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The Cause of the Conflicting
Statements Concerning the
Bacterial Contents of the
Vaginal Secretion of
the Pregnant
Woman

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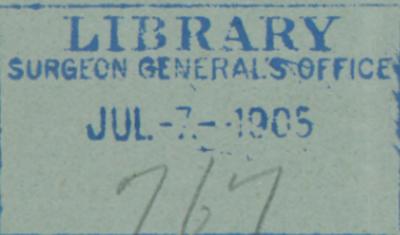
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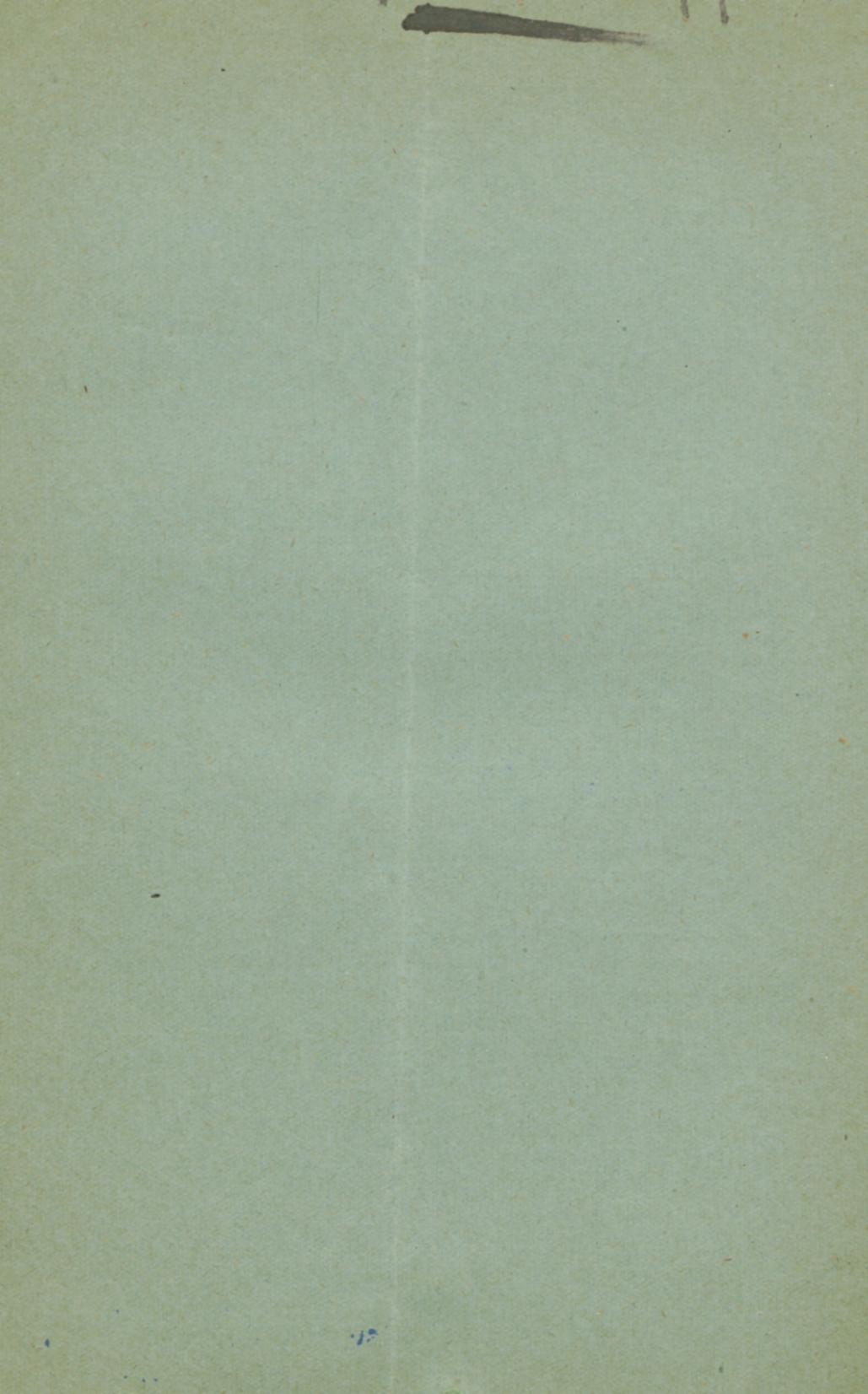
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THE CAUSE OF THE CONFLICTING STATEMENTS CONCERNING
THE BACTERIAL CONTENTS OF THE VAGINAL SECRETION
OF THE PREGNANT WOMAN.¹

