attended by a subsequent sterility. This, however, depends very much upon how well the animal gets over the usual metritis, and this, again, depends on whether the secundinae are retained or not. Aborting cows generally retain their placenta.

The retentio secundinarum is also quite common in cows which have delivered normally, and is thus a serious annoyance. Farmers are as a rule well aware of the importance of this and always ask what is to be done if a cow does not

clean herself. Twenty-five per cent of all the cows which I had under treatment from May 1, 1906 up to May 1, 1907, suffered from a retained placenta, and not half of these cows had aborted. Eleven per cent were cases of dystocia, torsio uteri and septic metritis. If I add the 26% of sterile cows, which nearly all had metritis, then I had 63% of all the cows treated which suffered from metritis.

The methodical examination of especially the big herds reveals the frequency and the importance of the more or less septic metritis. There are also sometimes diseases of the uterus after a normal delivery, and without a retentio secundinarum. These cases are as a rule not serious, and cause no disturbance in the general state of health; most of these cases, however, evade notice, since there is no abnormal discharge, and since what there is, ceases very soon after the parturition. There can be nevertheless an inflammation with enlargement of the uterus and with accumulation of exsudate. Ailments of this kind are later recognized by the abnormal estrum and the failure of conception. The exact diagnosis, of course, is made by an examination per rectum and per vaginam one month after the delivery.

After a normal parturition the involution of the uterus is finished in three or four weeks, so that the first estrum can appear after that time. Very often, however, the heat comes later, which is caused by the incomplete involution of the uterus. This fact I found out through many examinations on representative animals.

During the last year I systematically examined many cows per rectum and per vaginam in the time after the normal parturition, to ascertain the course of the normal involution and to make an early diagnosis of an eventual metritis. I found that there are many decisive differences. The shortest time in which a uterus became involved again was 12 days (one case) and only in few animals was the uterus normal again after 14-18 days. In the most cases it

took three, four and even five weeks, which still can not be called pathological.

I made the further observation that cows may have a benign metritis without having any discharge or without being disturbed in their general condition. In these cows the uterus is often more or less enlarged even to the extent that it cannot be encompassed with the hand; there is also quite often an excretion in the uterus. Generally these ailments are benign; they are caused by an infection which prevents the involution of the uterus.

If the apparent metritis cases are added to the less obvious ones which can be made out only by an elaborate examination, the total number very nearly equals the number of sterile cows.

It is, therefore, apparent that the majority of sterility cases are caused by inflammatory processes of the uterus, which themselves are caused by infection.

The fact that so often many or even all animals of a herd are diseased, and that the symptoms are so very different in different herds or individuals, can only be explained by the fact that the infections are of a different nature hence of a different virulence. This also explains the continuity of sterility complaints in certain herds.

It is a well known fact that puerperal infection is endemic in many stables, and also that these infections may vary with the locality. This is, for example, demonstrated by the difference in time in which the secundinae may become decomposed. In contagious abortion, where the placenta is the seat of inflammatory and exsudative processes, the secundinae decompose more quickly than in normal cows. Even in the latter the conditions may vary very much, so that in one case the placenta is found to be decomposed after a few hours and in others even after days to be very little changed. The only explanation for this is the difference in the distribution and in the virulence of the infectious material. In some stables it is impossible, to prevent malignant

metritis even with the utmost care, if one is forced to operate, be it on account of a dystocia, or removal of the secundinae.

While therefore there is a big difference between the individual herds in regard to the number of animals affected and in the virulence of the infection; there is a certain conformity between the number of acute and septic metritis cases and the number of sterile animals in a herd. In other words, in stables where many cows with purulent or septic discharge from the genital organs are found, there are also many animals which have difficulty with conception.

Here are a few illustrations: On the "Tranekjaer" farms, where the conditions of hygiene, feed and care were uniform and beyond criticism, there were big differences in the number of cases, and in the course of the chronic as well as of the acute metrites. On all three farms the stables were new, with beton floors, splendid light and ventilation, peat being used as a litter. The cows were carefully groomed and during the summer went out on the pasture every day from 8 a. m. until 2 p. m. To be brief, the general conditions were splendid. As I began the treatment in May, I found in Paeregaard a smaller number of pregnant cows than in Slotsladegaard and in Groenslettegaard, but a bigger number of purulent and chronic metritis and endometritis cases. Of the 170 cows in Paeregaard I treated 122 during the year, and only 59 became pregnant without treatment. Ninety cows had inflammatory processes in the uterus or in the cervix, and eleven animals which were treated proved to be normal; in seventy the changes were so extensive that they could be recognized by the rectal examination; thirteen cows had aborted, and a number had retained the placenta. On the first visit especially, many cases of septic or purulent metritis were found, some of which were inveterate and resisted all attempts at treatment, but the cases of metritis which came up during the following year were also much more malignant than at the other two farms. The

most frequent uterus diseases, were a mucous catarrhal metritis with the orificium open, injected and more or less swollen. These cases were very difficult to cure. In Ladegaard the conditions were very much more favorable. One hundred and thirteen out of 197 cows became pregnant without treatment. Of the 66 treated cows 64 had inflammations of the uterus or of the cervix, in 44 the uterus being enlarged; two of them were normal, and nine had aborted. The majority of these animals suffered from a chronic and catarrhal metritis, but all these affections were much more benign than in Paeregaard.

In the third herd, at Groensletegaard, I treated 41 cows out of 112; 25 of them also had aborted. Of these 41 cows 37 had inflammations of the uterus or of the cervix, most of them with an abundant purulent discharge which, however, quickly disappeared after treatment. Only two cows which had been sterile for a long time did not become pregnant again.

In the beginning of the second year the metritis cases in Paeregaard were again more numerous and more difficult to treat than at the two other places. Accordingly the number of pregnant cows was smaller.

Similar conditions existed on the two farms Brahesborg and Wilhelmsborg which are close together and belong to one master. In Brahesborg nearly all the cows became pregnant every year, but in Wilhelmsborg considerable irregularities had existed for the last ten years. In spite of a yearly addition of about 40 heifers the number of the cows had gone back from 130 to 100. The conditions were similar to those in Paeregaard. Many of the animals were affected with a catarrhal and others with a septic purulent metritis; these ailments were, however, of a rather benign character and yielded to the treatment quickly. The percentage of the cows which conceived became 76%, which is quite satisfactory.

On another estate, Anhof, the conditions were similar to

those in Wilhelmsborg. The stables, however, were not so well built, and the floor was contaminated from several cases of infectious abortion. Malignant metritis cases after parturition were frequent, especially after retentio secundinarum, the operative removal of which would cause death. Sterility of course, was frequent through a number of years. The septic as well as the more chronic catarrhal metritis cases were cured in a remarkably short time, especially after the treatment of the retained placenta was changed. The percentage of pregnant animals became satisfactory, and it was evident that this fact was in correspondence with the elimination of the septic and purulent metritis.

On most of the other big estates irregularities of conception were more or less variable, but always too considerable. On the small farms these troubles very rarely continue through several years, yielding to the treatment and very often disappearing completely.

Interesting examples are the stables in Lille Myregaard and in Gadegaard Nylars. At the first place the trouble began in 1905 without any apparent cause, and spread over the whole herd. Twenty-one cows out of thirty were treated; eighteen had inflammatory processes in the uterus and in the cervix, three were apparently normal and nine had cysts in the ovaries. Starting in the fall of 1905 the yellow bodies in each individual case were pressed out, with very little success, as only three cows became pregnant. The rest had to be treated with irrigations before conception could take place. Of the twenty-one cows sixteen then became pregnant, and since then the conditions are nearly normal, with only sporadic cases of sterility.

In Gadegaard Hylars the trouble began in the beginning of the year 1906; all the cows which had calved and had been in heat again before Christmas 1905, became pregnant without any difficulty, but all the cows which calved after Christmas had to be treated several times with great care before they conceived again. The whole herd had to be

treated after a while on account of a very persistent, purulent and catarrhal endometritis which in every case started with a puerperal infection. Four of the cows had degeneration of the ovaries and distinct symptoms of nymphomania. Twelve out of the seventeen cows became pregnant again.

There was no good explanation for these uterus infection in the last case; therefore one is inclined to consider the possibility of an infection through the bull, especially as the first two cows which did not conceive again were bred to the bull of the local breeding society. However, in the stable where this bull was kept, no cases of sterility or metritis happened, nor among the other cows of other stables where this bull was used, at least not to any extent.

There is no doubt that an infection can be carried by the cohabitation, as the many cases of infectious abortion or granular vaginitis in cows, and the inflammations of the preputium and of the penis in the bull clearly indicate.

The question is: Should there be any importance attached to this method of infection, and in what relation does it stand to the sterility of cows? Is it possible to explain the majority of such ailments, as Nielsen (Sorring) does, on the ground of a follicular vaginitis or metritis, which is admittedly carried through the bull?

On the basis of my rather extensive observation I must answer in the negative, since in our part of the country the infection through the bull is absolutely insignificant. I do not consider here the infection with contagious abortion, which, of course, is a separate question.

Considering the conditions as I found them in the many herds where I attended regularly to the treatment, and where I examined nearly all the cows one month after parturition, I must say that a considerable part of the uterine diseases was present before the cows were bred to the bull again. Furthermore it can be shown that the majority of the treated animals did not show any heat symptoms, or were not bred at all, so that in these cases an infection from

the bull is out of the question. If I include the animals which suffered from a metritis subsequent upon parturition, we have the following list:

| | |
|---|---|
| Number of herds | 24 |
| Treated animals | 777 |
| Without estrum | 328 |
| Estrum | 313 |
| Metritis after delivery | 130 |

It can be seen that more than the half of the animals were not bred to the bull at all, as they did not show any heat symptoms, and adding these to the 130 which had an acute metritis, we have 458 or 59%, the sterility of which can not be referred to the bull. Three hundred and fifteen cows had been bred to the bull once or several times before they were treated, but the existing lesions in the cervical canal and on the orificium could not be explained through an infection at the cohabitation. The only explanation is the infection during the delivery or shortly after.

A small number of the cows which had only an endometritis, but no lesions on the cervix, could have been infected from the bull; but this number is so small, that it is in no relation to the frequency of the infections supposedly caused by the bull. I have therefore little doubt that the few cases where the transmission of an infection through the bull was evident have been exaggerated far beyond their importance.

**Kruse** (Silkeborg) reports a case like that, where a bull had infected 70 cows, only a few of which became pregnant. Another case is mentioned by **P. Jensen** (Kvärndrup). I must, however, object to the statements of **Kruse**, and, later, of **Nielsen** (Sorring), who, on the basis of a few cases like these, claim that the majority of all sterility complaints are the result of follicular vaginitis and metritis derived from an infected bull.

The presence of the follicular vaginitis in herds where an infection through the bull has been observed is not enough evidence to permit one to regard this catarrhal affection as the cause of the sterility. Follicular vaginitis is only capable of producing sterility when the infection extends itself to the metra; but a metritis can have many other causes; besides, the granular vaginitis is found very frequently without the animals suffering at all from sterility.

The argument has been brought forward that the virulence of the infectious material or the immunity of the animal may vary, and that accordingly the disease may prove to be very harmful in one case and comparatively innocent in the other. It can, however, be distinctly shown that infectious vaginitis and sterility in individual herds are in no relation; in other words, the infectious vaginitis is an extremely innocent infection, which very rarely causes any trouble at all. If one examines the propagation of infectious vaginitis in a herd where sterility is also common, one will generally find that all individuals—cows, heifers and calves—are infected, but that only the cows have trouble with conception, the heifers becoming pregnant very promptly. This demonstrates the fact that the sterility is connected with a previous parturition.

If a large number of heifers does not become pregnant then the bull was inferior, or one failed to note exactly the estrum periods in the animals.

In the breeding herd of Traneka there was no difficulty in getting the heifers pregnant, despite an extensive dissemination of the infectious vaginitis; many cows however remained sterile. Out of forty-nine heifers in Bjerrebygaard forty-eight became pregnant, and nearly all were suffering from infectious vaginitis. Similar conditions are found frequently. In Skovsbo for example 98 heifers out of 99 conceived, in spite of the infectious vaginitis, but in the same herd I treated 36 out of 70 cows on account of sterility, in one year.

It surely must be admitted that the follicular vaginitis ought to produce as much sterility in heifers as it is supposed to do in cows. **Nielsen** (Sorring) describes the lesions of the granular disease as they are seen in the vagina of the cow and on the preputium and penis of the bull; he considers them as the most important causes of sterility. This, as I mentioned before is not justifiable, since lesions so severe as he describes are quite rare, and because the so infected cows conceive quite often from the infecting coitus or very soon after.

