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Trichomoniasis of the Utah Agricultural Experiment Station Dairy Herd

Rue Jensen

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TRICHOMONIASIS OF THE UTAH AGRICULTURAL EXPERIMENT STATION DAIRY HERD

by

Rue Jensen

A thesis submitted in partial fulfillment of the requirements

for the degree of

Master of Science

in

School of Arts and Sciences

Utah State Agricultural College

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Approved:

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Major Professor

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For English Department

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Dean of the School

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Chairman of Committee on Graduate Work
ACKNOWLEDGMENTS

This problem was pursued under the direction of Dr. D. E. Madsen, whose constant supervision and patient teaching is greatly appreciated. Professor George Q. Bateman extended assistance and full use of the Experiment Station dairy herd and its supplementary equipment.
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INTRODUCTION

Definition and Etiology. Bovine trichomoniasis is a venereal infection that reduces the fecundity of cattle. It is caused by Trichomonas foetus (Riedmuller), a flagellated protozoan which inhabits the genital tract, causing inflammation and partial sterility. Both sexes are susceptible to infection. In females it is usually of short duration and frequently terminates spontaneously following abortion. In males the disease has both acute and chronic stages. During the acute stage the preputial membranes become inflamed and a muco-purulent discharge develops in which trichomonads are abundant. In the following chronic stage symptoms disappear, but the animal remains a carrier and is a dangerous source of infection to healthy cows. Diagnosis is made by examining the material from infected organs for the specific parasite.

Taxonomy and Morphology of Trichomonas foetus (Riedmuller).

Classification is as follows:

Phylum—Protozoa
Subphylum—Plasmodroma
Class—Mastigophora
Subclass—Zoomastigina
Order—Polymastigida
Family—Trichomonadidae
Genus—Trichomonas
Species—foetus

The cell body of Trichomonas foetus (Riedmuller) is fusiform or napiform. It varies from 9 to 20 microns in length, and from 3 to 7 microns in width. Its salient features are an undulating membrane and 4 flagella arising from the blepharoplast, 3 of which are anterior and free, the fourth proceeds caudad bordering the undulating membrane for
its entire length and projecting unattached behind. By means of the flagella and undulating membrane the organism moves jerkily through an irregular course, as is characteristic of the genus *Trichomonas*. For detailed morphology see figure 1.

1. Blepharoplast
2. Anterior flagella
3. Posterior flagellum
4. Undulating membrane
5. Accessory filament in the undulating membrane
6. Posterior free flagellum
7. Costa
8. Axostyle
9. Endoaxostylar granules
10. Chromatic ring
11. Terminal spine
12. Parabasal body
13. Cytoplasm
14. Nucleus
15. Cytostome
16. Karyosome

Figure 1. Diagram of *Trichomonas foetus* (Riedmiller). x4000.
After Wenrich

**Distribution of Infection.** Bovine trichomoniasis has a wide geographic distribution. In Europe it has been reported from Italy, France, Germany, Holland, and England. Futamura has reported it from Japan. In the United States the infection is known to be present in the states of New York, Pennsylvania, Iowa, Illinois, Maryland, Texas, Michigan, California, and Utah.

Survey work done in Utah under the direction of the Utah Agricultural Experiment Station includes examination of herds in Cache, Utah, Davis,
Sanpete, and Sevier Counties. Infections were found present in all counties where examinations were made except Sevier. Because of unrestricted commerce of cattle among the important live-stock centers, it is supposed that trichomoniasis is widely spread and probably exists in some cattle in the majority of the counties of the state.

