Staff Meeting Bulletin
Hospitals of the » » »
University of Minnesota

Chronic Brucellosis

Volume XVII | Friday, February 8, 1946 | Number 13

STAFF MEETING BULLETIN
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INDEX

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I.

UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
CALENDAR OF EVENTS
Feb. 9 - Feb. 15, 1946
Medical Visitors Welcome

No. 101

Saturday, Feb. 9

9:00 - 9:50 Pediatrics Grand Rounds; I. McQuarrie and Staff; W-205 U. H.

9:15 - 10:20 Surgery-Roentgenology Conference; O. H. Wangensteen, L. G. Rigler, and Staff; Todd Amphitheater, U. H.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; M-515 U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221 U. H.

11:30 - 12:20 Anatomy Seminar; The Induction of Germinal Mutations by Methylcholanthrene; L. C. Strong; I.A. 226.

Sunday, Feb. 10

11:00 - 1:50 Obstetrics and Gynecology Grand Rounds; J. L. McKelvey and Staff; Station 44, U. H.

Monday, Feb. 11

9:00 - 9:50 Roentgenology-Medicine Conference; L. G. Rigler, C. J. Watson and Staff; Todd Amphitheater, U. H.

9:00 - 10:50 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff; Interns Quarters, U. H.

12:15 - 1:15 Pediatrics Seminar; Irvine McQuarrie and Staff; 6th Floor Eustis.

12:15 - 1:15 Obstetrics and Gynecology Journal Club; M-435, U. H.

12:30 - 1:20 Pathology Seminar; The Age Factor in the Pathogenesis of Acute Rheumatic and Bacterial Endocarditis; Dr. B. J. Clawson; 104 I. A.

12:30 - 1:20 Physiology Seminar; Morphological Alterations in Man Induced by Prolonged Starvation; Dr. Austin Henschel; 214 M. H.

4:00 - School of Public Health Seminar; Critical Analysis of Trends in Public Health Education; Miss Catherine Vavra; 6th Floor Student Health Service Bldg., Women's Lounge.

Tuesday, Feb. 12 - Holiday

9:00 - 9:50 Roentgenology-Pediatrics Conference; L. G. Rigler, I. McQuarrie and Staff; Eustis Amphitheater, U. H.

3:15 - 4:15 Gynecology Chart Conference; J. L. McKelvey and Staff; Station 54, U. H.

Wednesday, Feb. 13.

8:00 - 8:50 Surgery Journal Club; O. H. Wangensteen and Staff; M-515 U. H.

9:00 - 10:30 Pediatrics Staff Rounds; W-205 U. H.

9:00 - 10:50 Neuropsychiatry Seminar; Staff; Station 60 Lounge, U. H.

11:00 - 11:50 Pathology-Medicine-Surgery Conference; Cardiac Decompensation; E. T. Bell, C. J. Watson, O. H. Wangensteen and Staff; Todd Amphitheater, U. H.

12:30 - 1:20 Physiology Chemistry Journal Club; Staff; 116 M. H.

4:00 - 6:00 Medicine and Pediatrics Infectious Disease Rounds; W-205 U. H.

Thursday, Feb. 14

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; Todd Amphitheater, U. H.

12:30 - 1:20 Physiological Chemistry; Cyrus P. Barnum; 116 M. H.

4:30 - 5:20 Ophthalmology Ward Rounds; Erling Hansen and Staff; E-534, U. H.

4:30 - Bacteriology Seminar; Purification of Antiserums; Charles Stahlberg; 214 M. H.

5:00 - 5:50 Roentgenology Seminar; Problems in the Radiation Therapy of Uterine Carcinoma; J. L. McKelvey; M-515 U. H.

Friday, Feb. 15

9:00 - 9:50 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221 U. H.

10:30 - 12:20 Otolaryngology Case Studies; L. R. Boies and Staff; Out-Patient Otolaryngology Department; U. H.

11:50 - 1:15 University of Minnesota Hospitals General Staff Meeting; Influenza in Infants and Children; John Adams; New Powell Hall Addition Amphitheater.

1:00 - 2:00 Dermatologic Allergy; Dr. Stepan Epstein; W-312 U. H.

2:00 - 3:20 Dermatology and Syphilology; Presentation of Selected Cases of the Week; H. E. Michelson and Staff; W-312 U. H.

1:30 - 2:20 Roentgenology-Neurosurgery Conference; H. O. Peterson, W. T. Peyton, and Staff; Todd Amphitheater, U. H.