EVERY one who has attempted to follow the literature upon the bacteriology of the vaginal secretion in pregnant women must be impressed with the large amount of work which has been done upon the subject, and must regret that it has not as yet led to a general consensus of opinion.

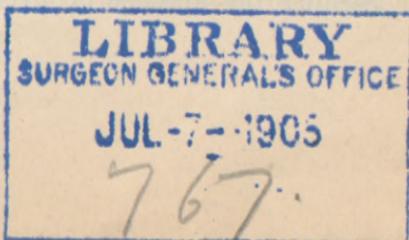
The first work upon the subject, in which modern bacteriological methods were employed, was published in 1887 by Gönner, who stated that the vaginal secretion of pregnant women did not contain the several varieties of bacteria which are usually found in puerperal infection, although it did contain large numbers of bacteria, which could be seen in cover-slip preparations, but which would not grow upon the usual culture media. He therefore concluded that autoinfection could not occur and that prophylactic vaginal disinfection was not necessary.

The same year, Döderlein stated that the lochia taken from the vagina, in at least 75 per cent of the cases, contained species of micro-organisms which grow upon the usual culture media, among which streptococci and staphylococci were not infrequently noted. He was accordingly forced to admit that autoinfection might occur in a certain proportion of cases, and accordingly advocated the use of prophylactic vaginal douches.

Hardly a year has elapsed since 1887 in which one or more articles have not appeared on this subject, and, unfortunately, the conclusions of almost every author have been more or less directly contradictory of those of his immediate predecessors.

I shall not attempt to go into the history of the subject at this time, for the reason that I have recently done so in the

¹ Read before the Medical Journal Club of Baltimore, October 22, 1898.



article which I read before the American Gynecological Society last May, and which appeared in THE AMERICAN JOURNAL OF OBSTETRICS for October, 1898, but shall content myself with saying that the various observers may still be grouped in the same two classes as were Gönner and Döderlein. The one class of observers, believing that the vaginal secretion of pregnant women is absolutely free from the various pathogenic micro-organisms which give rise to puerperal infection, discard the doctrine of autoinfection, and therefore consider preliminary vaginal disinfection as useless, if not absolutely harmful; while their opponents believe that the vagina is swarming with various varieties of pathogenic micro-organisms, and are accordingly forced to believe in the possibility of autoinfection in a certain number of cases, and to recommend the employment of prophylactic vaginal douches if they follow their belief to its legitimate conclusion.

To put the matter briefly, we may say that Gönner, Thomen, Samschin, Krönig, Menge, and myself (in 1898) take the negative side; while the majority of observers believe that pyogenic bacteria may be found in a certain proportion of cases; streptococci, not to mention the several varieties of staphylococci and the colon bacillus, having been found by the various observers in a varying percentage of these cases, as is shown by the following list: Burckhardt 4 per cent, Steffek 4 per cent, Döderlein $4\frac{1}{2}$ per cent, Burguburu $8\frac{1}{2}$ per cent, Vahle 10 per cent, Witte $12\frac{1}{2}$ per cent, Kottmann 13 per cent, Winter 15 per cent, myself (1893) 20 per cent, and Walthard 27 per cent.

In view of the marked discrepancy in the results of the various investigators, and the statement of Krönig that the positive results of most observers were due to the faulty method by which they obtained the secretion for examination, by which they themselves introduced into the vagina the bacteria which they later found in their cultures, I determined to repeat my work of 1893 upon a larger number of cases, following as closely as possible the technique employed by Krönig.

I did so, and reported the results of the examination of 92 cases to the American Gynecological Society last May, when I stated that I had been unable to cultivate streptococci from a single case, and had found the staphylococcus albus in only two cases, and therefore found nothing which could lend the slightest support to the doctrine of autoinfection.