REVIEW OF LITERATURE

*Trichomonas foetus* (Riedmuller) was discovered by Mazzanti (19) in 1900 in material from cows considered to be permanently sterile, a condition which he assumed was caused by the protozoan. In 1925, Derscher (19) observed flagellates in an aborted foetus. In 1928, Riedmuller (19) also found trichomonads in an aborted foetus. He described and named the organism. During the period from 1929 to 1932 Abelein (19) extensively investigated incidence among cows having diseased uteri. Of the 168 animals studied by Abelein 144 harbored trichomonads. Abelein tested the pathogenicity by inoculating 8 heifers intravaginally, 4 with material containing uterine and vaginal microflora, but not trichomonads. These animals served as controls. The other 4 heifers he inoculated with material having similar microflora, but containing trichomonads in addition. After breeding the 8 heifers to a normal bull, the 4 controls remained normal; but of the 4 inoculated with trichomonads 1 aborted, 1 became sterile, and 2 developed pyometra. From the stomach contents of an aborted foetus, Witte (19) in 1934 obtained bacteria-free trichomonads which he propagated in vitro. With this strain Witte repeated Abelein's experiment and obtained similar results.

Trichomoniasis was first observed in the United States in 1932 at Pennsylvania by Emmerson (9), who with Wenrich (22) made an accurate,
detailed description of the morphology of *Trichomonas foetus* (Riedmuller). Cameron, Fincher, and Gilman (5) encountered herds whose breeding histories were similar to those described for European cases of trichomoniasis. In them the presence of trichomonads was subsequently demonstrated. Cameron (3) retested *Trichomonas foetus* (Riedmuller) for pathogenicity by inoculating it into heifers, free from Bang's disease, which were subsequently bred to an undiseased bull. Results obtained were similar to those of Abelein and Witte. During 1937-1938 Andrews (2) and Rees (19) made intensive studies of the course, sequelae, and transmission of infection, and they improved the methods of diagnosis.

**OBJECTS OF STUDY**

In January 1936 all members of the Utah Experiment Station dairy herd reacted negatively to the agglutination test for Bang's disease. Yet sterility and other breeding difficulties persisted. During the ensuing 2 years from 85 breedings 22 normal calves were delivered, averaging 4 breedings per calf. Four aborted foeti were observed. In fluid from all of these foeti trichomonads were found and pronounced as the causative agent of abortion by Dr. D. E. Madsen, Animal Pathologist for the Utah Agricultural Experiment Station. During the same period, from January 1936 to December 1937, Dr. D. E. Madsen and Dr. O. G. Larsen made microscopic examinations of 57 samples of morbid uterine and vaginal exudate from 34 cows which were encountering breeding difficulties and found trichomonads present in 9 of the samples. Special attention was given to those animals diagnosed positive, and periodic examinations were made of them. But for successive examinations consistent results were not obtained. The same animal was sometimes found to be positive,
then negative, and then positive again on successive examinations. Results, similarly inconsistent, were obtained in survey work preliminary to this study. Occasional abortions, shown definitely to be due to trichomoniasis, indicated an enzootic infection. Yet the exact cases, other than those aborting advanced foeti, could not be located. Any short series of negative findings for an animal was insufficient evidence for negative diagnosis, because no reliable method of diagnosis was available. The source of herd infection, its course, and its symptoms were insufficiently known.

Because the disease was assuming progressively more importance throughout the state, its study was necessitated with 2 objectives: (1) to introduce a more accurate, efficient method of diagnosis, and to determine the exact herd incidence; (2) to determine the course, symptoms, and source of herd infection through the study of individual cases.

METHODS OF PROCEDURE

Diagnosis and Exact Incidence. Bovine trichomoniasis is diagnosed by demonstration of the causative organism by microscopic examination. Difficulties sometimes attend. There is evidence, as will be shown later, that the preferred habitat of the parasite is the uterine cavity. Some investigators suppose that the uterus is the primary site of infection and that the parasites are found in the vagina only as they are discharged from the uterine reservoir. The vagina, being an unsuitable habitat, rapidly diminishes the number of trichomonads to a point where there is little probability of their detection.

Usually it is impossible to extract material from the uterus; therefore, examinations must be made from vaginal contents. It may be attempted by direct microscopic examination or by culturing in an arti-
ficial medium followed later by microscopic examination.