In the last 14 years I examined 30 to 40 bulls from two to four times yearly, and I found only two cases of inflammation of the preputium which forced the animals to a temporary inactivity. One of these cases which happened in February, 1907 was very interesting. The animal was two years old, and a quite satisfactory breeding animal. The owner had douched his preputium and his penis after the bull had covered a cow with infectious abortion; the tube, however, had been used on the same day on a cow with a purulent metritis. The bull became infected, his preputium showed inflammation and a slight discharge. In that stage he infected six cows, which all contracted a vaginitis of different intensity. Two cows of his own stable had swelling of the vulva, a membrane of the vaginal mucosa and an abundant purulent discharge; a third cow acquired a distinct follicular vaginitis. Three cows in two other stables became affected with vaginal inflammations, two of them having croupous membranes. A seventh cow became infected through her neighbor. None of the cows however contracted a metritis, and all of them recovered inside of 14 days, becoming pregnant afterwards.

During my work as practitioner I have not seen any other cases of transmission through the bull in 21 years, nor do I have reports of this kind from the breeding societies, infectious abortion of course, excepted, which is often reported as being transmitted through the bull.

I practiced not only in Bornholm, but also in Fuhnen, Langeland, Falster, Möen, Seeland and in Schonen. Nowhere did I see a transmission of that kind, finding, however, quite often a preputial catarrh in the bull. Many of my colleagues had the same experience, but **Martin Poulsen** does not mention that method of transmission at all.

It has been mentioned quite frequently that it is not difficult to get cows with a follicular vaginitis pregnant; the two important factors are really the metritis of the cow and the quality of the bull.

The acute form of the granular disease is not at all common in our part of the country, and, if present, does not always cause sterility. So there is hardly any probability that the chronic and mild form should be the persistent cause in so many sterility cases.

**How then is chronic endometritis the cause of sterility?**

Admitting that in the majority of sterile cows a metritis is present, and that pregnancy becomes possible if the metritis is eliminated, there are still a number of conditions to be considered.

As I mentioned before, the endometritis may take a different course in different animals; it may be located in the uterus proper or in the cervix; the amount of secretion may differ; there may be complications in the form of a real metritis or perimetritis, and, finally, the ovaries may be involved to a certain extent.

It is therefore necessary to find in all cases the real cause of sterility and to then apply the proper treatment.

In most cases the sterility is caused by one or several of the following conditions:

1. Stenosis of the cervix, of the uterus horns or of the oviducts. They are caused by lesions of the portio vaginalis, of the cervical canal, or of the two orificia, by swelling of the mucosa in any part of the uterus, connected with an increased and pathological secretion.

2. Changes of the mucosa which prevent the implantation of the ovum, or cause an early abortion.

3. Lesions of the ovaries, which are generally secondary, or rather, reflexive processes, and which prevent the normal ovulation, as cystic degeneration and corpus luteum persistens.

So far as the stenosis is concerned there cannot be any doubt that it can be the cause of sterility. If one considers the anatomy of the bovine genital apparatus, the narrow and indirect cervical canal, the long and curved uterus horns, whose lumen is so very small, specially in the apices, one must admit that even a little change can obstruct the passage of the spermatozoa. In addition to that the mating act in cattle is a very short and quick one, the quantity of discharged semen is comparatively small, and has to be deposited on a definite place.

It is generally admitted that the sperma ought to be deposited in the cervical canal; an ejaculation into the uterus proper is uncertain and hardly necessary. **Zschokke** states that the immission of the penis into the uterus is unnecessary and unlikely; it is however necessary that the sperma be deposited in the os uteri externum, as conceptions are prevented if the penis is not introduced far enough.

The changes one finds so often in the cervix of sterile cows are capable of preventing the passage of the spermatozoa entirely or of making it at least very difficult.

During the normal estrum the cervical canal is open, the os uteri externum forms a round, wide and funnel shaped opening which leads into the entirely passable cervical canal; the latter is now so straight that it may be passed by the largest catheter without difficulty. The canal is filled with a thin, clear and alkaline mucous matter which pours into the vagina.

It can be easily understood that the above mentioned lesions of the cervix may prohibit conception. The swollen, irregular and ragged portio vaginalis often has the ori-

ficium on the side, which may in addition be very narrow or even entirely covered with folds of the mucosa.

Still more difficulties for conception may be present in the cervical canal, which may be impassable on account of being bent, narrow, or obstructed with folds of the mucosa. Quite frequently also a viscous and greasy secretion blocks the canal, and is then the cause of sterility.

Even apparently insignificant changes of the portio or of the canal, which hardly obstruct during normal conditions, may produce stenosis in the hyperemia of the estrum. I found that often through the examination of bulling cows.

The same observation applies to the uterus proper, where the injected mucosa becomes still more hyperemic with the hyperemia of the estrum, and is then capable of obstructing the passage of the spermatozoa. This is especially evident on the os uteri externum, where sometimes a part of the swollen mucosa covers the orificium entirely. (See Fig. 13.)

The cow of this illustration had calved in May, 1907, and has had an estrum three times after that. The orificium was swollen, injected and secernating; there were large folds of the mucosa round the orificium, which covered the entrance into the canal entirely.

Sometimes the mucosa of the canal protrudes from the orificium also during the heat-free time and can be easily recognized by its dark red color; during the estrum this mucosa increases still more in size and obstructs the canal completely. Similar conditions may exist in the whole length of the canal, but are especially frequent in the middle and near the os uteri internum.

It is therefore necessary to extend the observation to the direction of the cervical canal, to its width, to the color of the portio and to the state of the mucosa; it is not sufficient to be able to introduce a catheter into the uterus, when the animal is not in heat.

The best procedure is to examine the animal during the estrum, so as to be able actually to see the stenosis.

We have often therefore an indication for the dilatation of the cervix; the old reason for this operation, however, viz., a growing together of the mucosa, is an extremely rare one in cows which have had a calf. Stenosis of course can be caused by other conditions than by the growing together of the mucosa.

The dilatation of the cervix has been frequently a satisfactory measure. **Esbensen** (Söllestedt) told me that he had

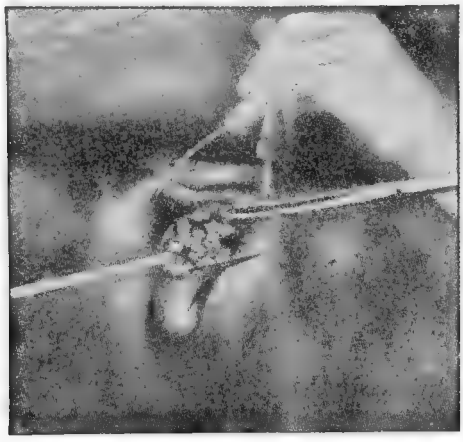

Fig. 13.

very good successes with this operation on one estate; but in many other cases the treatment was without result, most likely due to the circumstance that there were complications, or that the operation was not complete.

It is also very possible that hyperemia of the uterus-horns obstructs the passage of the spermatozoa. Its mucosa may be covered with mucous matter and arranged in folds. The lumen of the horns, specially in the apex, is so very small that even a slight swelling of the mucosa can close the opening.

An early abortion is nothing uncommon in cows, and it

may be that the cows which have an estrum every now and then, have aborted in the meanwhile. Such an abortion can be easily overlooked. A farmer reported once to me that he saw a heifer abort a two months old fetus. The animal pressed only a little, and she did not seem to be in the least disturbed, as it kept on feeding. One may imagine how easily such an act may escape observation in a dark and dirty stable. Sometimes the ovum is not expelled at once, but after a while, in the form of a decomposed and greasy mass. While irrigating a cow which came regularly in heat, I once found a fetus, and several times I have found in similar cases parts of tissue which apparently originated from a fetus.

The cause of these premature abortus cases is the pathological condition of the uterus mucosa. The ovum can not attain the necessary nourishment and is incapable of initiating those changes which cause a more intimate connection between the fetal and maternal placenta during the second month. During the first month the ovum is loose in the uterus horn and is nourished by diffusion from the uterine milk.

**Frank** states that an incomplete production of this uterine milk on account of pathologic conditions in the uterus may be the cause of an early abortion, and so the cause of sterility.

As I mentioned before, the mucosa which is covered with a purulent secretion is not capable of forming a close connection with the fetus in the second month; if the uterine epithelium and the uterine glands are atrophic, then it is clear that a nourishment of the ovum is out of the question, and the sterility is then complete.

Early abortion on account of a chronic endometritis is of common occurrence in women.

### The Cystic Degeneration of the Ovaries.

In the above I have called degeneration a secondary lesion, which is produced and sustained by the pathological

condition of the uterus. The reason for my contention is the fact that one always finds a primary metritis together with cystic degeneration of the ovaries, and that the treatmen of the metritis does away with the cystic degeneration.

Ovarial cysts, originating in the follicles, are of very common occurrence. Of 863 cows which I treated in the years 1905-1906, I found cysts of the ovaries in 127, or in about 14%. In 1906-1907, I found 63 in 400 cows, or 15%. Only on a very few farms with small herds did I find no cases of this kind; in other herds the number of cows with cystic degeneration of the ovaries varied between 20-40%, and in still others a trifling percentage was found.

As a rule one finds, connected with the cystic degeneration, an endometritis, which may be easily recognized by a rectal or vaginal examination. The symptoms of endometritis are: Asymmetrical uterus horns, an open cervical canal, and especially a swollen and secernating portio vaginalis, which produces a thick, viscous and muco-purulent secretion.

Of 181 cows with cysts, 25 of which had symptoms of nymphomania, more than half had a metritis; 179 had an open cervical canal, the mucosa of which was swollen and hyperemic; they also had a swollen, injected, deformed, and secernating orificium.

It is possible that these symptoms are not so evident in post mortem examinations, since **Zschokke** found lesions of the ovaries only in cows with nymphomania; it may be, however, that he only examined old cases, where the uterine lesions were completely or nearly healed.

**Hess** generally found metritis in cows with a cystic degeneration of the ovaries; he concludes that the cysts are the primary lesions, and that the uterine disease is accidental, or caused by the defect of the ovaries. Yet he states later that there is a certain relationship between the degeneration of the ovaries and the abnormal dilatation of the cervical canal. He generally found in cases of nymphomania the ori-

ficium open so wide that a lead pencil or even one or two fingers could be introduced; there was also a pathological excretion of varying intensity. Furthermore he found in the majority of cases an enlarged uterus, which was generally asymmetrical; the uterus can be of the thickness of an arm and twice or thrice longer than normal. Postmorten examinations of **Guillebeau** found in four cases out of eight the cystic degeneration, complicated with lesions of the uterus, the cervix and the vagina.

**Tuff** examined the genital organs of 14 cows and found inflammatory processes of the uterus and of the oviducts, together with a cystic degeneration of the ovaries.

Even if it is admitted that the cystic degeneration is rarely found without lesions of the uterus or of the cervix, it is still doubtful what kind of a connection, if any, they have. Can one lesion be the cause of the other, and which is the primary lesion, or is it accidental that they are together met with so often?

**Hess** contends that the cystic degeneration of the ovaries causes the endometritis, which again is the cause of the sterility.

This opinion can be proved to be wrong; it is not difficult to find out that the metritis is primary and the degeneration of the ovaries is secondary; furthermore, the cure of the metritis means also the cure of the cystic degeneration.

In my numerous systematic examinations of cows, one month after they had calved, I never found a cystic degeneration of the ovaries without a considerable enlargement of the uterus, whose contents quite often were several liters of a purulent, bloody or viscous fluid.

On the estate Damsbo I found out of 28 cows which had recently aborted, 8 with cysts of the ovaries, all these cows having also a more or less purulent metritis. In the 181 cases of cystic degeneration mentioned above, 12 of the ani-

mals had aborted, one had a pyometra, and of the fifteen, which had acquired the cysts in four to twelve months after the parturition, the majority had been sick with a septic metritis shortly after the delivery.

That these metritis cases were caused by an infection in connection with the parturition I take for granted. But also many cases where later inflammatory processes on the cervix and on the orificium were found, can only be explained by an infection during or shortly after the parturition.

The cysts are very rarely formed shortly after the calving; it generally takes two to three weeks, about to the time of the first estrum. In the very numerous cases where I examined cows for a metritis in connection with the calving I never found cysts in the ovaries. As I said before, they are formed, if early, two to three weeks after the delivery, but can also be formed very much later. According to **Hess** it is not very uncommon to find cysts in the ovaries of heifers or even of young calves.

It is easy to prove that the cystic degenerations are not only secondary lesions, but also that they are caused by the primary metritis.

A timely and proper treatment of the metritis puts an end to the cystic degeneration of the ovaries, so that cows with nymphomania are nearly never seen again in herds where the treatment mentioned is carried out. Even old cases are cured with the successful treatment of the chronic metritis.

Therefore, I think it probable that the different lesions and affections of the uterus are capable of producing, directly or indirectly, a cystic degeneration of the ovaries. One theory is that the inflammatory processes of the metra encroach through the oviducts upon the ovaries; in post-mortem examinations, however, an oophoritis is seldom found to be connected with the usual cystic degeneration of the ovaries. The only explanation then is a reflex action,

which agrees with the observation that the causal lesion very often is an inflammation of the cervix.

In human medicine we have similar conditions. Inflammatory processes in the uterus are supposed to produce a cystic degeneration of the ovaries, which again disappears when the causal lesion is cured.