II. CHRONIC BRUCELLOSIS

Wesley W. Spink
Wendell H. Hall
George N. Aagaard

Introduction

Chronic brucellosis has been described by Alice Evans[1] as a "dreary" and a "deceptive" disease. The disease is dreary for the patient in that the chief manifestations are weakness and easy fatigability. Sustained physical or mental exertion upon his part is almost impossible. The disease is deceptive for the physician in that he is confronted daily with patients complaining of being tired and weak. Therefore, it becomes extremely difficult to differentiate between chronic nervous exhaustion and chronic brucellosis. The problem of chronic brucellosis at this hospital and elsewhere frequently has the following pattern: individuals complain of feeling weak, tire readily, and have had a possible exposure to brucellosis in that they have ingested unpasteurized milk from a questionable source. Physical examination most often reveals no localizing signs of the disease. An intradermal test with brucella antigen shows a positive reaction, and the titer of agglutinins for brucella in their blood serum may be 1:40 or 1:80. The problem then confronting the physician is, do these patients have active brucellosis? Experience would indicate that the foregoing criteria are insufficient for making an absolute diagnosis of active brucellosis. Unfortunately, these are the criteria that are frequently used by physicians in treating a patient for brucellosis. As will be pointed out shortly, an absolute diagnosis of brucellosis can only be made after the organism is isolated from the tissues or body fluid of patients. If the disease cannot be proved bacteriologically, often only a presumptive diagnosis of brucellosis can be made. The problem is further complicated by the fact that if patients are presumed to have active brucellosis, what shall the physician do about it in the way of therapy?

The purpose of this report is to present the problem of chronic brucellosis as based on investigations carried out on 18 patients seen at the University Hospitals over a period of the last 8 years. Brucella were isolated from all of these individuals. During those years several hundred individuals suspected of having brucellosis were studied. While there are reasons for believing that many more patients had chronic brucellosis than are included in the summary of the 18 patients in Table 1, we have selected for the present discussion only those cases where the diagnosis was unequivocal. It is desired to emphasize certain epidemiological features of the disease; the outstanding clinical manifestations; methods employed in diagnosis; and an evaluation of present-day therapy.

Definition of Chronic Brucellosis

We have defined brucellosis as being chronic if the patient has had manifestations of the disease for 3 months or longer. As a rule, brucellosis is an acute, febrile illness with recovery taking place between one and three months. However, relapses are not unusual. It has been known for years, though not widely appreciated, that individuals may harbor brucella in their tissues for many months and that at times the organisms may be recovered from the blood or urine of these patients. Not infrequently, these individuals may have few or no complaints. They are not conscious of any chronic illness. This was beautifully demonstrated in a report of the Mediterranean Fever Commission issued in 1905 in which E. A. Shaw[2], a surgeon in the Royal Navy, summarized a group of investigations carried out in the personnel of the Naval dockyard in Malta. These individuals were engaged in hard physical labor. He found out that of 525 laborers, 79 or 15 per cent, had agglutinins for brucella melitensis in their bloods. Of these 79, 22 revealed a high titer of agglutinins. Cultures of blood and urine from these 22 individuals were made. From 10 of these 22 patients, Shaw recovered the organisms

Table 1

Summary of Clinical Data in 18 Patients with Chronic Brucellosis Proved Bacteriologically

Case No. Age & Sex	Occupation Source of Infection	Duration of Illness	Symptoms	Titer of Agglutinins	Skin Test	Species and Source of Culture	Treatment	Outcome
1-64 M	Well driller Raw milk	5 mos.	Weakness; stiff and painful neck and shoulders; pain on swallowing; numbness of arms and hands	1:640 1:320 1:80	+	Br. abortus from blood 1x.	Thomas collar; 60 gm. sulfanilamide 13 days	Fusion of C_3 and C_4 vertebrae. Feels well 4 yrs. later.
2-36 M	Farmer Raw milk	5 mos.	Weakness; chills; dyspnea; orthopnea; rt. hemiparesis.	1:1280 1:1280 1:1280 1:1280	-	Br. abortus from blood 8x.	Sulfonamide for 40 days.	Died after 8 mos. of illness. Subacute bacterial endocarditis. Br. abortus from mitral vegetations.
3-29 M	Farmer Raw milk	5 mos.	Weakness; ulcer on toe; sweats; nausea.	1:5120 1:5120 1:5120	-	Br. abortus from vegetations on aortic valve at autopsy. Blood cultures sterile during life.	Blood transfusions.	Died after 6 mos. of illness. Subacute bacterial endocarditis aortic valve.
4-25 M	Laborer Raw milk	8 mos.	Weakness; anorexia; generalized body aches; lumbar pain.	1:2560 1:2560 1:1280	+	Br. abortus from blood 1x.	84 gm. fulfanilamide in 16 days. Plaster cast and later brace.	Complete recovery. Able to do heavy work. Well 5 years later.
5-34 M	Skinning hogs' heads in packing plant - Handling infected material.	10 yrs.	Weakness; generalized aches; back pain; nausea and pain rt. shoulder.	Absent 1st 2 yrs. on 10 occasions. 1:400 1:640 1:640 1:640	+	Br. suis from pericholecystic abscess.	Cholecystectomy and drainage of abscess.	After 10 yrs. of illness pericholecystic abscess with liver abscesses found at operation. Convalescence favorable.