These results fully substantiated Krönig's statements concerning the absence of pyogenic bacteria from the vaginal

secretion, and were directly contradictory of my work in 1893, when I examined the vaginal secretion from 15 pregnant women who were kindly placed at my disposal by the late Prof. Michael at the Lying-in Hospital of the University of Maryland. At that time, I demonstrated the presence of streptococci in 20 per cent and staphylococci in 53 per cent of my cases.

The explanation which I offered in my recent paper for this marked difference in results was that in my early work I unintentionally introduced into the vagina a large part of the organisms which I later found in the cultures, while I avoided so doing in my later work.

In 1893 I obtained the secretion for examination by introducing a sterilized cylindrical glass speculum into the vagina, and taking the secretion from portions of the vaginal wall which apparently had not come in contact with the end of the speculum; whereas, in the later series of cases, I employed an apparatus which was invented by Menge for obtaining the secretion from non-pregnant women. This consists of a nickel-plated tube about 25 centimetres in length and 4 or 5 millimetres in diameter, which is closed at one end. Just above the closed end is a fenestrum 2 centimetres long, which takes in about one-half the periphery of the tube. Within this tube fits a second tube, whose upper end is provided with a handle, and whose lower end is so arranged as to close the fenestrum, when it is pushed down within the outer tube, and to open it when it is drawn up. After sterilization, the instrument is ready for use and is introduced into the vagina, after spreading the margins of the hymen widely apart, taking care that the instrument does not come in contact with its margins. After its introduction, the fenestrum is opened and the secretion scooped up by giving the instrument a rotary motion, after which the fenestrum is closed and the tube removed from the vagina, and taken to the laboratory, where its contents are examined.

By this means one is able to obtain a secretion which has not been contaminated by bacteria from the entrance to the vagina; whereas, it is more than probable, when a speculum is used for obtaining the secretion, that a certain number of organisms, which are present about the hymen, are carried up into the vagina and become mixed with its secretion.

When I reviewed the literature from this point of view, I found that the observers who had obtained positive results (with the exception of Kottmann) had obtained the secretion for examina-

tion by means of a speculum; while Krönig, Menge, and myself employed a small tube, which could be introduced into the vagina without coming in contact with the margins of the hymen, and thereby practically eliminated the danger of contamination by bacteria from the vulva. At first glance, the work of Kottmann appears to contradict this statement, as he did not employ a speculum, but made use of an ingenious apparatus, with which he believed he could obtain the vaginal secretion without danger of contamination. His apparatus in this respect, however, is quite as faulty as the speculum, as I indicated in my paper, and its imperfections are clearly shown by the results obtained with it, as he demonstrated staphylococci in 70 per cent, streptococci in 13 per cent, and colon bacilli in 11 per cent of his cases.

While the explanation which I have offered explains the difference in results in an apparently satisfactory manner, it is not absolutely conclusive; and, on my return from the meeting of the American Gynecological Society last spring, I determined to attempt to settle the question definitely by the series of experiments to which I now wish to invite your attention.

From each of 25 pregnant women, who had not been examined previously, I removed with a platinum needle some of the secretion from the margins of the hymen and the inner surface of the labia minora, and then obtained a certain amount of vaginal secretion by means of Menge's tube, and immediately afterward introduced a sterilized glass speculum into the vagina and obtained the secretion from portions of the vaginal wall which apparently had not come in contact with the tip of the speculum. From each of the three secretions thus obtained, cover-slip preparations were made and three agar plates inoculated; agar alone being used as a culture medium, instead of the various media which I had employed in my previous work, as I desired to isolate and study only the pyogenic bacteria, instead of the entire bacterial flora of the vagina.

The results are shown in the table on pages 8 to 10 of this article, in which I give the bacteria which I cultivated from the three varieties of secretion from each case, and also the description of the cover-slip preparations which were made from the secretion obtained by means of Menge's tube. To avoid unnecessary repetition, I shall designate the secretion obtained from the vulva, and that obtained from the vagina by means

of Menge's tube and the speculum, as vulval, tubal, and specular secretion, respectively.