We have no intimate knowledge of the process of cyst formation; we only know that generally, solitary and follicular cysts produce the symptoms of nymphomania; there are different opinions about the real causes and the formation of ovarial cysts.

**Zschokke** contends that the lack of a yellow body causes the cyst to form, as otherwise the ripe follicle would rupture. Therefore if an unknown cause prevents the formation of the yellow body, the impetus for the rupture of the follicle is wanting and it grows larger and larger, finally forming the typical ovarial cyst.

**Hess** tries to explain the cyst formation by the anatomy of the follicle walls, without considering the yellow body at all. He explains that in such a fragile tissue as the Graaf follicle a minute disturbance or an insignificant pathological condition is enough to interrupt the alimentary processes. If, therefore, the contents of the follicle die, the tunica interna will not be able to fill the cavity with connective tissue, as is done in the atresia folliculi. The fluid of the follicle is then augmented through transudation, and a cyst with anemic walls, containing a fluid poor of cells, is formed.

**Hess** is of the opinion that cystic degeneration of the ovaries is especially frequent in very good milk cows of from five to eight years of age; but it is just as often met with in very young cows or even heifers. In very high bred animals, which are kept all the time in the stable, and which are fed with concentrated feed, the ailment is more common than in cattle which go on the pasture. Hess thinks the granular disease to be an important etiological factor, as he observed

more cases of cystic degeneration after an infection with this disease.

**Zschokke** and **Hess** consider heredity also to be one of the major causes.

Metritis, however, is a simple and satisfactory explanation of all the cases of cystic degeneration, which sometimes appear to be so erratic. It explains the single and the accumulated cases, the cases in slovenly and in well kept herds, the cases in the stable and in the pasture. It also explains why the disease has a predilection for some locations, and why it is sometimes so unresponsive to treatment. What other explanation is there for the fact that this ailment per se so innocent, inclines so often to relapses, if there is not another cause, of a much more obstinate persistence and duration?

The successful treatment of metritis indicates also the importance the latter has as a cause of cystic degeneration. In the years 1905-1906 I treated 127 cows with nymphomania; 67 of them (which equals 56%) became pregnant again; of the rest more than half became quiet, and only a few animals had to be eliminated on account of their condition. Among these animals there were, however, a number of old cases which gave so little milk that the treatment did not pay. In the years 1906-1907, the second year of the treatment, the number of diseased animals was in the decrease. Of 700 cows which were then examined I found 61 with cysts, of which 46, or 75%, became pregnant; the rest was cured with only a few exceptions.

The following tabulation gives a good idea of the success of the treatment; all these herds were under continuous observation.

| Name of Estate | Number of Milk Cows ..... | Number of Cows with Cysts .... |
|---|---|---|
| Damsbo | 123 | — |
| Tybrind | 189 | — |
| Wilhelmsborg | 106 | — |
| Dalum Landbrugsskole | 35 | — |
| Anhof | 100 | 2 |
| Frörup Praestegaard | 30 | — |
| Falkensteen | 130 | 1 |
| Holgershaab | 70 | 1 |
| Skovsbo | 70 | 1 |
| Skröbelevgaard | 70 | — |
| Hansen, Torpe | 40 | — |
| Larsen, Torpe | 15 | — |
| Paeregaard, Tranekaer | 170 | 1 |
| Ladegaard, Tranekaer | 169 | 1 |
| Grönslettegaard, Tranekaer | 112 | — |
| Marienborg | 252 | 1 |
| Barebröndstrup | 30 | — |
| Vallensgaard | 45 | — |
| Pigaard | 28 | — |
| Savskaeregaard | 25 | — |
| Langemyregaard | 32 | — |
| Skovgaard | 25 | — |
| St. Hallegaard | 45 | 2 |
| | 1911 | 10 |

Only ten out of about 2000 animals could not be cured. In the years 1907-1908 the number was nine out of 3100 cows. As cured cases I understand only such as showed no symptoms for such a long time that a relapse could be produced. The number of cows with an incurable nymphomania is therefore so small as to be negligible.

The majority of these cows came under treatment very early, in most cases before the symptoms of nymphomania were developed; the presence of cysts was always recognized

through an examination per rectum; and the initial symptoms, as the sinking of the pelvic ligaments, and edematous swelling of the vulva, were seldom lacking.

The results might doubtfully be claimed for the treatment, as the early rupture of the cysts may prove, under certain conditions, to be a better treatment than the treatment of the metritis in a late stage.

This consideration induced me to segregate all the animals, which had the typical symptoms of nymphomania with the intention of finding out if the treatment of the metritis alone could influence the nymphomania.

In the year 1906 I treated thus 107 cows with nymphomania; some of them were fresh cases, but others were quite old, a few even of a year's duration. These cows were observed for a long time, so that an eventual relapse would have been noted. Pregnancy was in all cases determined by rectal examination.

Of these 107 cows 92, or 86%, were completely cured; two animals were castrated, eleven became partly quiet, and two could not be reported. Of 92 animals 72 became pregnant.

The success of the uterus treatment in nymphomania is therefore evident. In the majority of the cases the symptoms disappeared very quickly, and in the others the relapses were only mild; in only a few cases could the animals not be kept on the pasture.

In more than half of the animals the treatment had to be repeated however;

36 cases were once
32 cases were twice
19 cases were three times
7 cases were four times
5 cases were five times
and 8 cases were still oftener treated.

I must say, however, that many of these animals were not so thoroughly treated as my present theory demands.

If I compare these results with those I used to get from rupturing the cysts, the difference is very striking. Since **Hegelund** advised the rupturing of the cysts I have used this treatment quite often. I will give the experience of two years. In the year 1904 I treated thus 30 cows, 22 of which had to be castrated; in 1905 I treated 57 and in 37 had so little success that they had to be castrated also. That is, of course, a very poor result.

My present treatment of cystic degeneration of the ovaries consists of rupturing the cysts, douching the uterus and treating especially the cervix.

I always rupture the cysts through the rectum, and never have been unsuccessful with that method.

The treatment of the uterus has to be very painstaking. Even if it is enlarged only to an inconsiderable extent I apply a massage over its entire length and make an irrigation with alcohol. If there are no pus-flakes or other pathological secretions present I fill the uterus with solution of Lugol (Iodine 1, 0, Potassium Iod. 0, 3, Aqu. 97.0); in the contrary case I use a solution which contains the same chemicals in a concentration of 1:3:17. I inject it with a small rubber catheter which I introduce with a mandrin, and which is not dangerous, even if pushed to the apices of the uterus horns. One also can use a small syringe. The treatment of the cervix is the most important, however, as it is there that the most prominent lesions are found. The inflamed and secernating mucosa has to be cleaned with alcohol, and the entire cervical canal has to be wiped with a cotton plug soaked in Tincture of Iodine or in Lugol Solution.

I used to treat the vaginal portio, which is also generally affected in cows with nymphomania, exactly as I treat the cervical canal; but I found that I had better success if I cut away all the pathological tissue which had formed round the orificium. The recovery takes much less time, and is surer. The operation is not painful, and the bleeding even in extensive operations is insignificant. I have used quite a num-

ber of other chemicals, as alumen, argentum nitricum, creolin, lysol, lysoform, acid, pyrolign and glycerine, but the iodine treatment gave the best result.

The success of the treatment depends to a large extent upon the age of the affection. Very often the treatment has to be repeated at frequent intervals.

### The Persistent Yellow Bodies.

Much attention has been paid in this country to the corpus luteum persistens as the cause of sterility in cows; especially in of late years the pressing out of the yellow bodies has been used very frequently in the treatment of sterility. It was supposed that this operation would not only excite ovulation, but would cure also the different affections of the metra. The treatment has even been used by farmers, in the hope of having in it a simple cure of these troubles.

It is, however, no longer doubtful that those expectations were exaggerated; disappointments were frequent, as was inevitable when people thought to find in this operation the universal cure of all genital troubles in cows.

So far, it is not known how the yellow bodies are formed, whether from the tunica interna or from the membrana granulosa; nor is their physiological function clear. Among practitioners there is no knowledge about the significance the yellow bodies may have in regard to sterility.

One needs only to compare the opinions of **Nielsen** and **Poulsen.** **Nielsen** contends that the loosening of the yellow body has the same effect as the complete pressing out, while **Poulsen** states that the pressing out has to be quite complete. It can be demonstrated, however, that neither the loosening nor the pressing out are necessary operations to produce a speedy appearance of the heat; a simple massage of the uterus or a warm infusion in the vagina produces the same result.

Moreover, it is more reliable and safer to treat the affections of the uterus than to try to produce an estrum by pressing out the yellow bodies.

A comparison of results makes this statement very convincing. In 143 cows, which were treated in 1905-1906 with uterine douches, there were 139, or 96%, which showed heat symptoms after the treatment. In 99 cases they appeared inside of a month, in 35 inside of two months and in 4 inside of three months, which was, on an average, inside of 20 days after the treatment. Among the cases where the treatment was unsuccessful was one old case, one cow with nymphomania, and one with tuberculosis. 122 cows became pregnant, 99 of which conceived after the first cohabitation.

I think it is quite evident that a metritis is more efficiently influenced through a direct treatment than through the pressing out of yellow bodies; specially in a pyometra I consider the treatment of the ovaries as quite illusive. This is still more the (illusive) case when a stenosis of the cervical canal is present. I have therefore given up pressing out the yellow bodies, and employ this treatment only in exceptional cases, for example, in cows with a very small vulva.

### The Treatment of Sterility.

I first try to eliminate all the animals which may be pregnant by a careful examination per rectum; on the others I employ the treatment according to the diagnostic examination per vaginam and sometimes also per rectum.

The treatment is different when a recent metritis, with a more or less putrid discharge, or a chronic endometritic, or a pyometra is present.

Since the endometritis as well as the pyometra is caused by an infection during delivery, it is important to pay more attention to diseases of the uterus shortly after the parturition.

The aim is

1. To prevent an infection of the uterus,
2. If an infection is present, to bring the metritis which follows to a quick termination.

In regard to the first point, I think it important to note the most frequent cause of a malignant infection. This is the

**retentio secundinarum**; operations during birth are of only small importance.

**The question is now, how to treat cows which retain their placenta?**

There are considerable differences of opinion on this question; some advise leaving the secundinae undisturbed, but the majority try to remove them. Others prescribe medicaments, but nearly all order irrigations with indiscriminately strong creolin—or lysol solutions.

If the removal of the placenta is done with all care, and with proper consideration for all circumstances, it is without doubt the best treatment.

It should be done within the first twenty-four hours after calving, at a time when the uterus is not yet contracted and the secundinae are still quite fresh. The wide open uterus permits an easy operation, and the danger of infection is then as small as possible. It is absolutely impracticable to wait for a few days; if the secundinae do not go out in the first seven or eight hours, they only very rarely will without operation, and it is therefore senseless to wait. The operation has to be performed with the utmost care and cleanliness.

The placenta should be removed entirely, but it does not matter very much if little remnants of it are left in the apices of the horns. If one is not able to remove the bulk of the secundinae, viz., if the connection between them and the uterus is too strong, or if the animal presses too much, one should desist from the operation. The new treatment with an injection of a normal salt solution into the vessels of the placenta seems to offer a splendid solution of many difficulties.

After the removal of the placenta I usually do not make an infusion, since the value of such a procedure at that time is doubtful. If a malignant infection has taken place before or during the operation, its development can not be prevented. The straining of the cow, furthermore, is harmful, and so is

any quantity of the infused solution which may be retained in the uterus. As a matter of fact it is nearly impossible to remove all the fluid from the horns, where it then prevents the contraction of the uterus, and facilitates an infection.

If the secundinae are decomposed I do not advise a premature attempt at removal, but think it better to wait until it is possible to pull out the placenta in its entirety and without violence; a careful irrigation should follow.

If an infection has taken place and a metritis is found, then it is important to bring this metritis as quickly as possible to a conclusion. The contents of the uterus have to be removed, and the organ carefully cleaned through disinfecting irrigations. Till now this has been a difficult task; the contraction of the cervical canal and the restlessness of the animals have made the introduction of the catheter, which was, moreover, inefficiently constructed, very difficult. The whole technique has been very unsatisfactory. One has generally been satisfied to infuse a solution of carbolic acid, lysol or creolin, and has not taken care really to clean out the uterus. This mistake can not be remedied by the use of strong disinfecting solutions. On the contrary, the infused fluid can be harmful by increasing the resistance which the uterus has to overcome in its involution.

The important measure, therefore, is to remove all the contents of the uterus, so as to make its contraction easy.

The following technique is an efficient and an easy one:

Fig. 14—Sharp hook.

A sharp hook (Fig. 14) is inserted into the cervical canal and the cervix drawn into the vulva; a speculum (Fig. 15) is then put into place. With two or only one big forceps (Fig. 16) the cervix is then securely held, so that a catheter easily can be introduced into the uterus. The cows feel pain only

when the arm is introduced in the vagina, but do not mind the subsequent operations.