Table 1 (Cont.)

Case No. Age & Sex	Occupation Source of Infection	Duration of Illness	Symptoms	Titer of Agglutinins	Skin Test	Species and Source of Culture	Treatment	Outcome
6-36 M	Farmer. Handling infected material & raw milk.	4 mos.	Weakness: cough; chills; sweats; pain rt. hip and rt. arm.	1:1280 1:640	+	Br. abortus from blood 1x.	109 gms. sulfadiazine in 25 days.	Afebrile. Able to do farm work.
7-12 M	School boy Raw milk	3 mos.	Pain in legs.	1:1280 1:640 1:640		Br. abortus from blood 2x.	13.5 gms. sulfadiazine in 7 days.	Afebrile. At school.
8-42 F	Housewife Raw milk	3 mos.	Weakness; nervousness; palpitation.	1:320 1:320 1:320 1:320 1:320	+	Br. abortus from blood 1x.	46 gms. sulfanilamide in 10 days; iodine; x-ray therapy for hyperthyroidism, thyroidectomy.	Afebrile. Only complaint 4 yrs. later is nervousness.
9-18 M	School boy ? Raw milk	4 mos.	Slight weakness; tires easily; cough.	1:2560		Br. abortus from blood 2x.	Bed rest.	Complete recovery; into Army.
10-36 M	Unknown	4 mos.	Weakness; cough; hoarseness; sweats; chills.	1:640 1:1280 1:640	+	Br. abortus from blood 1x.	109 gms. sulfadiazine in 19 days. Drainage rt. antrum.	Afebrile. Feels well. Recurrent fever, given 2nd course of sulfadiazine. Afebrile after therapy but bacteremia present.
11-40 M	Trucking-milk collector. Raw milk.	4 mos.	Weakness; cough; chills; sweats.	1:640 1:5120 1:1280	+	Br. abortus from blood 3x.	134 gms. of sulfadiazine in 21 days. 81 gms. in 14 days.	Recurrence of fever 2 mos. after 1st course of sulfonamide, but no bacteremia. Following 2nd course no recurrence in 1 yr. & working every day.

Table 1 (Cont.)

Case No. Age & Sex	Occupation Source of Infection	Duration of Illness	Symptoms	Titer of Agglutinins	Skin Test	Species and Source of Culture	Treatment	Outcome
12-6 M	School boy Raw milk	5 mos.	Weakness; anorexia.	1:640	+	Br. abortus from blood 1x.	14 gms. sulfadiazine in 17 days; fever therapy (cabinet) 4 x	Complete recovery. Well for 3 yrs.
13-55 F	Housewife Raw milk	7 mos.	Weakness; fatigue; sweats; treated for "influenza" 4 mos. before entry to Hospital.	1:640 1:640	+	Br. abortus from blood 1x.	72 gms. sulfadiazine in 15 days.	Complete recovery.
14-57 F	Housewife Raw milk	8 mos.	Weakness; sweats; chills; lumbar pain; pain in shoulders.	1:5120 1:5120	+	Br. abortus from blood 1x.	41 gms. sulfadiazine in 10 days.	Complete recovery. Well 2 years later.
15-41 M	Farmer Handling aborted material from infected cattle	11 mos.	Weakness; generalized aches; cough; pain rt. upper quadrant.	1:40 1:640 1:80	+	Br. abortus from blood 4x.	Penicillin, 1,100,000 units in 9 days.	Complete recovery. Well 1 yr. later. Repeat cholecystogram after treatment showed normal functioning gall bladder.
16-44 M	Miller-farmer ? direct contact infected cattle while vaccinating calves.	3½ mos.	Weakness; fatiguability; fever; sweats; anorexia.	1:640 1:1280 1:1280	+	Br. abortus from blood	Campolon I.V. SD. 94.5 gm.. 17 days.	Much improved, afebrile, but nervous, B. abortus from blood after Rx discontinued.

Table 1 (Cont.)