**Direct Examination without Culture.** In the early pioneer work on bovine trichomoniasis diagnoses were made by examining sample exudate microscopically without culturing. It was accomplished by collecting mucus and morbid fluid from infected organs with a cotton swab saturated with isotonic solution and attached to a metal applicator. Fluid for examination was obtained by pressing the swab between 2 glass slides. This method has 3 disadvantages: (1) it is inconvenient; (2) it necessitates immediate examination following extraction, which is usually impractical under field conditions; (3) without concentration of the parasites, paucity often renders their detection a difficult and tedious process. This may account for the inconsistency in findings of earlier work. The direct method for diagnosis has been employed in Utah by Dr. D. E. Madsen and Dr. O. G. Larsen. It was used at the beginning of this study, but without success. Dikmans (7) of the U. S. Bureau of Animal Industry still uses and advocates the method. Andrews (2) and Rees (19) have experimentally compared the direct method with the culture method and have found the latter more reliable and more efficient.

**Culture Method.** This method attempts to concentrate the trichomonads by inoculating them into a culture medium which is suitable to their growth and reproduction, thus facilitating their detection. The culture method was used throughout the main part of this study. Its technique was developed by Andrews (2) and improved by Rees (19). Necessary equipment includes pipettes, culture medium, incubator, and microscope.

The pipette is an instrument for extracting material from infected organs for subsequent examination. The ones used in this study were prepared in the laboratory. It is a simple instrument, inexpensive,
conveniently used for extracting material to be examined, and easily and readily constructed. One end of a piece of glass tubing, 20 inches long and three-eighths of an inch in diameter, was sealed by heating it to the melting point of glass. About one-fourth inch from the sealed end a lateral aperture was blown, the edges of which were smoothed by reheating. Four inches from the other end the tube was bent to form an inner angle of approximately one hundred and thirty-five degrees, with the angle and the lateral aperture on the same side of the tube. To the open end a rubber bulb of about fifty cc. capacity was attached, forming an instrument as shown in figure 2.

![Figure 2. Pipette for obtaining samples for examination](image)

Ringer's-Egg-Blood medium was the culture medium used in this study. It was prepared by thoroughly mixing 4 whole eggs with 50 cc. of Ringer's solution. After apportioning the mixture to test tubes in 1 cc. amounts, it was slanted and sterilized in the autoclave at 15 pounds pressure for 30 minutes. About fifteen cc. of Ringer's solution containing dextrose and defibrinated cow's blood were added to each of the tubes, filling them to capacity. The ingredients of Ringer's solution were in the following proportions:
Sodium chloride---------8.50 grams
Sodium bicarbonate-------0.20 "
Potassium chloride-------0.14 "
Calcium chloride---------0.12 "
Disodium phosphate-------0.01 "
Dextrose-----------------2.00 "
Distilled water---------1.00 liter

After adjusting the solution to a pH of 7.4, it was sterilized in the autoclave at 15 pounds pressure for 30 minutes. After cooling the solution to room temperature, 0.5 percent defibrinated cow’s blood was added under aseptic conditions. Sterile tubes of the medium were stored until needed.

For every examination a sterile pipette was used to avoid spreading infection. Approximately one-half of the fluid medium from a culture tube was drawn into the rubber bulb through the lumen of the pipette, which was then inserted into the vagina to the junction of the cervix, always with care not to penetrate the urethra. The pipette was so oriented that the bulb and the lateral aperture were dorsal. From this position the contained fluid was aspirated into the vaginal cavity. Rotation of the instrument through 180 degrees then placed the lateral aperture in a ventral position for retrieving fluid, mucus, and trichomonads, if present, from the floor of the vagina. This material was replaced into the culture tube and incubated for from 36 to 48 hours at 37 degrees Centigrade.

In vitro *Trichomonas foetus* (Riedmuller) is intolerant to bacteria. In a culture medium the maximum concentration is reached in from 36 to 48 hours, after which the total number rapidly diminishes because of bacterial contamination.