I use for infusions and for the removal of the uterus contents a thickwalled rubber catheter (Fig. 17), which is closed at the end but has two openings on the side. Such a catheter is easily introduced and does not clog up; another advantage

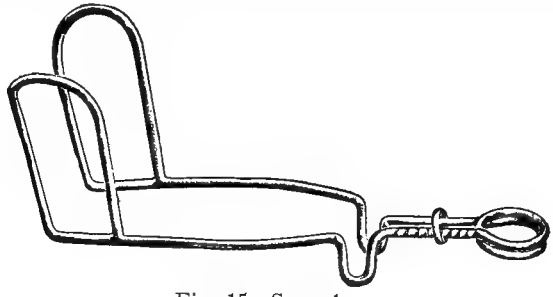

Fig. 15—Speculum.

of it is that it does not become closed by sharp turns or by the pressure of the cervical canal. If the canal is so narrow that I can not introduce this catheter, then I try to dilate it by the use of a bigger one. If even that is of no use, I employ a metal tube as a mandrin. (Fig. 18.) After I have introduced the catheter with the help of this instrument I draw it so far back that its end is on the os uteri internum. The rubber catheter is then in the uterus proper and the metal tube keeps open the cervical canal. The contents of the uterus can be then easily removed after they are diluted with water. To remove the contents completely it is necessary to massage the uterus from the rectum. It is quite possible to clean the uterus by repeated infusions. If tissue remnants or necrotic cotyledons are found which cannot pass the catheter, one must try to press them through the cervix, possibly after a dilatation of the latter with the knife.

For the irrigations I employ first pure luke-warm water or weak solutions of lysol (¼—1/10%), and afterwards a solution of iodine and potassium iodide in the relation of 1:3:97 or 1:3:200, which, however, has to be removed again.

In the treatment of the chronic endometritis one has to pay chief attention to **the size of the uterus**, to **the thickness of its walls** and to **the nature of the secretion**; it is also important to note whether the **mucosa of the uterus** is affected, or whether the lesions are chiefly in **the cervix.** An affection of the uterine mucosa without lesions of the cervix is rarely found; the contrary however is quite frequent, specially in old cases.

The treatment consists of:

1. **Drawing back the cervix,**
2. **Introducing the catheter,**
3. **Removing the discharge** and
4. **Infusing the disinfecting and astringent solution.**

If the portio vaginalis and the cervix are much affected, they are treated specially.

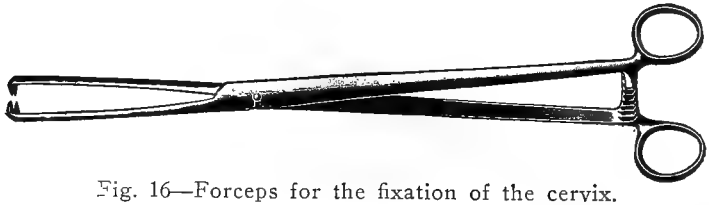

Fig. 16—Forceps for the fixation of the cervix.


Fig. 17—Rubber catheters.

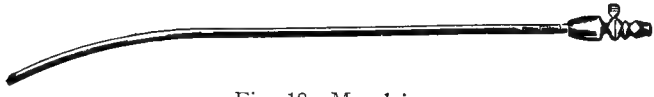

Fig. 18—Mandrin.

I always use a hook to draw forth the cervix, since it is easier to insert than the forceps which I use afterwards to hold the cervix in its new position.

My metal catheters (Fig. 19) are of two sizes; besides them I use several rubber catheters of varying size. One

has to introduce the metal catheters with a boring motion, but has to bear in mind that the body of the uterus is only 2-5 cm long. It is therefore easy to perforate the uterus wall if the necessary care is not employed. If it is difficult or impossible to penetrate the os uteri internum, it has to be enlarged with a forceps (Fig. 20) or with the knife.


Fig. 19.—Metal cathether.

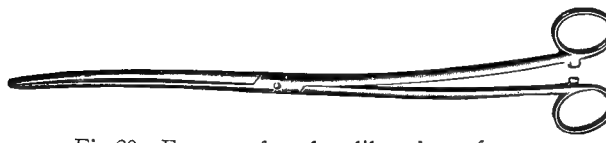

Fig.20—Forceps for the dilatation of cervex.

It is impossible to penetrate further with the metal catheter than into the body of the uterus, and one can therefore remove only the discharge which is present there; no doubt one can fill the horns of the uterus with the solution, but it is impossible to get it completely out again with massaging. I use therefore the rubber catheters which I introduce with a mandrin; after the mandrin is removed one is able to push the rubber catheters without danger of perforation into the uterus horns. It is possible then not only to remove all secretion present, but also to infuse concentrated solutions without bringing them into contact with the vaginal mucosa.

I have used solutions of sodium carbonate, sodium chlorid, creolin, lysol, lysoform, alum, argentum nitricum and of iodine. I had the best results with a diluted alcohol infusion, which dissolves very well the viscous and greasy secretion, followed with another infusion of Lugol solution, 1:3:17 or 1:3:97. In most of the cases the weaker solution is sufficient, but in old and obstinate cases I always use the stronger one, which I inject with a rubber catheter and a glass syringe.

As a rule the cervix has to be specially treated. If the cervical canal is narrow and crooked and its mucosa injected, secernating and covered with a mucous, greasy excretion, then all these parts have to be cleaned with diluted alcohol and cotton, and afterwards painted with astringent solutions. For a while I used ac. pyrolignos. crud., but gave it up on account of its persistent odour; I am using now tinct. of iodine (1:10) or Lugol solution (1:3:17).

If the lesions are very prominent and the portio vaginalis is very much swollen and deformed, as is quite often the case in cows with nymphomania, then the treatment must be repeated several times before satisfactory results are attained. I prefer therefore in these cases to remove the pathological parts of the mucosa with the knife or the scissors. The operation is not very painful, and the hemorrhages are always insignificant; since the tissue is, however, rather tough, it is necessary to have sharp and strong instruments. If there are considerable lesions of the cervix I have daily infusions made with a solution of sodium carbonate.

The **pyometra** is treated, just like the acute septic metritis, by cleaning the uterus and subsequent disinfection. As a rule a mandrin has to be used to introduce the catheter, as the cervix is generally swollen and the cervical canal is very narrow and crooked. The contents of the uterus have to be removed by massage from the rectum; there are often concretions. The discharge may be thick, and has then to be diluted, or it may be purulent, fetid or odourless. It may amount up to 12 liters. After the removal of the secretion the uterus collapses and can be encompassed by the hand. The walls are nearly always very thin, and the introduction of even a soft catheter has to be done with the utmost care so as not to perforate the walls. In some cases the uterus does not collapse; the walls are then thick and contract into folds. If the horns of such an uterus are massaged one feels that an inside membrane becomes detached; in the ends of the horns generally necrotic tissue is found.

It is advisable to begin the treatment of sterility as soon as possible after the last parturition, as it is then less difficult to effect a cure. In old cases careful and often repeated treatment is necessary to limit the secretion and to make the uterus normal again. The eventual pregnancy depends on the condition of the cervical canal, whether it be passable or not, and of the uterus mucosa, whether it be capable of complying with the needs of the ovum. The majority of old metritis cases is incurable, or if not the treatment would demand so much time and labor that only very expensive animals would be worth it.

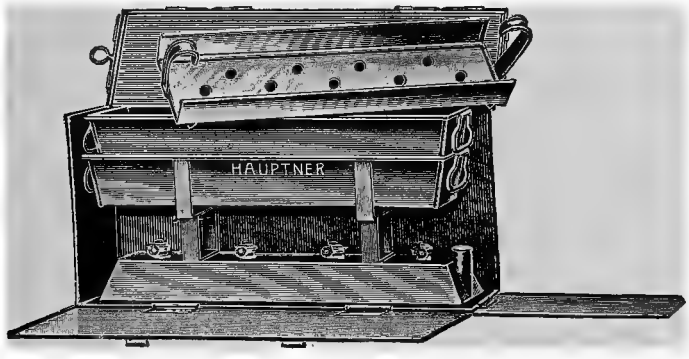


Fig. 21—Sterilizer.

The treatment of the uterus demands the most painstaking cleanliness, as there is always a danger of infection. The surgeon has to have clean hands and instruments; especially the latter may transmit the infectious material. They have therefore to be sterilized after each single case, which may be easily done in sterilizer I am using (See Fig. 21).

It is remarkable how little the animals are disturbed by the treatment and how negligible the eventual complications are, provided that a careful technique is employed. The insertion of the instruments in the cervix does not produce any pain, nor is there a disagreeable reaction to the strain of the ligaments when the cervix is drawn into the vagina. The

most painful operation is the introduction of the hand into the vagina and the insertion of the speculum, especially if the vagina is very narrow, as in heifers. The mucosa of the vagina is very sensitive to strong disinfecting solutions, and special care has to be taken not to let any of these solutions come into contact with the urethral mucosa; this would produce much pain and restlessness. In cases with chronic inflammations the mucosa of the cervix and of the vagina do not seem to be so very sensitive; the most irritating solution seems to be the creolin, while the Lugol solution irritates the least.

The only dangerous complication is the perforation of the uterus wall. If the contents of the uterus are putrid, a dangerous and possible lethal peritonitis may be the result. This happened twice to me; in the first case I perforated with my largest metal-catheter in a rather recent metritis. The cow contracted a peritonitis, but recovered after a long time. The second cow had aborted, and the uterus walls were very thin; I perforated with a rubber catheter and had the animal killed, as it developed a peritonitis. Beside these cases I had no other accident in the treatment of more than 4,000 animals. With good technique and the proper catheters, such as I use now, a perforation is nearly out of the question.

In cases of catarrhal metritis a perforation with a sterile catheter is of no significance.

I have made the important observation that one can sometimes irrigate a pregnant uterus without disturbing the pregnancy. In a number of cases the animals had been in heat such a short time ago that it was not possible to make the diagnosis of pregnancy; the uterus was enlarged, the walls thickened and the cervical canal open and secernating. I made infusions, and found later that the animals were pregnant, without having been covered since the treatment. In the first cases I was dubious about the reliability of the records, but later became convinced and now I have on rec-

ord about one hundred cases of this kind, among them pregnancies up to three and a half months. A very remarkable case I had in Skröbelevgaard, where I made a rectal examination in a cow and found a pregnancy of three and a half months. However, I was informed that the cow had not been bred, and then corrected my diagnosis, supposing the presence of a pyometra. The cervix was open, and I infused a Lugol solution of 1:3:97 strength. The cow, however, was pregnant, yet did not react with an abortion.

### The Results of the Treatment.

Several facts are to be considered in estimating the results of the treatment as they depend: 1, **on the care and efficiency, with which the breeding of the herd in question is done,** 2, **on the percentage and character of the prevailing irregularities** and 3, **on the technique and frequency of the treatment.**

As to the first point, it is of course necessary that the animals be bred at the right time and to a good bull. Both points are very often neglected; the estrum symptoms of the cows are not sufficiently noted and are often passed by, or the mating act is not satisfactory on account of a mediocre or abused bull. The estrum symptoms in some cows may be so slight or of such short duration that even a good observer may overlook them. In nearly all the large herds I find cases of this kind, and there the care is generally better than on the smaller estates. It is, therefore, advisable to make regularly rectal examinations at least on the large estates, so as to control efficiently the breeding of the animals.

The second point is of more importance still; it concerns all the animals of a herd, while the overlooking of the estrum is more or less exceptional, the circumstances that breeding results are some times better in small stables than on large estates, is often explained by the better attention which is paid there to the mating act. In the large herds the breeding makes much work, and is very often ordered to be done in the leisure time of the attendants, much to their displeas-

ure. It can, therefore, be easily understood that an insufficient mating act may be passed for a normal one under the circumstances. Very often the bulls are exhausted; and not infrequently the bull which is the easiest to handle is used over and over again, even if the others are quite fresh. The most frequent difficulty in this regard is that the bull is incapable or unwilling to breed with the necessary energy. The reason may be: too bulky abdominal organs, too long hoofs, pains in the tendons or in the joints, or, especially, inflammatory processes of the preputium. The latter are often overlooked on account of their chronic character; they may be without significance and not deteriorate the qualities of the bull, but very often they hinder the animal from perfecting the mating act with the energy necessary for a fecundation. Sometimes these bulls infect the cows, and one is able then to notice a few days after the breeding an injection of the vaginal mucosa, and exudation. This infection is often considered the cause of the sterility, which is usually present, but the real cause is the deposition of the sperma in the vagina, where it perishes.