Case No. Age & Sex	Occupation Source of Infection	Duration of Illness	Symptoms	Titer of Agglutinins	Skin Test	Species and Source of Culture	Treatment	Outcome
17-28 F	Housework on farm. Raw milk. Infected cattle on farm.	4½ mos.	Weakness; anorexia; fever; chills; epistaxis; amenorrhea.	1:640 1:640 1:320 1:320	+	Br. abortus 3 x from blood.	Penicillin I.M. 50,000 x 48 100,000 x 71 - Total 9,500,000 SD. 134 g. in 23 days.	No improvement from penicillin. Marked improvement following SD. Temp. normal 12 days after starting Rx. Blood cult. + at conclusion of Rx, + 2 wks. later.
18-35 F	Housewife on farm. Raw milk. Abortions in herd supplying milk.	14 mos.	Weakness; fatiguability; nervousness; muscle pain; blurring of vision.	1:1280 1:1280 1:160	+	Br. abortus from blood.	127 gms. sulfadiazine in 21 days.	Definite improvement. Blood culture sterile. Still complains of blurring of vision.

from the blood or urine. These cases, then, were instances of ambulatory cases of chronic brucellosis. But the remarkable part is that several of them denied that they ever had symptoms of the disease. Undoubtedly, chronic and ambulatory cases of brucellosis with bacteremia exist today. Such cases are included in the present report.

Etiology of Brucellosis

It is well to discuss briefly the etiology of brucellosis. At the present time there are three species of microorganisms responsible for the disease, namely, Brucella abortus, from the cow; Brucella suis, from swing; and Brucella melitensis, from the goat. These three species differ biologically and, as a consequence, the clinical manifestations in human beings differ. It is often stated that infection due to Brucella abortus produces the milder form of the disease, whereas infection due to Brucella suis is usually more severe and tends to produce a chronic form of the disease. An analysis of cultures isolated in the Laboratories of the Minnesota State Department of Health indicates that the great majority of cases of brucellosis in human beings in Minnesota are due to Brucella abortus. While cases due to Brucella suis do occur, as far as is known no cases of brucellosis due to Brucella melintensis have originated in Minnesota. It is of interest that in Iowa cases of brucellosis caused by Brucella suis are quite frequently encountered. In a recent report from Iowa several human cases of brucellosis due to Brucella melitensis were discovered[3]. In view of this, it is possible that cases of brucellosis due to Brucella melitensis may exist in Minnesota.

Incidence of Brucellosis

A problem of paramount importance is whether brucellosis is on the increase in Minnesota. As a basis for discussion it is well to refer to data obtained from the Laboratories of the Minnesota State Department of Health. A analysis of these would indicate that brucellosis is on the increase. Table 2 shows the annual distribution of 2,179 cases which have been recognized in Minnesota.

Table 2

Analysis of 2,179 cases of Brucellosis in Minnesota

	Male		Female		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
1934	78		24	1	102	1
1935	92	2	22	1	114	3
1936	57	2	20		77	2
1937	66	4	23	1	89	5
1938	71		14		85	
1939	73	3	19		92	3
1940	106	2	31	1	137	3
1941	135	1	42		177	1
1942	208	1	52		260	1
1943	258	1	67	1	325	2
1944	302		91	1	393	1
	1,446	16	405	6	1,851	22

From 1927 to Dec. 31, 1933. 328 cases (255 male, 73 female) were reported; 5 cases were fatal.

It is apparent that more cases have been reported in recent years than previously, The question still arises, however, whether the increase may not be due to the fact that the physicians are more conscious of the disease and are looking for it. Table 2 also illustrates the low death rate from this disease. Table 3 shows the probable sources of infection of the Minnesota cases.

Table 3

Analysis of 2,179 Cases of Brucellosis in Minnesota
Probable Sources of Infection

Handling abortion material (23 cases in veterinarians)		270
*Raw milk		1,337
(1) From herds with history of abortion	642	
(2) From herds abortion denied	302	
(3) From herds no data on abortion	393	
Handling meat in packing plants		367
Handling meat outside packing plants		50
Lab. work (incl. a physician who handled hog uteri)		2
No assignable source (108) No data (45)		153

*Includes 457 farmers who may have haldned abortion material, 276 in group 1, 132 in group 2, and 49 in group 3.

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The data demonstrate two outstanding features characteristic of the epidemiology of the disease. First, that the infection results from the ingestion of raw milk obtained from infected herds of cows, and second, that infection may take place through abrasions in the skin as a result of handling infected material. Therefore, the highest incidence of the disease will occur in rural populations where milk is not uniformly pasteurized, and among individuals handling infected material, namely, in packing plants and upon farms. The occupational distribution of those having the disease is presented in Table 4.