At the end of an incubation period a drop of culture medium was extracted from the bottom of the culture tube and examined microscopically for motile trichomonads with a 16 mm. objective and 10x ocular
under reduced lumination. The 16 mm. objective and 10x ocular permitted a relatively large field of view which facilitated the search, and still provided sufficient magnification for identification. In the darkened field any motion was readily noticeable. Trichomonads, when present, were always observed in a characteristic motion. The degree of motility varied, however. In some samples the trichomonads were very active and moved jerkily through a tortuous course across the field. Such motion was due to the combined action of the undulating membrane and the anterior flagella which projected cephalad from the protozoan. In other samples the jerking motion was manifested, due to contractions of the flagella, but no progressive movement was discernible. In other samples the flagella, instead of projecting forward, projected caudad as long streamers. Such organisms moved forward through a direct, smooth course without jerking. In still other samples the only perceptible motion was the feeble undulation of the undulating membrane, there being no progressive movement and no jerking. Such specimens were easily overlooked.

A negative diagnosis was made after examination of from 20 to 30 microscopic fields without finding any trichomonads.

**Incidence of Infection in Herd.** A series of 10 weekly examinations was made of each member of the herd of 30 animals beginning October 25, 1938. Infections in animals H38, H329, and H310 were diagnosed through these examinations. It is probable that trichomonads were present in the vaginal contents of animal H329 sometime during the period from October 25, 1938, the date of the first examination, until November 11, 1938, the date at which trichomonads were first found, but examinations failed to demonstrate them. This may have been due to inexperience of the diagnostician, or the trichomonads may have frequented and then vacated the vaginal contents between 2 successive examinations. Table
1 is a record of this series of weekly examinations. Infections in animals H323, H300, H326, and H331 were contracted, diagnosed, and studied later.

For breeding purposes the Experiment Station dairy herd is divided into 2 blocks with a separate sire for each block. During the period from January 1936 to December 1938, 6 normal calves from 41 breedings, averaging 6.8 breedings per calf, were produced by the block sired by bull H145. Records show that a foetus sired by bull H145 was aborted May 25, 1937, as a result of trichomoniasis. During the same period from January 1936 to December 1938, 9 normal calves from 20 breedings, averaging 2.1 breedings per calf, were produced by the block sired by bull H455.

Having determined from routine examinations of the entire herd that animals H30, H310, and H329 were cases of infection, it was noticed that all these animals became positive to examination shortly after breeding to bull H145. Consequently, all animals bred to that bull were carefully observed for development of disease. Additional infections in animals H300, H326, H323, and H331 were thus located. From October 26, 1938, until March 1939, 10 animals were bred to bull H145. Of these, 7 were subsequently found to be infected. Table 2 shows the record of daily examinations of these animals from date of breeding until March 1939.

Case Studies of Infected Animals. Case H30. This animal was bred to bull H145 on November 10, 1938. After an incubation period of 9 days trichomonads were first found. Results of daily diagnoses were positive throughout a period of 19 days.

Throughout this period of positive diagnosis a positive correlation existed between the total number of parasites in examined samples and
their degree of motility. At the beginning the parasites were scarce
and relatively inactive. The motility and the total number of the
flagellates increased until about the third day, when their maximum
number and maximum motility were reached. From then on the number of
parasites and their motility gradually diminished until the end of the
period of positive diagnosis.

If implantation resulted from the breeding of November 10, 1938,
the embryo was destroyed by parasitism and aborted without being noticed.
The next estrum of the animal occurred January 10, 1939, without breeding.
It recurred normally February 1, 1939, and the animal was rebred to bull
H145. On February 21, 1939, the animal was again in estrum and was bred
to bull H145.