In 4 of 25 cases, I found the same organisms growing upon the plates from each of the three varieties of secretion, and, as they were identical with those which I found in cover slips made from the tubal secretion, I feel justified in concluding that I had to deal with the original vaginal secretion in each case, and that the tubal and specular secretions had not been contaminated from the vulva.

When we analyze the results which I obtained in the remaining 21 cases, we find that staphylococci (either albus or epidermidis albus) were observed in the vulval secretion in 15 cases (60 per cent), in the specular secretion in 10 cases (40 per cent), and that they were uniformly absent from the tubal secretion. I also found that colon bacilli were present in the vulval secretion in 4 cases, in the specular secretion in 2 cases, and that they were absent from the tubal secretion. Adding together the cases in which staphylococci or colon bacilli were observed, we find that pyogenic bacteria were found in the vulval secretion of 19 cases (76 per cent), in the specular secretion of 12 cases (48 per cent), and were entirely absent when secretion was obtained by means of the tube.

Looking at the matter from another point of view, we find that plates made from the vulval secretion were never sterile; while they were sterile in 5 cases (20 per cent) when the secretion was obtained by means of a speculum, and in 15 cases (60 per cent) when obtained by means of Menge's tube.

Upon a certain number of plates we found nothing but a few yeast colonies, which not infrequently occur in the normal vaginal secretion, so that we may also regard the cases in which they were observed as practically sterile. Yeast colonies were found twice in the vulval secretion and three times in both the tubal and specular secretions. Adding these results together, we find that the vulval and specular secretion was either sterile or contained nothing but yeast in 2 cases (8 per cent) and in 8 cases (32 per cent), respectively, while the tubal secretion was sterile or contained nothing but yeast in 18 cases (72 per cent).

It is accordingly evident that pyogenic bacteria occurred very frequently in the vulval secretion, less frequently in specular secretion, and were entirely absent from the tubal secretion, being present in 60, 40, and no per cent of the cases,

respectively; whereas the converse is the case when we consider the cases in which the cultures were sterile, as is shown by a percentage of 8, 32, and 72, respectively.

When we analyze the table from another point of view, we note that staphylococci were observed in the specular secretion in 10 cases, in 8 of which staphylococci were likewise present in the vulval secretion, but absent from it in the 2 remaining cases. As the tubal secretion was sterile in all of these cases, I feel that we shall not go far wrong in concluding that the staphylococci, which were found in the specular secretion in the 8 cases in which staphylococci also were found in the vulval secretion, had been carried up into the vagina from the vulva by means of the speculum; for had they been originally present in the vagina, they would likewise have been found in the tubal secretion. It would therefore appear that staphylococci were noted in the vulval secretion in 15 cases, and in 8 of them (53 per cent) were carried up into the vagina by introduction of the speculum.

Exactly the same may be said concerning the colon bacilli, which were observed in the vulval secretion in 4 and the specular secretion in 2 cases. In other words, colon bacilli, which were present at the vulva, were carried up into the vagina in 50 per cent of the cases by introduction of a sterile speculum.

My work shows conclusively, whenever pathogenic bacteria are present about the vaginal orifice, that they are carried into the vagina in about 50 per cent of the cases, when an object the size of a small cylindrical speculum is introduced into the vagina and comes in contact with the margins of the hymen.

And I believe that I shall not go far wrong if I state that the positive results of the observers who employed specula for obtaining the vaginal secretion for examination are to be explained in the same way; and it would appear that Krönig was perfectly justified in stating that the positive results of most investigators were due to bacteria which they had introduced into the vagina themselves.

This series of cases also serves to confirm my work of last spring and enables me to add 25 cases to the 92 which were then reported, making a total of 117 cases in which the vaginal secretion was obtained by means of Menge's tube, and in which streptococci were not found at all and staphylococci only in 2 cases.

The practical results obtained from the 25 cases under consideration may be summarized in the following conclusions:

1. This work tends to reconcile the conflicting results of the various observers by showing that they are due to the difference in the technique by which the secretion was obtained for examination, and not to gross errors in bacteriological work.