Table 4

Analysis of 2,179 Cases of Brucellosis in Minnesota
Occupational Distribution

Farmer	718
Housewife & Domestic	344
Packing Plant employee	361
Miscellaneous, including 202 children and students	635
Meat handler (excl. of packing plant)	24
Veterinarian	23
Cattle trucker	8
Laboratory worker	3
Cream tester	11
Unknown	52

From the foregoing data, then, one may conclude that the disease is more prevalent in rural populations where raw milk is ingested. Therefore, fewer cases will be encountered in the populations of the large municipalities where pasteurization of milk is required.

Most of the patients admitted to the University Hospitals come from rural areas. Therefore, it was of interest to determine how many of these individuals were exposed to brucellosis. This was determined in the following manner: 533 consecutive individuals over 15 years of age attending the Medical Out-Patient Clinic of the University Hospitals were studied in 1945. Intradermal tests were carried out with a brucella antigen using a purified protein prepared from a strain of Brucella abortus[4]. At the same time blood was drawn from each of these individuals for the determination of the agglutination reaction for brucella. The patients were unselected and ambulatory, and no consideration was given to their specific complaints. A summary of the information acquired by Dr. George Aagaard is presented in Table 5.

Table 5

Analysis of Intradermal Tests (Brucella) and Agglutinin Titers in Adults Attending Medical Out-Patient at University Hospitals in 1945.

Intradermal Tests	
Total no. consecutive intradermal tests (purified protein)	533
Total no. with positive tests	104
Per cent of 533 adults studied consecutively with positive intradermal tests	19.5
Agglutinin Tests	
I. Of 104 adults with positive intradermal test	
Total no. with aggls. in blood serum (6 1:80)	23
Total no. with no demonstrable aggls.	74
Total no. with no report on aggls.	7
Per cent of adults having positive intradermal test and demonstrable aggls.	23.7
Cases suspected of having brucellosis	8
Cases finally proved of having brucellosis	1
II. Total no. of consecutive adults with neg. intradermal tests	255
Total no. with demonstrable aggls. in blood serum	10
Per cent of patients with neg. intradermal test but demonstrable aggls.	3.92

Possible Exposure to Brucellosis

Of 104 patients with positive intradermal test, 97 lived on a farm and/or rural area and/or used raw milk.

It is to be noted that of the 533 patients, 104 or 19.5 per cent gave positive intradermal tests. Of these 104 adults with positive skin tests agglutination reactions were done on 97, and 23 of these, or 23.7 per cent, had demonstrable agglutinins. Only 6 of these individuals had an agglutinin titer greater than 1,80. Eight of the 104 individuals were suspected as having brucellosis. However, only one individual had an unequivocal diagnosis of brucellosis, and this individual had a demonstrable bacteremia due to Brucello abortus. Agglutination reactions were also carried out in 255 consecutive adults with negative intradermal tests, and 10 of these individuals or 3.92 per cent had demonstrable agglutinins. Of the 104 patients with positive intradermal tests, 97 lived on a farm and/or rural area and/or used raw milk. These data show quite clearly the dangers at hand in making a diagnosis of active brucellosis on the basis of a positive intradermal test or the presence of a low titer of agglutinins in the blood, especially when these doubtful data are obtained from individuals with a vague symptomatology. This is particularly true where brucellosis is endemic and a high proportion of the population is exposed to the infection.

It is of interest to review briefly the epidemiological information acquired from the 18 cases of chronic brucellosis included in this report. It is very likely that 12 of these individuals became infected as a result of drinking unpasteurized milk obtained from herds of cattle with Bang's disease. An additional case probably acquired the infection as a result of ingesting raw milk. Four of the individuals gave a definite history of handling infected material. It is of interest that in the series of 18 cases there is only one packing plant employee. The source of the infection remains unknown in one case. Brucella abortus was isolated from 17 of the 18 cases. Only one case was due to Brucella suis.

It would be anticipated that children would be more likely to get brucellosis than adults since they drink milk more regularly. However, we have only encountered two individuals 12 years or younger having chronic brucellosis. While a few children have been seen at the University Hospitals with the acute form of the disease, brucellosis is less frequently encountered in children than in adults. This has been the experience of practically all students of the subject. Why children are more resistant to brucella than adults is not known. It is recognized that it is more difficult to infect young animals than older animals. An analysis of 2,179 Minnesota cases shows quite clearly that the disease is much more frequently encountered in adults than in children.