Symptoms of infection were not distinct. The vestibular membranes
were inflammatory and rubescent. The vagina contained an abnormally
large quantity of mucus, which at the beginning of the positive period
was translucent but contained flakes of pus. After about the second day
of the same period the mucus was replaced by a mucopurulent exudate.
Examination with a speculum showed that it was probably being discharged
from the cervix. This morbid material was occasionally discharged ex-
ternally from the genital tract. After disappearance of the parasites
the mucus returned to normal. Examination disclosed a slight petechi-
ation of the vaginal mucosa.

Case H326. This animal was bred December 28, 1938, to bull H145.
The course, symptoms, and sequelae of infection were identical to those
of animal H88.

Case H300. This animal was bred November 28, 1938, to bull H145.
After exposure and an incubation period of 10 days, trichomonads were
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Table 1. Herd incidence determined by 10 weekly examinations

Positive later

Aborted

Positive later
Table 2. Record of daily examinations of animals infected with and exposed to trichomoniasis

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* Date of breaching
- Diagnosis positive
+ Diagnosed positive
* Not examined

+ Slaughtered
demonstrable for 11 days, after which they disappeared from the vaginal contents. To this point the infection was identical to those of animals H68 and H326. But from here on they differ. Results of daily examinations changed from positive to negative December 20, 1938, and remained negative until January 10, 1939, on which day the parasites were again found. Results of examinations were positive from then until February 17, 1939, when treatment was applied.

During this period of positive diagnoses symptoms of infection were similar to symptoms of the previous positive period. Examination with a speculum showed definitely that the exudate was being discharged from the uterus. This morbid material was copiously discharged from the genital tract.

On February 17, 1939, examinations revealed a distended uterus, a corpus luteum on the right ovary, severe pyometra, and an abundance of trichomonads in the purulent contents of the vagina. Treatment was applied as follows: the corpus luteum was enucleated; and approximately 500 cc. of 0.1 percent aqueous solution of Potassium Orthoxyquinoline Sulphonate were injected into the uterus through a catheter passed through the cervical canal. All subsequent examinations, until the end of the period of investigation, were negative. Within 4 days the uterus regained normal size and the mucus returned to normal. The first estrum since the breeding of November 29, 1938, occurred February 24, 1939. No breeding was performed.

Swangerd (21) reported successful treatment of cows by injecting an aqueous solution of potassium iodide into the uterine cavity at weekly intervals for a series of 3 weeks.

Case H329. This animal was bred October 26, 1938, to bull H145. After 44 days pyometra developed and the results of examinations were
positive for a relatively long period. It is probable that this animal became temporarily positive after the initial incubation period, but escaped notice because of inexperience of the diagnostician. Granting this probability, the course, symptoms, and sequelae of infection were identical to those of animal H300.

The next estrum of the animal occurred December 17, 1938, with trichomonads demonstrable daily. Examination per rectum revealed a corpus luteum on the left ovary. This was enucleated February 17, 1939. As a result estrum occurred February 22, 1939. After removal of the corpus luteum no positive diagnosis was made by March 1, 1939, the end of the period of investigation.

Case H310. This animal aborted, due to trichomoniasis, a foetus sired by bull H145 on August 26, 1938. The animal was rebred to bull H145 November 21, 1938. An abundant growth of very active trichomonads were found November 24, 1938. At no other examination was diagnosis positive. Normal conception and implantation apparently resulted from the breeding. A degree of resistance may have resulted from the earlier infection.

Cases H319 and A62. Both of these animals were bred to bull H145 during December 1938. Daily examinations were made from the date of breeding until the close of the investigation. No trichomonads were found. Animal H319 was slaughtered January 20, 1939. No trichomonads were recovered from contents of either the vagina or the uterus. On July 14, 1938, animal A62 aborted a foetus as a result of trichomoniasis. A degree of resistance may have resulted from this infection. After the breeding of December 13, 1938, estrum and rebreeding recurred February 23, 1939. Additional history has not been acquired.
Cases H331 and H323. Infections of these 2 animals were parallel in course and symptoms from inception until March 1, 1939, the end of the investigation. These animals were bred to bull H145 on January 27 and January 25, 1939, respectively. After an incubation period of 18 days trichomonads were first observed. Examinations were positive until the end of the period of investigation or for approximately two weeks.