These facts I have found out only of late years; I had observed that in some herds which were under quite similar conditions of housing and care and where the percentage of metritis infection was rather even too, there nevertheless was often an unexplainable difference in the percentage of pregnant cows. For instance, in Paeregaard, an estate I mentioned before, the metritis cases were more numerous and more malignant than in Ladegaard, during the first year of treatment as well as in the beginning of the second year, nevertheless 65% of the animals compared with 72% in Ladegaard became pregnant. In the second year, however, the percentage of Paeregaard decreased in an inexplicable way, as the metritis cases were now no worse than in the other two herds which belonged to the estate. The cause could be only the bulls; there were three bulls used for the healthy cows, and one

which was bred only to the animals which had infectious abortion. The lists indicated that the bull "Odin" had covered 72 cows, 25 of which became pregnant; in the case of the bull "Bjarke" it was 37 out of 76, and in "Loke" 11 of 24. An examination of the genital organs offered the necessary explanations of these poor results. Odin had a hard tumor of an apparently tuberculous nature in the upper part of his right testicle; the other three were affected with an inflammation of the preputium, which did not prevent the mating act but caused its being insufficiently executed. One of the bulls infected the cows, but only in a hardly noticeable degree, and was later cured; the affection of the other bulls resisted treatment.

The preputial catarrh is **per se** of no influence in regard to the fecundation, if only the act is perfected with the necessary energy. In July 1906 all the bulls of the estate Falkensteen became suddenly very slow in covering the cows, but nevertheless did it satisfactorily. In November of the same year I began the examination and treatment of the cows there and found quite a number of fresh metritis cases. During the fall and the winter the bulls became still more slow and in February they refused entirely to cover the cows; on all of them a preputial catarrh was found. The animals were treated and the mating was discontinued for one month. After the lapse of this time the bulls were cured and the slowness in the mating act had disappeared; there is, therefore, no doubt that the preputial catarrh was the real cause of the trouble. The percentage of pregnancy was, in spite of the conditions of the bulls, a quite favorable one, namely 87%. Another example of the importance which is to be attached to the condition of the bull, I found in a herd of 12 cows, three of which had aborted. The affection of all the cows was of a slight nature and all showed symptoms of heat 14 days after parturition. The three cows which had aborted were covered by a strong and healthy bull, while the others were bred to an overworked animal of a breeding

society. The first three cows all became pregnant after the one cohabitation, but only one of the others did. None of the animals showed any lesions after two careful examinations.

I saw also many other cases where the bulls did not breed well, and it is necessary to keep this possibility in mind, in passing a judgment on a treatment of sterility.

Sometimes in a herd of heifers only a few are pregnant; then there is most certainly something wrong with the bull. If the bull is together with the cows in a pasture, then the breeding can not be observed and controlled; it may happen that a number of cows come in heat at the same time and the bull can then not be expected to cover them all well. Even a young bull may early become a poor breeding animal.

The success of the treatment depends, of course, chiefly on whether benign or more or less severe cases are the subjects.

In the result of the treatment the date of commencement of the pregnancy after the treatment, must also be considered and not only that the animal becomes pregnant at all.

In the following tabulations only such herds are included that were under observation and treatment for a considerable time, and of which I have all the important observations and the breeding lists, and in which I had the chance to make the final diagnosis of pregnancy. Single animals and herds where I undertook the treatment only casually, are not included.

With the exception of the first eight herds, I have not used the pressing out of the yellow bodies, to any extent.

The number of cows under observation was 3,527, 1,513 of which were treated once or more often on account of metritis, or of irregularities of the estrum. All the animals came under treatment in an early stage.

Of these cows 1,176, or 78%, became pregnant again.

The value of the pregnancy, however, as I have already stated, depends very much upon the length of time which has elapsed before the fecundation. Therefore, in 1,004

cases, I give the exact time in which the fecundation took place. I could not include all the animals, since I did not always have complete lists, and as a part of the cows became pregnant after I finished this report.

Out of 1,004 cows the following numbers became pregnant in the following time:

510 within 6 weeks.
187 within 2 months.
135 within 3 months.
64 within 4 months.
48 within 5 months.
39 within 6 months.
21 within more than 6 months.

The number of animals which became pregnant inside of the first three months is therefore 832, or 83%. It is likely, therefore, that if the animals come under treatment soon after the last parturition, in 83% of them sterility can be prevented. The normal term between two deliveries is 15 months; if, therefore, the cow calves later, a temporary sterility is present. To prevent this condition the cows have to come under treatment early.

In the last two columns of the tabulation the animals are given which carried over into the next year, and those which were discarded as hopeless. The first number 154 or 10%, the latter 180 or 12%. Of the animals which were carried over not all are sterile ones, as some came under treatment shortly before the end of the year. Among the discarded ones all animals are included which were treated, even if found to be incurable after a short trial; not included, however, are the animals which were eliminated in the first examination. Among the latter are all the animals which had been sterile so long that a treatment would have been unreasonable. In every herd many of such cows are found at the beginning of the treatment.

In the now following tabulations is recorded the treatment of the animals which had aborted is recorded.

| Estate | No. of Cows..... | No. of Treated Cows ..... | Time ..... | Percentage .... | No. of Pregnancies after the Treatment .... | Percentage .... | Time of Fecundation After the Treatment | | | | | | | Carried over ... | Incurable ..... | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 M. 6 W. | 2 M. | 3 M. | 4 M. | 5 M. | 6 M. | 7 M. | | | |
| 1 | 120 | 77 | $^{11}/_{15}$ 05 $^{8}/_{1}$ 06 | 64 | 65 | 84 | 32 | 7 | 6 | 1 | — | 2 | — | 8 | 4 | |
| The same | 123 | 64 | $^{12}/_{4}$ 06 $^{1}/_{8}$ 07 | 52 | 56 | 87 | 28 | 11 | 9 | 4 | 3 | 1 | — | 5 | 3 | |
| 2 | 208 | 88 | $^{11}/_{17}$ 05 $^{10}/_{1}$ 06 | 42 | 61 | 70 | 28 | 12 | 6 | — | 4 | 2 | 3 | 15 | 12 | |
| The same | 189 | 74 | $^{12}/_{15}$ 06 $^{10}/_{16}$ 07 | 39 | 61 | 82 | 25 | 5 | 8 | 2 | 1 | 2 | — | 7 | 6 | |
| 3 | 106 | 63 | $^{3}/_{13}$ 06 $^{10}/_{1}$ 06 | 60 | 48 | 76 | 27 | 6 | 6 | 6 | 3 | — | — | 6 | 9 | |
| The same | 98 | 49 | $^{12}/_{15}$ 06 $^{10}/_{1}$ 07 | 50 | 39 | 80 | 10 | 12 | 5 | 3 | 1 | 5 | — | 8 | 2 | |
| 4 | 35 | 18 | $^{12}/_{11}$ 05 $^{10}/_{1}$ 06 | 51 | 15 | 83 | 7 | 2 | 1 | 1 | 3 | 1 | — | 0 | 3 | |
| The same | 35 | 7 | $^{12}/_{11}$ 06 $^{10}/_{1}$ 07 | 20 | 7 | 100 | 3 | 2 | 2 | — | — | — | — | 0 | 0 | |
| 5 | 30 | 17 | $^{12}/_{17}$ 05 $^{1}/_{1}$ 07 | 57 | 14 | 82 | 7 | 1 | 1 | — | 1 | 2 | — | 1 | 2 | |
| The same | 30 | 14 | $^{1}/_{1}$ 07 $^{10}/_{22}$ 07 | 46 | 11 | 78 | 6 | 4 | 1 | — | — | — | — | 3 | 0 | |
| 6 | 100 | 46 | $^{12}/_{1}$ 05 $^{10}/_{1}$ 06 | 46 | 38 | 82 | 12 | 5 | 5 | 4 | 4 | 1 | 5 | 1 | 7 | |
| The same | 100 | 35 | $^{3}/_{23}$ 07 $^{12}/_{10}$ 07 | 35 | 22 | 63 | 7 | 5 | 1 | — | — | 1 | 1 | 4 | 9 | |
| 7 | 30 | 14 | $^{2}/_{6}$ 06 $^{10}/_{1}$ 06 | 48 | 11 | 80 | 5 | 2 | 3 | 1 | — | — | — | 1 | 2 | |

| Estate | No. of Cows .... | No. of Treated Cows ..... | Time ..... | Percentage .... | No. of Pregnancies after the Treatment ... | Percentage .... | Time of Fecundation After the Treatment | | | | | | | Carried over ... | Incurable ..... | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 M. 6 W. | 2 M. | 3 M. | 4 M. | 5 M. | 6 M. | 7 M. | | | |
| The same | 30 | 5 | $^{3}/_{15}$ 07 | 5 | 5 | 100 | 5 | — | — | — | — | — | — | 0 | 0 | |
| 8 | 175 | 95 | $^{11}/_{15}$ 05 $^{8}/_{1}$ 06 | 54 | 77 | 81 | 43 | 9 | 3 | 3 | 2 | 2 | 5 | 12 | 6 | |
| 9 | 155 | 38 | $^{3}/_{15}$ 06 $^{10}/_{1}$ 06 | 25 | 26 | 66 | 14 | 5 | 2 | 1 | 1 | 2 | 1 | 7 | 6 | |
| 10 | 140 | 37 | $^{11}/_{15}$ 05 $^{8}/_{1}$ 06 | 26 | 26 | 70 | 12 | 9 | 2 | 1 | 1 | — | — | 4 | 7 | |
| 11 | 75 | 33 | $^{12}/_{5}$ 05 $^{7}/_{10}$ 06 | 44 | 24 | 72 | 15 | 4 | 3 | 1 | — | 1 | — | 1 | 8 | |
| 12 | 170 | 66 | $^{5}/_{5}$ 06 $^{5}/_{5}$ 07 | 37 | 48 | 72 | 20 | 11 | 9 | 2 | — | — | — | 6 | 12 | |
| 13 | 170 | 120 | $^{5}/_{5}$ 06 $^{5}/_{5}$ 07 | 70 | 78 | 65 | 43 | 14 | 9 | 2 | — | — | — | 14 | 28 | |
| 14 | 112 | 41 | $^{1}/_{5}$ 07 $^{12}/_{14}$ 07 | 36 | 35 | 46 | — | — | — | — | — | — | — | 4 | 2 | |
| 15 | 50 | 35 | $^{1}/_{15}$ 07 $^{10}/_{15}$ 07 | 50 | 28 | 80 | 11 | 10 | 5 | 1 | — | — | — | 6 | 1 | |
| 16 | 50 | 16 | $^{1}/_{15}$ 07 $^{10}/_{15}$ 07 | 32 | 13 | 81 | — | — | — | — | — | — | — | 2 | 1 | |
| 17 | 40 | 14 | $^{1}/_{15}$ 07 $^{10}/_{15}$ 07 | 33 | 12 | 86 | 5 | 1 | 5 | 1 | — | — | — | 2 | 0 | |
| 18 | 60 | 19 | $^{12}/_{12}$ 05 $^{10}/_{1}$ 06 | 33 | 14 | 73 | 7 | — | 1 | 2 | — | 3 | 1 | 0 | 5 | |
| 19 | 15 | 6 | $^{1}/_{15}$ 07 $^{10}/_{15}$ 07 | 40 | 6 | 100 | 3 | 2 | — | — | — | 1 | — | 0 | — | |

| Estate | No. of Cows..... | No. of Treated Cows ..... | Time ..... | Percentage .... | No. of Pregnancies after the Treatment ... | Percentage .... | Time of Fecundation After the Treatment | | | | | | | Carried over ... | Incurable ..... | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 M. 6 W. | 2 M. | 3 M. | 4 M. | 5 M. | 6 M. | 7 M. | | | |
| 20 | 130 | 72 | $^{11}/_{16}$ 06 $^{8}/_{1}$ 07 | 55 | 63 | 87 | 35 | 5 | 6 | 8 | 3 | 4 | — | 3 | 6 | Not bred from August until middle of December. |
| 21 | 65 | 25 | $^{12}/_{15}$ 06 $^{7}/_{1}$ 07 | 38 | 14 | 56 | — | — | — | — | — | — | — | 7 | 4 | All animals, which had calved in spring not bred until Dec. |
| 22 | 250 | 41 | $^{5}/_{14}$ 07 $^{2}/_{8}$ 08 | 16 | 33 | 80 | 12 | 13 | 5 | — | — | — | — | 4 | 4 | |
| 23 | 45 | 13 | $^{10}/_{12}$ 05 $^{6}/_{11}$ 06 | 37 | 10 | 77 | 4 | 1 | 4 | — | — | — | 1 | 3 | 0 | |
| The same | 45 | 19 | $^{10}/_{1}$ 06 $^{1}/_{1}$ 07 | 44 | 12 | 63 | 7 | — | 1 | — | — | 3 | 1 | 2 | 5 | Three cows over 12 years old; one pyometra. |
| 24 | 28 | 6 | $^{12}/_{18}$ 05 $^{9}/_{7}$ 05 | 21 | 6 | 100 | 4 | 1 | — | 1 | — | — | — | 0 | 0 | |
| The same | 28 | 10 | $^{9}/_{7}$ 06 $^{11}/_{11}$ 07 | 70 | 7 | 70 | 3 | 2 | 2 | — | — | — | — | 1 | 2 | |
| 25 | 30 | 24 | $^{10}/_{1}$ 06 $^{12}/_{1}$ 07 | 87 | 18 | 75 | 5 | 3 | 3 | 4 | — | — | 2 | 0 | 3 | 12 aborted; 2 sold; one pyometra. |
| 26 | 32 | 7 | $^{6}/_{7}$ 06 $^{9}/_{14}$ 00 | 22 | 6 | 85 | 2 | 2 | 1 | 1 | — | — | — | 0 | 1 | |
| 27 | 25 | 12 | $^{12}/_{2}$ 05 $^{7}/_{15}$ 06 | 50 | 12 | 100 | 2 | 1 | 2 | 5 | — | 2 | — | 0 | 0 | |
| 28 | 30 | 20 | $^{11}/_{22}$ 05 $^{9}/_{21}$ 06 | 66 | 16 | 80 | 6 | 2 | 5 | 2 | — | 1 | — | 2 | 2 | |
| 29 | 25 | 11 | $^{2}/_{1}$ 06 $^{6}/_{1}$ 06 | 44 | 10 | 90 | 9 | 1 | — | — | — | — | — | 0 | 1 | |
| 30 | 26 | 6 | $^{12}/_{15}$ 05 $^{5}/_{23}$ 06 | 23 | 6 | 100 | 4 | 1 | 1 | — | — | — | — | 0 | 0 | |