Table 6

Analysis of 2,179 Cases of Brucellosis in Minnesota
Age Distribution

	Under 5	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-Up	Unk.	Total
Male	9	34	47	98	195	514	433	215	141	15	1701
Female	8	17	19	20	44	116	103	70	71	10	478
	17	51	66	118	239	630	536	285	212	25	2179

It is unusual to have more than one individual in a family with active brucellosis although all members may be exposed equally to the infection. In the present study several families of patients were investigated for the possibility of other members having active disease. As a result, two members in the same family were found to have brucellosis with bacteremia. This has been the only time in our experience at the University Hospitals where this has been

demonstrated. Patient 6 (Table 1) was a 36 year old farmer who had 15 cattle on his farm with Bang's disease. He had handled infected material from these cattle and had ingested raw milk from these animals along with other members of the family. Following his entry to the hospital, the other members of his family were investigated. His wife and two children were found to be well and no agglutinins were demonstrated in their bloods. However, Patient 7 (Table 1), a 12 year old son, had had an attack of tonsillitis and following this complained of malaise and pain in the legs. Although he was afebrile, he was found to have an agglutinin titer of 1:1280 and Brucella abortus was isolated from his blood on two occasions. It is not unlikely that, if careful studies were not carried out, the infection in the son would have been overlooked.

Patient 17 (Table 1) was a 28 year old single woman who was critically ill with chronic brucellosis. She was a member of a large family, all of whom drank raw milk. One year before entering the University Hospitals, her father bought 6 cattle and all showed negative tests for Bang's disease. However, shortly thereafter, abortions occurred in the herd and all animals were found to have positive tests for Bang's disease. All the cattle were disposed of including the calves and a bull. Five new cattle were purchased and they were found to be negative for Bang's disease. A short time later one of the cows aborted and 3 of them were found to have Bang's disease. In view of these epidemiological data, 8 other members of the family of Patient 17 were then studied and the data are presented in Table 7.

Table 7

Results of Investigations on Family of who was critically ill with Chronic Brucellosis and Bacteremia (Br. abortus).

Relation to Patient	Age	Titer agglutinins (before skin test)	Skin test (Protein)	Titer agglutinins (2 wks. after skin test	Blood culture	Comment
1. Brother	22	0	0	0	0	Recently released from Army.
2. "	30	1:80	0	1:80	0	
3. "	18	1:160	1+	1:160	0	
4. Sister	26	0	0	0	0	Home only weekends.
5. "	13	1:80	1+	1:180	0	
6. "	20	1:160	2+	1:160	0	
7. Father	55	1:160	3+	1:320	0	
8. Mother	54	1:160	2+	1:160	0	

- - -

From this evidence it would appear that 6 other members of the family had had a subclinical infection. None of them gave a history of having been ill. It is of interest that there were 2 members who had negative tests and it was found that they were not at home regularly.

Patient 11 (Table 1) was a 40 year old male who had been incapacitated for four months. His occupation was that of collecting milk from various farms and bringing the milk in to a creamery. One of the farmers supplied him daily with milk for his home. The patient, his wife and two children regularly drank raw milk obtained from this farmer. It was found later that the herd supplying this milk had Bang's disease. The results of investigations in this family

are given in Table 8.

Table 8

Results of investigations on family of with Chronic Brucellosis and Bacteremia (Br. abortus)

Relation to Patient	Age	Skin Test	Titer of Agglutinins	Blood Culture	Comment
1. Wife	38	+	0	0	
2. Daughter	6	+	1:1280	-	Fever and irritability 1 week before.
3. Daughter	4	0	-	-	

- - -

The wife had a positive intradermal test but no agglutinins in the blood and a culture of blood remained sterile. A six year old daughter had a positive intradermal test and an agglutinin titer of 1:1280. Unfortunately, blood could not be obtained for culture. One week before these studies were carried out this child was feverish and irritable. However, when seen the child was not acutely ill. Another daughter had a negative intradermal test. Blood was not obtained for the agglutination reaction or for culture. Again, it is apparent that two members in this small family were infected and one had had active disease.

Clinical Manifestations of Chronic Brucellosis

An examination of the symptoms of these 18 patients with chronic brucellosis as given in Table 1 reveals that the outstanding feature is weakness. As has been observed by others, this is the most prominent symptom that these patients have. In addition, vague aches and pains were prominent. Many complained of nervousness, sweats and chilly sensations. A history of having had "flu" was not infrequently obtained. In fact, acute brucellosis is often mistaken for influenza. One of the cardinal features of brucellosis, in general, is the lack of localizing signs of the disease, though the patients may have a demonstrable bacteremia and they may feel ill. They may have little or no fever. Five of the patients had abnormally enlarged peripheral lymph nodes. In seven of the patients the spleen was definitely enlarged and palpable. Two of the patients had subacute bacterial endocarditis and expired from the disease. These patients have been reported in detail elsewhere[5,6]. Two of the patients had spondylitis. One of the patients had a pericholecystic abscess and liver abscesses and his history will be detailed later.