At no time during this period were the parasites very abundant, but the greatest numbers occurred at approximately the third day. Their motility was not pronounced.

Symptoms of infection were similar to symptoms of the other infections.

Case H49. This animal was bred to bull H145 February 14, 1939. All examinations until the end of the period of investigation were negative. If infection resulted from the breeding, its course, at the end of the period of investigation, was unlike those of the other infected animals.

Case H145 (bull). Several examinations were made of the bull involved by culturing washings from the sheath and samples of semen. All examinations were negative. Records show that a foetus sired by bull H145 was aborted May 25, 1937, as a result of trichomoniasis. These data indicate that the infection of the bull was not recently contracted, that he is in the chronic stage of infection, and that the total number of trichomonads harbored by him is not great. All cases of trichomoniasis of the herd resulting from breeding to this bull, 8 of the 10 breedings performed by him during the period of investigation, strongly indict him as the source of infection to the herd.

On January 15, 1939, when it was evident that the bull was the source of infection to cows of the herd, he was treated medicinally for trichomoniasis by disinfecting the urethra and prepucial cavity with a
0.1 percent aqueous solution of Potassium Orthoxyquinoline Sulphonate. Subsequently 4 cows, H331, H323, H326, and E49, were bred to test the efficacy of the treatment. Animals H331 and H323 developed infection, which indicates that the parasites might inhabit the more inaccessible regions of the genital tract of the bull. Animal H326 was infected with trichomoniasis during the previous month, which may have endowed a degree of resistance. On February 17, 1939, the bull was re-treated in a similar manner with Potassium Orthoxyquinoline Sulphonate. The efficacy of this treatment had not been determined by March 1, 1939. Swangard (21) reported successful treatment of bulls by applying 3 applications of trypaflavine to the penis and prepuce each week.

Granular Vaginitis. Granulation or exanthema of the vestibular membranes was considered by early investigators of bovine trichomoniasis as a symptom of the disease. This is characterized by eruptions which vary in number and in size from tiny vesicular eruptions to papules 2 mm. in diameter and 1 mm. in depth. In Utah this condition was always associated with trichomoniasis. It was present also in uninfected animals. A large percent of all animals of breeding age, including non-virgin heifers, of the Experiment Station dairy herd manifested this condition. It was most severe among heifers following their first breedings. It was also present in the majority of cattle examined throughout the state for trichomoniasis, though few were found to harbor trichomonads. In this study granulation was considered to be distinct from trichomoniasis. However, when the 2 conditions co-existed, the vesicles were smaller and more abundant than in cases uncomplicated by trichomoniasis.
Efficacy of Diagnostic Methods Employed. Records of daily examinations of animals infected with trichomoniasis show that occasional negative diagnoses were made during the period when most diagnoses were positive. These may have been due to defective equipment or to faulty technique. Usually these negative diagnoses were made when the mucus was temporarily clear and apparently normal. They were presumably made during a recession of discharge of trichomonads from the uterine reservoir.

Several examinations were made of the entire herd with a glass speculum and battery light to determine the condition of the genital tract of parasitized cows as compared with the same of healthy cows. The only consistent differences observed was severe inflammation of the vestibular membranes and a slight petechiation of the vaginal mucosa, which was present only in animals infected with trichomoniasis. Petechia may have resulted from mechanical injury to the mucosa by the apparatus used. It is supposed that trichomoniasis rendered the mucosa traumatic, thus the condition tended to appear only in parasitized animals. Perhaps other infections cause a similar vulnerability of the mucosa. For these reasons petechiation in this study was not considered symptomatic of trichomoniasis.