| Estate | No. of Cows.... | No. of Treated Cows ..... | Time ..... | Percentage .... | No. of Pregnancies after the Treatment ... | Percentage .... | Time of Fecundation After the Treatment | | | | | | | Carried over ... | Incurable ..... | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 M. 6 W. | 2 M. | 3 M. | 4 M. | 5 M. | 6 M. | 7 M. | | | |
| 31 | 24 | 6 | $^{6}/_{28}$ 06 $^{10}/_{1}$ 06 | 25 | 5 | 83 | 5 | — | — | — | — | — | — | 0 | 1 | |
| 32 | 20 | 14 | $^{1}/_{9}$ 06 $^{11}/_{10}$ 06 | 56 | 13 | 93 | 8 | 2 | 2 | 1 | — | — | — | 0 | 1 | 10 aborted. |
| The same | 24 | 6 | $^{2}/_{19}$ 07 $^{8}/_{24}$ 07 | 25 | 5 | 83 | 1 | — | 1 | — | — | — | 1 | 0 | 1 | 3 aborted. |
| 33 | 27 | 16 | $^{10}/_{1}$ 06 $^{10}/_{1}$ 07 | 60 | 13 | 81 | 4 | 4 | 2 | 2 | — | — | — | 0 | 3 | 11 aborted. |
| 34 | 50 | 35 | | 70 | 31 | 88 | — | — | — | — | — | — | — | 4 | 0 | |
| 35 | 17 | 17 | $^{8}/_{1}$ 06 $^{10}/_{1}$ 07 | 100 | 12 | 70 | 2 | 2 | 2 | 2 | — | — | — | 0 | 5 | Late treatment; three with nymphomania; three with cysts. |
| 36 | 24 | 22 | $^{11}/_{13}$ 06 $^{11}/_{1}$ 07 | 91 | 14 | 63 | 7 | 1 | 2 | — | 2 | 1 | — | 6 | 2 | |
| 37 | 30 | 9 | $^{1}/_{1}$ 07 $^{7}/_{1}$ 07 | 30 | 8 | 90 | 4 | 1 | — | 2 | — | — | — | 0 | 1 | |
| 38 | 16 | 7 | $^{10}/_{1}$ 06 $^{8}/_{1}$ 07 | 43 | 5 | 71 | 1 | 3 | — | — | — | — | — | 2 | 0 | |
| 39 | 7 | 4 | $^{6}/_{28}$ 06 | 40 | 3 | 75 | 3 | — | — | — | — | — | — | 0 | 1 | |
| 40 | 28 | 5 | $^{3}/_{5}$ 06 | 18 | 5 | 100 | 5 | — | — | — | — | — | — | 0 | 0 | |
| 41 | 25 | 8 | $^{1}/_{22}$ 06 $^{7}/_{24}$ 06 | 32 | 6 | 75 | 1 | 3 | 2 | — | — | — | — | 0 | 1 | |
| The same | 25 | 6 | $^{10}/_{1}$ 06 $^{10}/_{1}$ 07 | 24 | 4 | 70 | 1 | — | 1 | — | — | 2 | — | 0 | 1 | |
| | 3527 | 1513 | | 43 | 1177 | 78 | 510 | 187 | 135 | 64 | 48 | 39 | 21 | 154 | 180 | |

| Estate | No. of Cows... | Aborted..... | Treated..... | Estrum..... | Pregnant..... | Calved..... | Aborted..... | Remarks |
|---|---|---|---|---|---|---|---|---|
| Gronslette-gaard. | 18 | 3/31 05 | 5/5 06 | 4/7 06 | yes | 1/14 07 | | |
| | 31 | 10/15 05 | 5/5 06 | 5/30 06 | yes | 2/28 07 | | |
| | 32 | 3/19 06 | 5/5 06 | 5/31 06 | yes | 2/28 07 | | |
| | 36 | 2/3 06 | 5/5 06 | 6/24 06 | yes | 3/26 07 | | |
| | 40 | 7/27 06 | 11/4 06 | 11/26 06 | yes | 8/29 07 | | |
| | 43 | 9/3 06 | 11/4, 11/22 06 | 11/30, 1/21, 2/22 07 | yes | 11/22 07 | | |
| | 45 | 8/29 06 | 11/4 06, 1/22 07 | 1/19, 2/7, 4/12 07 | yes | 12/26 07 | | Pregnant again in July. |
| | 49 | 4/27 06 | 5/5, 11/4 06 | 5/23, 11/6 06 | yes | | 6/18 07 | |
| | 51 | 8/10 06 | 11/4 06, 1/22 07 | 3/24, 5/2 07 | yes | | | |
| | 54 | 8/27 06 | 11/4 06, 1/22 07 | 2/2 07 | yes | 11/11 07 | | |
| | 55 | 2/28 06 | 1/22, 4/16 07 | 3/1, 3/22, 4/15 07 | yes | 1/25 08 | | |
| | 56 | 4/29 06 | 5/5, 7/13 06<br>1/22, 4/16 07 | 7 times | yes | | | |
| | 57 | 6/17 06 | 7/13, 11/4 07 | no estrum | | | | Sold |
| | 58 | 9/9 06 | 11/1 06, 1/22 07 | 3/29, 4/18, 5/7 07 | yes | | | |
| | 61 | 9/6 06 | 11/1 06, 1/22 07 | 12/11, 1/16, 5/8 07 | yes | 1/21 08 | | |
| | 63 | 9/10 06 | 11/1 06, 1/22 07 | 12/6, 1/28, 2/19 07 | yes | 12/9 07 | | |
| | 72 | 11/28 06 | 1/22 07 | 2/13, 3/30, 8/25 07 | yes | | | |
| | 74 | 10/31 06 | 1/22 07 | 2/7, 3/5 07 | yes | | | Dead |
| | 78 | 1/19 07 | 1/22 07 | 5/7, 5/30 07 | yes | | 1/2 07 | |
| | 90 | 12/13 06 | 1/22 07 | 4/2, 5/1, 6/18 07 | yes | | | |
| | 91 | 10/2 06 | 11/1 06 | 12/30 06 | yes | 9/27 07 | | |
| | 93 | 12/21 06 | 1/22 07 | 3/7 07 | yes | | 10/22 07 | |
| | 94 | 12/23 06 | 1/22 07 | 5 times | | | | |
| | 96 | 1/2 07 | 1/22 07 | 3/12, 5/17 07 | yes | | 7/2 07 | |
| | 98 | 1/4 07 | 1/22, 6/18 07 | 4 times | no | | | |
| | 99 | 1/9 07 | 1/22 07 | 4 times | no | | | |
| Lade-gaarden. | | 1/18 07 | 4/11 07 | 6/11, 6/20 07 | yes | | | |
| | 146 | 2/23 07 | 6/11 07 | 4/30, 6/13, 7/20 07 | yes | | | |
| | 265 | 3/16 07 | 6/17 07 | 7/23 07 | yes | | | |
| | 316 | 4/5 07 | 6/16 07 | 7/18 07 | yes | | | |
| Damsbo Hoved-gaard. | 8 | 7/22 05 | 12/3 05 | 1/6 06 | yes | 10/9 06 | | |
| | 10 | 8/4 05 | 12/3 05 | 1/5 06 | yes | 10/13 06 | | |
| | 11 | 10/12 05 | 12/3 05 | 1/3 06 | yes | 10/9 06 | | |
| | 13 | 10/21 05 | 12/3 05 | 2/9 06 | yes | | 8/26 08 | |
| | 13 | 8/26 06 | 10/2, 12/2 06 | 3/1 07 | yes | | | |
| | 32 | 10/24 05 | 12/3 05 | 1/6 06 | yes | 10/13 06 | | |
| | 63 | 7/30 05 | 12/3 05 | 1/8 06 | yes | 10/13 06 | | |

| Estate | No. of Cows... | Aborted..... | Treated..... | Estrum..... | Pregnant..... | Calved..... | Aborted..... | Remarks |
|---|---|---|---|---|---|---|---|---|
| | 82 | 7/24 05 | 12/3 05 | 1/11 06 | yes | 10/12 06 | | |
| | 109 | 8/15 05 | 3/12 05 | 1/1 06 | yes | 11/11 06 | | |
| | 131 | 11/23 05 | 2/13 06 | 4/23 06 | yes | 1/31 07 | | |
| | 163 | 12/26 05 | 2/13 06 | 4/14 06 | yes | 1/21 07 | | |
| | 4 | 8/12 06 | 12/8 06 | 12/30 06, 1/20 07 | yes | 1/11 08 | | |
| | 7 | 8/12 06 | 12/8 06 | 1/12, 2/10, 3/20 07 | yes | 12/24 07 | | Sold. |
| | 24 | 9/1 06 | 12/8 06 | 2/10 07 | yes | | | |
| | 29 | 10/18 06 | many times | 6/30 07 | yes | | | |
| | 149 | 11/22 06 | 12/8 06, 1/26 07 | | yes | | | |
| | 98 | 11/20 06 | 12/8 06, 1/20, 3/21 07 | 4/24 07 | no | | | |
| | 70 | 11/14 06 | 12/8 06, 1/20 07 | 2/23 07 | yes | 11/30 07 | | |
| | 44 | 12/20 06 | 4 times | no | no | | | |
| | 36 | 10/2 06 | 3 times | 5 times | yes | 3/10 08 | | |
| Tybrind. | | | | | | | | |
| | 50 | 12/5 05 | 2/5 06 | 4/7, 5/17 06 | yes | 7/9 07 | | |
| | 83 | 8/7 05 | 11/29 05, 2/5 06 | 12/21 05, 1/30, 3/12 06 | yes | 12/11 06 | | |
| | 88 | 7/20 05 | 11/29 05 | 1/24 06 | yes | 10/28 06 | | |
| | 138 | 11/11 05 | 2/15 06 | 4/8 06 | yes | 12/28 07 | | |
| | 165 | 12/3 05 | 2/15 06 | 4/20 06 | yes | 1/26 07 | | |
| | 214 | 6/18 06 | 3 times | 3 times | no | | | |
| | 172 | 9/28 05 | 11/29 05 | 12/22 05 | yes | 10/8 06 | | |
| | 154 | 9/10 05 | 11/29 06 | 12/1 many times | yes | 3/21 07 | | |
| | 36 | 5/6 06 | 5/29 05 | 6/7 06 | yes | | | |
| | 16 | 9/8 06 | 10/5 06, 12/12 06 | 10/8 06, 1/12, 1/31 07 | yes | | | |
| | 31 | 9/8 06 | 12/12 06 | 1/30, 2/23 07 | yes | 1/4 08 | | |
| | 46 | 10/2 06 | 10/5 06 | 11/10 06 | yes | 7/24 07 | | |
| | 60 | 11/19 06 | 1/30 07 | 3/10 07 | yes | 12/10 07 | | |
| | 63 | 2/14 07 | 4/10 07 | | yes | | | |
| | 66 | 8/18 06 | 10/5 06, 5/11 07 | 5/11 07 | no | | | |
| | 78 | 12/3 06 | 7/13 07 | no | no | | | |
| | 141 | 11/12 06 | 12/12 06 | 2/29 07 | yes | 12/17 07 | | |
| | 210 | 11/27 06 | 1/30, 4/10 07 | | yes | 12/10 07 | | |
| | 151 | 8/15 06 | 10/5 06 | 10/10 06 | yes | 10/18 07 | | |
| | 184 | 9/12 06 | 10/5, 12/12 06 | 2/25 07 | yes | 12/16 07 | | |
| | 183 | 11/14 06 | 1/30 07 | 4/25 07 | yes | 2/28 08 | | |
| Vilhelms-borg. | 5 | 8/28 05 | 3/9, 4/20 06 | 5/10, 5/17 06 | yes | 2/12 07 | | |
| | 10 | 1/15 06 | 3/9, 4/20 06 | 5/4, 5/27 06 | yes | | | |
| | 20 | 1/29 06 | 3/9, 4/20 06 | 3/15 06 | yes | | | |