Those who obtained the secretion by means of a speculum carried bacteria from the vulva up with it and necessarily got positive results; while those who obtained their secretion by means of a small tube avoided so doing and obtained negative results.

2. This series of cases serves to confirm the previous work of Krönig and myself, which conclusively shows that the various pyogenic bacteria which give rise to puerperal infection are not found in the vaginal secretion of pregnant women.

3. This being the case, autoinfection with these organisms cannot occur, and when they are found in the puerperal uterus they have been introduced from without. Accordingly, prophylactic vaginal douches are not necessary and are probably harmful, laboratory work thus standing in direct accord with the practical experience of most clinicians.

4. The work clearly demonstrates the danger of vaginal examinations, as I have shown that the introduction of a small cylindrical speculum, which is certainly no larger than two fingers, carries up into the vagina, in 50 per cent of the cases, whatever pathogenic organisms may be present at the vaginal entrance.

In view of the extreme sensibility of the vulva and the manifest impossibility of disinfecting it with anything like the certainty with which we can disinfect our hands, it becomes apparent that the introduction of a perfectly sterile finger into the vagina is not always a harmless procedure.

5. The danger of the vaginal examination being thus demonstrated, it is apparent that it must give place more and more to the external examination of the pregnant and parturient woman.

No.	Name.	Appearance in tube.	Cover slip from secretion obtained by Menge's tube.	Agar plates.		
				From vulva.	Tube.	Speculum
1	.....	Thick, white.	Epithelium, no leucocytes. Vaginal bacilli, possibly a few cocci.	1. Staphylococcus albus. 2. Unidentified thick bacillus.	Sterile..	Short, thick, non-motile, unidentified bacillus.
2	Hagan.	Thick, white, starch-like.	Epithelium, leucocytes. Fairly thick bacilli, 1-2-4, alone, in pairs or short chains. Yeast (?).	Pink cocci....	Sterile..	Staphylococcus albus.
3	Cole	Thick, creamy, some gas bubbles	.....	Staphylococcus albus.	Sterile..	Sterile.
4	Hanks..	Yellowish fluid.	Epithelium, leucocytes. Short, thick bacilli, rounded ends. Yeast (?).	1. Short, tolerably thick bacilli, 1-2-3, rounded ends; non-motile; stain with Gram; grow anaerobically in agar, not in potato and milk. Yeast (?).	Like vulva.	Like vulva.
5	Galliger	Thick, white fluid.	Epithelium, many leucocytes. 1. Short, thick bacilli, rounded ends, from almost coccus forms to 1-3 2. Thinner bacilli, 1-3-4. 3. Yeast.	Staphylococcus albus.	Sterile..	Staphylococcus albus.
6	Henderson.	Thick, white fluid.	Epithelium, no leucocytes. 1. Fairly thick bacilli, rounded ends, 1-2-3. 2. Thicker bacilli, square ends, 1-3-4. 3. Yeast (?).	Short, thick bacilli, 1-2-3, rounded ends; non-motile; stain with Gram; grow on agar, not on other media.	Like vulva.	Like vulva.
7	Redding.	Thick, white, starch-like.	Epithelium, no leucocytes. Typical vaginal bacilli, possibly a few diplococci.	Staphylococcus epidermidis albus. Bacillus like vaginalis, growing upon agar, but not on other media.	Bacillus as in vulva.	Bacillus as in vulva.