Interpretation of Results. Three observations indicated that in the female the uterus is the primary site of infection: (1) After exposure to infection animal H300 became positive to examination for 17 days, then negative for 45 days, and then returned positive for an indefinite period without further exposure. All examinations were made of the vaginal contents. (2) In every case of infection an occasional
negative diagnosis was made during the period when most diagnoses were positive. (3) Examination of the genital tract of animals H300 and H329 with a speculum and light showed that the muco-purulent exudate was being discharged from the uterus. These data indicate that trichomonads are found in the vagina, in some cases, only as they are discharged from the uterus.

The infections of animals H300 and H329 were essentially alike in course of infection and in symptoms. Following exposure and an incubation period of approximately ten days trichomonads were demonstrable in the purulent contents of the vagina for approximately eighteen days, after which daily diagnosis became permanently negative and the mucus returned to normal. This course of infection may be designated as course 1. Infections of animals H300 and H329 represent another course of infection. In animal H300 after exposure and an incubation period of 10 days, daily diagnoses were positive for 11 days, then negative for 48 days, and then positive again until treated 1 month later. Animal H329 developed pyometra 44 days after exposure and became positive to examination for a relatively long period. It is probable that this animal became temporarily positive after the initial incubation period, but escaped notice because of inexperience of the diagnostician. Infections of animals H300 and H329, then, represent course 2. The two courses, 1 and 2, were identical during their early stages. In course 1 after exposure and an incubation period of 10 days trichomonads were demonstrable from a muco-purulent exudate of the genital tract. Examination with a speculum and light disclosed that the cervix was open and suggested that the exudate was being discharged from the uterus. The parasites either failed to enter the uterine cavity, or if they entered it they were destroyed, for
after about eighteen days they disappeared, the infection terminated spontaneously, and the estral cycle resumed.

In course 2 after exposure and an incubation period of approximately ten days parasites were demonstrable from the muco-purulent contents of the vagina for approximately eighteen days. Following this period the mucus returned to normal and examinations were negative for approximately forty-five days, after which time the parasites and the purulent discharge reappeared for a relatively long period. Examination with the speculum and light showed that during the first period of positive diagnosis and purulent discharge, the cervix was open and that the discharge was probably coming from the uterus. Examination during the second period of positive diagnoses showed definitely that the exudate was being discharged from the uterus. Evidently the infection localized in the uterine cavity, the cervix closed for 45 days, and then reopened after development of pyometra, again discharging trichomonads into the vagina.

Examination per rectum showed the uterus to be distended, and the corpus luteum intact.

Whether the infections of animals H321 and H323 conform with course 1 or course 2, or whether they follow entirely different courses could not be determined by March 1, 1939. The study of them is incomplete.
SUMMARY

In 1937 trichomoniiasis was known definitely to exist in some of the members of the Utah Agricultural Experiment Station dairy herd. Its source, incidence, symptoms, and diagnosis were insufficiently known.

The culture method of diagnosis was tried, for which the pipette and Ringer's-Egg-Blood medium were the essential equipment, and was found to be efficacious if applied when trichomonads were present in the vaginal contents.

Incidence of trichomoniiasis within the herd was determined by a series of 10 weekly examinations. Nine individuals, including a bull, were found to be infected sometime during the period of investigation.

Daily examinations and observations were made of infected animals and of animals exposed to infection through breeding to the infected bull, H145. Two types of courses following infection were noted: (1) after exposure and an incubation period of 10 days, during which time no symptoms of infection appeared and no parasites were demonstrable, a purulent exudate developed and trichomonads were demonstrable for approximately eighteen days, after which symptoms disappeared and the infection automatically terminated; (2) after exposure and an incubation period of 10 days a muco-purulent exudate developed and examinations were positive for approximately eighteen days, negative for approximately forty-five days, then positive again for an indefinite period following the development of pyometra and the purulent discharge.

All infected animals manifested inflammation of the vestibular membranes and a muco-purulent exudate which occasionally was discharged from the genital tract. These were considered symptoms of bovine trichomoniiasis.
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*In this paper foreign publications are reviewed.