| Estate | No. of Cows. | Aborted. | Treated. | Estrum. | Pregnant. | Calved. | Aborted. | Remarks |
|---|---|---|---|---|---|---|---|---|
| | 85 | 1/27 06 | 3/9, 7/5 06 | 3/22, 5/3, 5/22, 7/4 06 | yes | | | |
| | 96 | 9/27 05 | 3/9 06 | 3/30 06 | yes | | | |
| | 107 | 2/9 06 | 3/9, 4/20 06 | 5/27 06 | yes | | | |
| | 148 | 12/28 05 | 3/9, 4/20, 7/5 06 | no | no | | | Necrosis of vagina. |
| | 149 | 2/1 06 | 3/9, 7/5 06 | | yes | | | |
| | 22 | | | | yes | | | |
| Rissinge. | 3 | 6/2 05 | 4 times | 7/10 06 | no | | | |
| | 7 | 10/10 05 | 12/12 05 | 1/9 06 | yes | | | |
| | 224 | 6/28 05 | 12/13, 2/21 06 | 5/26 06 | yes | 11/25 06 | | |
| | 248 | 10/8 05 | 2/21 06 | 4/5 06 | yes | | | |
| Dalum. | 26 | 4/4 06 | 5/4 06 | | yes | 6/4 07 | | 10223 lb. milk. |
| | 2 | 5/7 06 | 5/25 07 | 8/23 07 | yes | | | 403 lb. butter. |
| | 19 | 5/7 06 | | 7/13 07 | yes | | | |
| Anhoff. | | | | | | | | 9423 lb. milk. |
| | 6 | 9/24 05 | 4/25, 6/1 06 | 5/19, 6/3, 7/15 06 | yes | 4/21 07 | | 457 lb. butter. |
| | 8 | 12/6 05 | 2/23 06 | 4/4 06 | yes | 4/10 07 | | |
| | 9 | 8/17 05 | 2/23, 4/25, 6/1 06 | 7/6 06 | yes | 4/12 07 | | |
| | 12 | 9/2 05 | 4/25 06 | 5/21, 6/28 06 | yes | 4/9 07 | | |
| | 28 | 10/24 05 | 2/23, 4/25, 6/1 06 | 8/5, 9/4 06 | yes | 3/5 07 | | |
| | 52 | 11/18 05 | 2/23, 4/25, 6/1 06 | 4/28, 6/29 06 | yes | 4/5 07 | | |
| | 58 | 2/22 06 | 4/25, 6/22 06 | 5/24, 6/11 06 | yes | 4/5 07 | | |
| | 29 | 10/1 05 | 12/9 05, 2/23 06 | 2/11, 3/12 06 | yes | 1/27 07 | | |
| | 17 | 12/6 05 | 2/23 06 | 4/30 06 | yes | | | Sold. |
| | 22 | 12/13 05 | 2/27 06 o. fl. G. | " | yes | | | Sold. |
| | 5 | 6/30 06 | 12/9 05, 2/23 06 | 4/28, 5/30 06 | yes | 2/12 07 | | |
| | 56 | 7/18 07 | 7/11 07 | 7/24 07 | yes | | | |
| | 76 | 11/1 06 | 3/7, 7/11 07 | 6 times | yes | | | |
| Bare Brondstrup. | 25 | 5/20 07 | 7/8 07 | 7/14, 8/28 07 | yes | | | |
| | 21 | 7/4 07 | 7/13 07 | 8/19 07 | yes | | | |
| Falkensteen. | 26 | 12/16 06 | 3 times | 1 time | no | | | Pyometritis. |
| | 23 | Aug. 05 | 11/12 06 | 12/4 06 | yes | Oct. 07 | | |
| | 58 | 12/4 06 | 1/31 07 | 2/8, 5/3 07 | yes | | | |
| | 74 | 11/15 06 | 1/31 07 | 4/9 07 | yes | | | |
| | 77 | 11/16 06 | 1/31 07 | 4/15 07 | yes | | | |

| Estate | No. of Cows... | Aborted..... | Treated..... | Estrum..... | Pregnant..... | Calved..... | Aborted..... | Remarks |
|---|---|---|---|---|---|---|---|---|
| | 88 | 1/21 07 | 1/31 07 | 2/3, 5/27 07 | yes | | | |
| | 89 | 1/25 07 | 1/31 07 | 3/24, 4/14 07 | yes | | | |
| | 90 | 2/10 07 | 3/12 07 | 5/14, 6/14, 7/1 07 | no | | | |
| Skovgaard. | 1 | 4/25 06 | 6/6, 8/2, 11/20 06 | 12/3 06 | yes | 9/5 07 | | |
| | 2 | 12/3 06 | 2/19 07 | 3/11 07 | yes | 12/3 07 | | |
| | 7 | 1/20 07 | 2/19, 5/11 07 | 3/10, 4/9, 5/6, 8/8 07 | yes | 5/6 08 | | |
| | 12 | 3/19 06 | 6/6 06 | 17/14, 8/12, 9/20 07 | yes | | 3/26 07 | |
| | 12 | 3/26 07 | 5/11 07 | 5/31, 8/16 07 | yes | 5/20 08 | | |
| | 15 | 8/12 06 | 11/10 06 | 12/21 06 | yes | 10/1 07 | | |
| | 19 | 3/27 06 | 6/6 06 | 7/3 06 | yes | 4/5 07 | | |
| | 21 | 3/24 06 | 6/6 06 | 10/19 06 | yes | 7/24 07 | | |
| | 22 | 1/9 06 | 2/19 06 | 3/31 06 | yes | 12/27 06 | | |
| | 23 | 4/2 06 | 6/6 06 | 6/22 06 | yes | 3/26 07 | | |
| | 24 | 3/9 06 | 4 times | 9 G. 6/4 07 | yes | 3/1 08 | | |
| | 18 | 4/21 06 | 6/6 06 | 6/15, 7/6 06 | yes | | 10/12 06 | |
| | 18 | 12/10 06 | | | | | | Sold. |
| | 14 | 5/10 06 | not treated | 7/11 06 | yes | | Nov. 06 | |
| Lange-myre-gaard. | 54 | 2/15 07 | once | 4/23, 5/13 07 | yes | 2/8 08 | | |
| | 48 | 1/5 07 | 2/22 o. fl. G. | 5 times | yes | 8/4 08 | | |
| | 4 | 12/8 06 | 1/15 07 | | | | | Sold in April Pyome-tritis. |
| | 16 | 4/1 07 | 8/28, 10/8 07 | 3 times | no | | | |
| | 20 | 2/20 07 | several times | several times | | | | |
| | 39 | July 06 | many times | many times | | | | |
| | 22 | 5/31 06 | not known | 9/18 07 | no | | | Cyst. |
| | 33 | 4/13 07 | 4/20, 6/8, 10/8 07 | | no | | | |
| | 37 | 2/21 07 | 4/2, 6/8, 8/28 07 | 8/27, 9/19 10/3, 11/29 07 | yes | 8/13 08 | | |
| | 41 | 12/12 06 | 4/2 07 | 4/8 07 | yes | 1/22 08 | | |
| | 43 | 2/23 07 | 4/2 07 | 7/1 07 | yes | 4/2 08 | | |
| | 44 | Nov. 06 | 2/8 07 | 2/17 07 | yes | 11/26 07 | | |
| | 46 | 11/16 06 | 1/11, 2/8, 2/22 07 | 3/23 07 | yes | 12/30 07 | | |
| | 53 | 2/21 07 | not treated | | | | 11/26 07 | |
| Raaby-gaard. | 2 | 11/11 06 | 2/1, 4/24 07 | 5/1, 6/14, 07 | yes | | 1/25 08 | |
| | 4 | 1/28 07 | 2/14 07 | 4/13 07 | yes | 1/11 08 | | |
| | 5 | 12/13 06 | 4/24 07 | 2/28, 4/25, 5/21 07 | yes | 2/29 08 | | Sold. Pyome-tritis. |
| | 6 | 10/3 07 | 10/16 07 | | | | | |
| | 7 | 8/1 07 | 11/21 07 | | | | | |

| Estate | No. of Cows... | Aborted..... | Treated..... | Estrum..... | Pregnant..... | Calved..... | Aborted..... | Remarks |
|---|---|---|---|---|---|---|---|---|
| | 8 | 4/7 07 | 4/28, 10/16 07 | 7/4, 8/2, 8/3, 11/3 07 | yes | | | |
| | 12 | Sept. 07 | 10/16, 11/21 07 | 11/3 07, 3/9 08 | yes | | | |
| | 13 | 1/1 07 | 2/14, 4/28 07 | 4/4, 5/1 07 | yes | 2/5 08 | | |
| | 15 | 12/8 06 | 2/14 07 | 2/11 07 | yes | 11/26 07 | | |
| | 16 | 2/5 07 | 4/24 07 | 5/8, 6/17, 7/13 07 | yes | | | |
| | 22 | 11/22 07 | 2/14 08 | 3/18 08 | yes | | | |
| | 24 | 8/30 06 | 2/14 07 | 2/28 07 | yes | 11/12 07 | | |
| | 26 | 1/30 07 | 2/14 07 | 4/21 07 | yes | 2/4 08 | | |
| | 28 | 8/18 07 | 10/16 07 | 11/18 07 | yes | 8/15 08 | | |
| | 3 | Mar. 07 | 4/24 07 | 4 times | yes | 6/29 08 | | Heifer. |
| | 14 | 3/5 07 | 4/24 07 | 5/21, 6/5 07 | yes | 4/23 08 | | |
| Värmelands-gaard. | 1 | 2/9 07 | 7/9 07 | 7/24 07 | yes | 4/16 08 | | |
| | 4 | 1/25 07 | February | March | yes | 4/25 08 | | |
| | 10 | 6/10 07 | not treated | | | | | Metritis. |
| | 11 | 2/9 07 | 3 times | 6 times | no | | | |
| | 13 | 7/19 07 | 3 times | 3 times | yes | | | |
| | 18 | 1/10 07 | 1 time | February 07 | yes | 11/4 07 | | |
| | 19 | 4/20 07 | 2 times | 8/17 07 | yes | 4/25 08 | | |
| | 20 | 11/4 07 | 1 time | 4/26 08 | yes | | | Cysts in |
| | 21 | 12/16 06 | several times | several times | no | | | the ovaries. |
| | 26 | 2/21 07 | 8/18 07 | 1/5 08 | yes | | 7/19 08 | |
| | 28 | 4/7 07 | 8/18 07 | several times | yes | 7/12 08 | | |
| | 29 | 5/17 07 | 8/18 08 | 10/2 07 | yes | 6/14 08 | | |
| | 30 | 8/24 07 | December | 5/9 08 | yes | | | Heifer. |
| | 31 | 11/7 07 | December | 2/2 08 | yes | | | |
| | 32 | 11/23 07 | December | 5/25 08 | yes | | | |
| Ct. Myre-gaard. | 49 | 11/7 07 | 6/25 08 | 2/25, 3/11, 6/15 08 | yes | | | |
| | 50 | 12/16 07 | 4/1 08 | 1/14, 4/7 08 | yes | | | |
| | 52 | 2/9 08 | 4/1 08 | 5/6 08 | yes | | | |
| | 55 | 1/28 08 | 4/1, 6/25 08 | 2/10, 2/28, 3/18, 4/8, 7/30 08 | yes | | | |
| | 57 | 7/1 08 | not treated | | | | | Sold. |
| | 59 | 12/5 07 | 1/28 08 | 1/15, 2/28 08 | yes | | | |
| | 61 | 3/12 08 | 6/25 08 | 7/3, 8/28 08 | yes | | | |
| | 63 | 8/25 07 | ? | ? | no | | | |
| | 66 | 5/28 08 | 6/25 08 | 6/27, 8/27 08 | yes | | | |