Laboratory Diagnosis of Brucellosis

Certain laboratory procedures are extremely important in the diagnosis of brucellosis. Since most of the patients with brucellosis present a vague symptomatology, and have few or no localizing signs of the disease, it is apparent that this is a disease where the correct diagnosis must be based upon laboratory procedures:

1. Blood leucocytes. As seen in Table 1 not a single patient had an elevated white blood count. The total leucocyte count was either normal or slighily diminished. Leucocytosis in chronic brucellosis is very uncommon. In both the acute and chronic forms of the disease it is extremely rare to have a total leucocyte count of over 10,000 cells per cmm. The differential leucocyte count is of considerable value in the diagnosis of brucellosis. A relative or absolute lymphocytosis is quite frequently encountered. It should be

emphasized that the initial hematological report has not infrequently led to the ultimate diagnosis of brucellosis.

2. Erythrocyte sedimentation rate. Brucellosis is one of the few infectious diseases in which the sedimentation rate may be normal. Nine of the patients in this series had normal erythrocyte sedimentation rates. In three patients with localizing signs of suppuration the sedimentation rates were either normal or only slightly elevated. Thus, in case 5 (Table 1), an individual with pericholecystic abscess and liver abscesses had a normal sedimentation rate. Cases 2 and 3 (Table 1) had endocarditis and the sedimentation rates were normal or only slightly elevated. A normal sedimentation rate in an individual with a chronic, febrile illness of doubtful etiology should lead to further investigations for brucellosis.

3. Agglutinins. The most reliable and simple test for screening patients with suspected brucellosis is the agglutination reaction. It should be recognized, however, that patients may have active disease with a bacteremia and yet agglutinins may be absent from the blood. But such an instance has not been encountered in our experience. A question that is frequently asked is, what titer of agglutinins is of significance in the diagnosis of active brucellosis? One cannot make any dogmatic statements concerning the titer of agglutinins and its relationship to active disease. However, the higher the titer of agglutinins, the more likely is a bacteremia to be present[7]. This is demonstrated by consulting Table 1. It may be stated, therefore, that the higher the titer of agglutinins, the more likely is it that the patient has active brucellosis. As has been pointed out previously, patients having an agglutinin titer of 1:100 or less, constitute difficult diagnostic problems. Usually a demonstrable bacteremia is not present, and under these circumstances, one is generally justified in questioning the diagnosis of active brucellosis.

4. Intradermal skin tests. Several different antigenic materials are available for performing skin tests. Vaccines consisting of heat-killed organisms of the three species of brucella are frequently used. Brucellergin is a filtrate prepared from brucella grown in broth. Purified protein obtained from brucella has also been used. All of the foregoing agents, when injected intradermally, give a delayed type of tuberculin reaction, that is, the test does not usually become positive until 24 to 48 hours after injection. Carbohydrate material obtained from brucella cells has also been used for skin testing. This material elicits an immediate type of reaction and the reactions at times may be severe. For skin testing we have used purified protein material. This gives less violent reactions than the vaccine. Brucellergin also gives less severe reactions than the vaccine. A positive intradermal reaction with brucella antigen should be interpreted in the same manner as the tuberculin reaction is in patients with suspected tuberculosis. A positive test does not necessarily mean active infection but merely that the tissues of the individual have been invaded by brucella and the patient has been sensitized to the antigen. Again, patients may have active disease with a negative skin test, but in our experience, except for patients with endocarditis, this is not commonly encountered. We have not found that the purified protein substance or brucellergin will provoke a subsequent rise in the titer of the serum agglutinins or that the introduction of antigen for skin testing purposes in normal subjects will elicit a later appearance of agglutinins.

5. Blood culture. Any patient suspected of brucellosis should have careful bacteriological studies carried out. This means a culture of venous blood carried out with certain precautions. Fortunately, the Laboratories of the Minnesota State Department of Health are in a position to do this for any physician in this state. Cultural studies in patients suspected of having brucellosis at the University Hospitals have been done by the Laboratories of the Minnesota State Department of Health. The technique used by them is essentially as follows: from 5 to 10 cc. of

venous blood is introduced by the physician into a small bottle containing Bacto-tryptose broth and 1% citrate. When the flask reaches the laboratory, carbon dioxide is introduced into the flask so that a final concentration of about 10% is present. This is essential for growth of Brucella abortus. After incubation for approximately 5 days a small portion of the blood-broth mixture is withdrawn and cultural studies are carried out upon agar slopes. Usually, within 48 to 72 hours, growth of the organisms on the surface of the slant becomes apparent. We have attempted to isolate the organisms from urine but thus far have been unsuccessful. We have not been able to culture organisms from the bile of a few patients who have a demonstrable bacteremia. In 17 of the 18 cases Brucella abortus was obtained from the blood. In one patient Brucella suis was obtained from a pericholecystic abscess.