No.	Name.	Appearance in tube.	Cover slip from secretion obtained by Menge's tube.	Agar plates.		
				From vulva.	Tube.	Speculum
8	Neubauer.	Thick, white, starch-like.	Epithelium, few leucocytes. 1. Fairly thick bacilli of varying length. 2. Yeast (?).	Staphylococcus albus.	Sterile..	Staphylococcus albus.
9	Maslin.	Thick, white, starch-like.	Epithelium, few leucocytes. 1. Fairly thick bacilli of varying length, 1-2-4, often in chains. 2. Thick bacilli, square ends, 1-3-4. 3. Diplococci. 4. Possibly few yeast.	Staphylococcus albus.	Sterile..	Sterile.
10	Olsen...	Thick, white, starch-like.	Epithelium, no leucocytes. 1. Fairly thick bacilli, 1-3-4, often in chains. 2. Yeast.	Staphylococcus albus.	Yeast..	Staphylococcus albus. Yeast.
11	Wilmott.	Thick, white, starch-like.	Epithelium, no leucocytes. 1. Vaginal bacilli. 2. Much thicker bacilli, rounded ends, 1-3-4.	Staphylococcus albus.	Sterile..	Staphylococcus albus.
12	Togood.	Thick, yellow fluid.	Epithelium, few leucocytes. 1. Short, thick bacilli, rounded ends. 2. Fairly thick, long bacilli, 1-4. 3. Large diplococci.	Colon bacillus	Bacillus like vaginalis growing upon agar.	Colon bacillus.
13	.....	Thick, white, starch-like.	Epithelium, very few leucocytes. Fairly thick bacilli, 1-3-4, often in chains.	Very thick bacilli, 1-3-5; decolorizes with Gram; non-motile; do not grow on milk or potato.	Sterile..	Like vulva.
14	Kingston.	Thick, white, starch-like.	Epithelium, no leucocytes. Vaginal bacilli. Yeast.	Yeast.....	Fairly thick bacilli, 1-3-4.	Yeast.
15	Pleasants.	Thick white, mucous	Epithelium, leucocytes. 1. Fairly thick, long bacilli, 1-4-5. 2. Fairly thick bacilli, 1-2.	Staphylococcus albus.	Sterile..	Staphylococcus albus.
16	Koslowsky.	Thick, yellowish white, gas bubbles	.....	Staphylococcus albus.	Sterile.	Staphylococcus albus.

No.	Name.	Appearance in tube.	Cover slip from secretion obtained by Menge's tube.	Agar plates.		
				From vulva.	Tube.	Speculum
17	Steed...	Thick, white, starch-like.	Epithelium, no leucocytes. 1. Fairly slender bacilli, from almost coccus forms to 1-3. 2. Possibly few diplococci.	Staphylococcus albus.	Sterile..	Sterile.
18	Lewis..	Thick, milky white fluid.	Epithelium, no leucocytes. 1. Tolerably thick bacilli of varying length, 1-2-5. 2. Possibly few diplococci.	Colon (at least 50 colonies).	3 colonies of colon.	Colon (12 colonies.)
19	Johnston.	Thick, white fluid.	Epithelium, leucocytes. Fairly thick bacilli of varying length, from almost coccus forms to 1-4.	Colon	Sterile..	Unidentified bacillus. Staphylococcus albus.
20	Williams.	Milky white.	Epithelium, leucocytes. 1. Long, fairly thick bacilli, 1-4-5, often in short chains. 2. Short, fairly thick bacilli, 1-2-3. 3. Few cocci.	Colon. Staphylococcus albus.	Sterile..	Staphylococcus albus.
21	Morris.	Thick, white, starch-like.	Epithelium, no leucocytes. 1. Tolerably thick bacilli, 1-2-4, often in short chains. 2. Possibly a few cocci.	Staphylococcus albus. Moderately thick bacilli, which will not grow beyond original plates.	Sterile..	Sterile.
22	Jones..	Thick, white, mucous.	Epithelium, no leucocytes. Fairly thick bacilli, 1-2-4. Possibly a few yeast.	Staphylococcus albus. Colon.	Yeast..	Yeast.
23	Hennings.	Thick, yellowish-green fluid.	Epithelium, leucocytes. 1. Short, thick bacilli, 1-1½-3, often in pairs and short chains. 2. Cocci and diplococci.	Staphylococcus albus.	Sterile..	Staphylococcus albus.
24	Jackson.	Thick, white fluid.	Epithelium, no leucocytes. 1. Large, thick bacilli, 1-4-6, square ends, often in long chains. 2. Cocci 3 Short, thick bacilli, 1-2-3, rounded ends	Cocci which growslightly on potato; no growth in milk.	Like vulva.	Like vulva.
25	Clark...	Thick, white.	Epithelium, few leucocytes. 1. Tolerably thick bacilli, 1-2-5. 2. Yeast.	Yeast	Yeast..	Yeast.

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