| Estate | No. of Cows... | Aborted..... | Treated..... | Estrum..... | Pregnant..... | Calved..... | Aborted..... | Remarks |
|---|---|---|---|---|---|---|---|---|
| | 67 | 1/28 08 | 4/1, 6/25 08 | 6/23, 7/11, 8/26 08 | yes | | | |
| | 68 | 1/29 08 | 4/1, 6/25 08 | 4/1, 5/27, 6/16, 7/27 8/12 08 | yes | | | |
| | 69 | 3/4 08 | 6/25 08 | 6/19, 7/25 08 | yes | | | |
| | 70 | 3/4 08 | 4/1, 6/25 08 | 4/14, 5/25, 7/30 08 | yes | | | |
| | 71 | 3/14 08 | 4/1, 6/25 08 | 6/2, 6/7 08 | yes | | | |
| | 72 | 3/21 08 | 4/1 08 | 4/19, 5/7 08 | yes | | 7/15 08 | Estrum 8/5 Pregnant Incurable. |
| | 73 | 3/25 08 | 4/1 08 | 5/30 08 | no | | | |
| | 74 | 3/30 08 | 6/25 08 | 5/8, 6/22, 7/26 08 | yes | | | |
| Eskilds-gaard | 3 | 6/1 08 | | | | | | |
| | 13 | 10/4 07 | 2/21 08 | 2/21 08 | yes | | | |
| | 6 | 9/2 07 | | 6/24 07 | yes | 3/25 08 | | |
| | 17 | 10/12 07 | 12/4 07 | 2/20 08 | yes | | | Cysts. |
| | 21 | 8/4 07 | 12/4 07 | 4/9 08 | yes | | | |
| | 22 | 12/31 07 | 12/4 07 | 3/26 08 | yes | | | |
| | 23 | 5/26 07 | 8/16 07 | 9/7 07 | yes | 7/13 08 | | |
| | 31 | 1907 | 8/16 07 | 9/8 07 | yes | 6/14 08 | | |
| | 34 | 11/2 07 | not treated | | | | | Killed. |
| | 36 | 1907 | several times | 8 times | no | | | |
| | 37 | 10/10 07 | 12/4 07, 2/26 08 | 1/29, 4/25 08 | yes | | | |
| | 50 | 10/13 07 | 12/4 07 | 12/15 07, 1/6 08 | yes | | | |
| | 57 | 1/11 08 | 2/26 08 | 3/27 08 | yes | | | |
| | 32 | 8/23 08 | | no estrum | | | | |
| Vente-godtgd | 2 | 8/17 07 | 10/26 07 | | | | | Pyome-tritis. |
| | 3 | 8/30 07 | 10/26 07 | 12/29 07, 1/14 08 | yes | | | |
| | 4 | 7/4 07 | 8/8 07 | 1/2 08 | yes | | | |
| | 12 | 7/13 07 | 8/8, 2/5 08 | 3/2 08 | yes | | | |
| | 15 | 7/13 07 | March 07 | 4/11, 7/7 08 | yes | 4/8 08 | | |
| | 16 | 9/30 07 | 10/26 07 | 3/24 08 | yes | | | |
| | 18 | 8/25 07 | 10/26 07 | 1/14 08 | yes | | | |
| | 20 | 11/19 07 | 2/5 08 | 2/18, 3/11 08 | yes | | | |
| | 23 | 7/9 07 | 8/8, 11/26 07 | 11/22 07 | yes | | | |
| | 26 | 6/27 07 | 8/8, 10/26 07 | 1/2, 2/29 08 | yes | | | |
| | 27 | 12/27 06 | March 07 | 6/21 07 | yes | 3/29 08 | | |
| | 34 | 11/9 07 | 2/5, 5/7 08 | 1/10, 2/6, 3/4, 4/7 4/29 08 | yes | | | |
| | 8 | 10/18 07 | 10/26, 2/5 08 | 2/16, 3/24 08 | yes | | | |

I have made the tabulations so explicit that each animal can be followed up; the reason is that I believe the treatment of aborting cows to be especially important, and often very much neglected. It is well known that infectious abortion plays an important role in the sterility question; at least it takes a long time to get cows pregnant which have aborted, and sometimes it is extremely difficult, so that the revenue from these animals is considerably diminished. If these animals abort a second time there is no profit at all. I have therefore attended to all the abortion cases which happened in the herds I had under treatment. At first I met frequently with septic metritis following an abortion, in which the secundinae had not been removed and the uterus had not been disinfected. Now on all the estates referred to here the necessary measures were undertaken after each abortion.

The tabulations indicate that it is not very difficult to get the cows which have aborted pregnant again, as 179 out of 213, or 85%, conceived. They prove further that the time of conception is not considerably retarted, even if many animals had to be bred several times on account of lesions on the cervix and on the orificium. Only 11 cows aborted a second time, while 93 carried out their calves. When the records were made a number had not yet finished their pregnancy, but on the basis of earlier experiences I do not expect many of them to abort.

On the large estates, with the exception of the herd in Grönslettegaard, a relatively small number of animals has aborted. It was to be expected that in the larger herds the spread of the infection was not so quick as in the smaller ones, and accordingly the losses smaller.

These results are a sufficient proof that infectious abortions do not need to be accompanied by considerable losses and that we have a means in the proper treatment of preventing most of them. If all the cows which have aborted come at once under the treatment indicated the metritis

either does not develop or is of short duration. In this case also the milk production, especially when the cows do not abort before the 5th or 6th month, is satisfactory, and the conception takes place very soon. The reason for a decreased milk output is more the usual metritis than the abortion, and the same is true of the temporary sterility. In consequence of the possibility of treating and curing the metritis after abortion, it would be inadvisable to postpone the breeding of such cows for 4-6 months. This period is no guarantee against the infection of the bull, and causes considerable losses in the milk production.

The following examples are pertinent:

1. In the herd of Mr. J., Skovgaard, 13 out of 24 animals, aborted during December 1905 and the year 1906; most of them from January to May 1906. One of them retained the placenta, and one was sold for a defect of the udder; the others all became pregnant. Three aborted for a second time, two of which conceived again.

2. Of the 34 cows in the herd of Mr. K., Langemyregaard, 14 aborted between November 1906 and December 1907, most of them, however, in the winter 1907. All of the cows retained the secundinae; eight became pregnant again and one aborted for a second time; four had been sold, two shortly after the calving; one had an incurable metritis and cysts of the ovaries; and one was carried over under treatment.

3. In the herd of Mr. J., Raaby, 16 cows aborted out of 24 between August 1906 and November 1907, 12 of them between November 1906 and April 1907. Most of them retained the placenta, which was removed in only a few; all of the animals came under treatment only a considerable time after the calving. 14 cows became pregnant again, and one aborted for a second time. Ten gave birth to a normal calf in the next year.

4. Between December 16, 1906 and April 23, 1907, Mr. B., Vaermelandsgaard, had 15 out of 23 cows abort. Twelve

of them did not retain the placenta. One cow was eliminated without treatment, and twelve became pregnant, six of which had a normal estrum. One animal aborted for a second time.

5. In the herd of Mr. D., St. Myregaard, 17 cows out of 30 aborted between July 1907 and May 1908, 14 became pregnant again, two of which aborted for a second time. Three animals were discarded, one during the treatment.

6. In the year 1907 14 cows out of 34 on the estate Eskildsgaard aborted. Ten became pregnant again, none of which aborted for a second time. Four cows were discarded, three of them without treatment.

7. During the year 1907, 13 cows out of 35 aborted in the herd of Mr. O. T., Ventegodgaard. Twelve conceived again; one was affected with a pyometra.

The following tabulation indicates clearly that the milk-production need not suffer in the year of the abortions; whether or not it is deficient in the following year depends on the time which was needed to cure the prevailing metritis cases. The milk-production, in other words, depends on whether the aborting animals conceive again in due time and carry out in the second year.

| Estate | Quantity of Milk | | | | |
|---|---|---|---|---|---|
| | 1904 from 1./1. until 12./31. | 1905 from 1./1. until 12./31. | 1906 from 1./1. until 12./31. | 1907 from 1./1. until 12./31. | 1908 from 1./1. until 9./1. = 8th Month |
| Skovgaard ..... | 129 000 | 112 000 | **128 000*** | 126 000 | 80 000 |
| | | 20 Cows | 22 Cows | 23 Cows | 20 Cows |
| Langemyregaard..... | 169 000 | 180 000 | 211 000 | **160 000** | 130 000 |
| | 32 Cows | 35 Cows | 38 Cows | 34 Cows | 34 Cows |
| Jensen, Raaby..... | | | 133 000 | **130 000** | 88 000 |
| | | | 24 Cows | 24 Cows | 24 Cows |
| Värmelandsgaard..... | | | 151 000 | **158 000** | 109 000 |
| | | | 23 Cows | 23 Cows | 23 Cows |

On three of the four estates the milk quantity was normal in the year of the abortion as well as in the following

*) The numbers of the abortion years are in heavy print.

year; this was not the case, however, in Langemyregaard. The explanation is that there the cows had aborted in an early state of pregnancy—before the fifth month—, and that many others had not conceived in proper time in spite of previous normal birth. In the time between December 1, 1907 and September 1, 1908 only three abortions were reported on the four estates; they were all in older cows, while generally abortions take place in young cows or heifers.

In conclusion I would like to say that we are able to combat the damage from infectious abortion to a considerable extent; even if we cannot prevent the spread of the infection and the abortions, we can bring the consequent lesions, such as metritis, and sterility, to a speedy conclusion. Thus we prevent a decrease in the milk-production, and, in most cases, a second abortion.

## PROF. W. L. WILLIAMS'

## New York State Veterinary College, Cornell University, Ithaca, N. Y., Modification of Albrechtsen's Uterine Catheters, Return Flow, and Knowles Uterine Forceps for Sterility in the Cow.

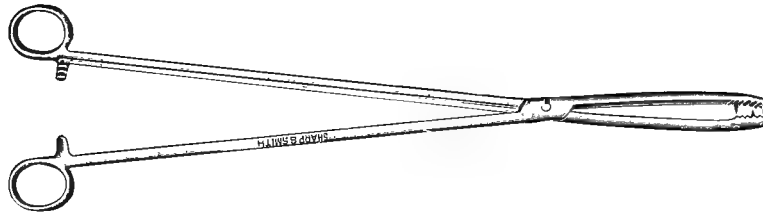

Fig. 22. Knowles' Special Uterine Forceps made in two lengths. Short Forceps, 15 inches long. Long Forceps, 20 inches long.

Instructions for using these instruments:

1. The 20-inch long uterine forceps are inserted into the vagina and guided by the hand to the external os uteri. The forceps are then opened and the one jaw is inserted as deeply as practicable into the os uteri; the other passes outside the lip of the os uteri. The forceps are then closed, grasping the lip of the vaginal portion of the uterus. Traction is exerted upon the forceps and the cervical portion of the uterus drawn back toward or into the vulva.

Albrechtsen's Uterine Catheters made in two styles and four sizes.


Fig. 23. Albrechtsen's Double Curve Catheter.

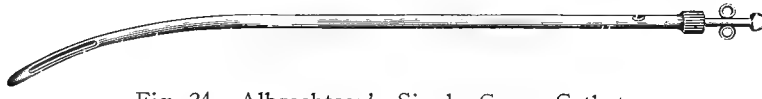

Fig. 24. Albrechtsen's Single Curve Catheter.

2. The shorter pair of forceps is now applied in a similar manner to the opposite lip of the external os uteri. Traction is applied to both pairs of forceps, the one being pressed to the right and the other to the left, so that the os uteri is exposed to view.

Extra small double curve taper point, size 14 inches long and 3/16 inch diameter at point. Small double curve, size 14 inches long, 5/16 inch diameter. Medium double curve, size 14 inches long, 7/16 inch diameter. Large double curve, size 24 inches long, ¾ inch diameter. Extra long, single curve taper point, 22 inches long, ¼ inch diameter at point.

3. The Albrechtsen uterine catheter of proper size is now introduced carefully through the cervical canal. No force is used. The catheter is revolved upon its long axis, is pressed towards the left or right, and upwards or downwards, or may be partially withdrawn and then pushed forward at a different angle, until the tortuous canal is finally found and followed into the uterine cavity. If this is not readily accomplished, introduce the Palmer's Uterine dilators carefully and trace the cervical canal. Open the dilators and thus dilate the canal somewhat, and press aside the transverse mucous folds. Repeat the application of the dilator until the uterine catheter can be safely and easily passed. The uterus is next douched by means of an ordinary fountain syringe, with a two per cent Lugol's solution, or other disinfectant, according to the desire of the operator. In cows which are sterile and where the uterus is slightly enlarged from chronic endometritis, the douching should occur one or two hours before breeding and all the solution forced out by rectal pressure. In other cases, where there is pus in the uterus, the douching may be repeated frequently.


Fig. 25. Palmer's Uterine Dilator (Modified.)

4. The large Albrechtsen uterine catheter is of special value in pyometra, following retained afterbirth. As a general rule it may be used without the application of forceps. In the use of these instruments as the uterine walls are frequently paralyzed, care is to be taken regarding the amount of force used. In many cases it is necessary for the operator to insert one hand into the rectum, and by pressing upon the uterus force the fluid out through the catheter. In all cases the fluid introduced through the catheter should be pressed out by rectal massage, unless it escapes freely of itself.


Fig. 26. Bozeman's Uterine Dressing Forceps.

5. The extra long uterine catheter is useful in evacuating pus from the uterus when the cervix is contracted. The inner tube may be detached and withdrawn, permitting the pus to flow out through the large outer tube.

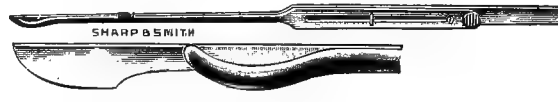


Fig. 27. Williams' Guarded Knife.

The Williams guarded knife is used to puncture those cysts of the ovaries which are too thick-walled to be

ruptured by compression. In performing this operation, the operator first grasps the ovary per rectum and draws it back over the roof of the vagina. The other hand then grasps the ovary, through the wall of the vagina and holds it securely. The bistoury is then carefully introduced guarded along the arm and hand, until the ovary is reached at the desired point, when the guard is removed and the blade of the instrument inserted.

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# *Contents*