6. Opsono-cytophagic test. Other tests have been proposed for the diagnosis of brucellosis. This includes the opsono-cytophagic test which is a measure of the ability of a patient's polymorphonuclear leucocytes to phagocyte brucella. We have evaluated this test carefully at the University Hospitals and have concluded that the test does not contribute any more information to the problem at hand than has been detailed[8]. We do not recommend its routine use.

7. The complement fixation test. This test is recommended by some as a helpful aid in the diagnosis of brucellosis. We have run parallel complement-fixation tests and agglutination reactions on serums and the former test does not add any more information than that which can be obtained with the agglutination reaction. Furthermore, the complement-fixation test is a time-consuming procedure.

In summary, then, the diagnosis of chronic cases of brucellosis depends on the following: a careful epidemiological survey with each patient should be carried out in order to trace the possible source of infection. This should be correlated with a careful personal history. The usual complaints of the patient are weakness, easy fatiguability, vague aches and pains, fever, and chills or chilly sensations. Laboratory data should include total and differential blood leucocyte counts, erythrocyte sedimentation rate, agglutination reaction with serum, and at least one culture of venous blood. Then a skin test should be performed with an appropriate brucella antigen. If the patient's illness cannot be defined bacteriologically, then the clinician will experience some difficulty at arriving at a correct diagnosis. Again, the patient that presents the largest problem is the individual with vague complaints, a positive skin test and a low titer of Brucella agglutinins.

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Case Report

To illustrate the difficulties in the diagnosis of chronic brucellosis the following case is presented. The patient was under observation at the University Hospitals at different periods for 10 years before a diagnosis of chronic brucellosis was established bacteriologically. The case represents one of the most remarkable instances of chronic brucellosis that has been encountered at the University Hospitals or that has been recorded in the literature.

A 43 year old married male was first admitted to the University Hospitals on April 11, 1936. He had been a packing plant employee for 15 years and his occupation was that of skinning pig's heads. On October 10, 1945 he had an onset of malaise, weakness, fever, thoracic and lumbar pain, and polyarthritis. Several days prior to this illness he had skinned rabbits with "boils" and fed the meat to a dog and the dog later died. On November 20, 1935, serological tests revealed no agglutinins for Brucella, and a week later there were no agglutinins for Brucella but a 1:20 titer for B. tularense was present. Because of this history and the presence of agglutinins for B. tularense he was hospitalized and given antitularense serum without improvement. His past history was irrelevant except that in 1929 and 1930 he had had a 4 plus Wasserman and subsequently received treatment.

Physical examination revealed a temperature of 103. The spleen was palpable and there was tenderness over the thoracic and lumbar spine. Laboratory data showed a leucocyte count of 4,900 with a differential of P/47, L/53; serology, negative; no agglutinins for typhoid or paratyphoid; no agglutinins for brucella or tularense; blood culture, sterile. A skin test carried out with brucella vaccine was markedly positive. The sedimentation rate was normal. X-ray of the spine was negative. This patient was discharged, improved, on April 24, 1936 with a diagnosis of probable brucellosis.

The second admission to the hospital was April 10, 1937. Shortly after his discharge one year previously he had had a generalized macular eruption of the skin, fever, weakness, pain in the lumbar and cervical regions, all occurring in cycles of 6 weeks. He also complained of a boring pain in the left hip of 6 weeks' duration and he had lost 22 pounds in weight. Physical examination revealed a normal temperature. He had cervical lymphadenopathy. The spleen was not palpable and the left leg was smaller than the right. Laboratory data showed a white count of 6,000 with a differential value of P/64, L/33, M/3. The sedimentation rate was slightly accelerated; serology, negative; blood culture, sterile. Serum was then sent to two different laboratories for the brucella agglutination reaction. Laboratory "A" reported no agglutinins; laboratory "B" reported a titer of 1:400 for brucella and titer of 1:10 for tularense. X-rays showed atrophy of the left femur, slight narrowing of the joint cartilage, but the spine was normal. He left the hospital improved.

He was not seen again until May 26, 1939. In the intervening time, in February of 1939, he had developed stiffness of the neck and a large cervical node appeared on the right, which was removed at another clinic. The node was cultured and inoculated into a guinea pig with negative results. The patient then developed swelling of the right tibia which was incised, a biopsy made, and a diagnosis of Brodie's abscess was recorded. Agglutinins for brucella were absent. When seen again in May of 1939 at the University Hospitals he entered because of a persistent sinus of the right leg, and pain over the cervical and thoracic vertebrae. Physical examination revealed pain on percussion over the cervical and lumbar spine and swelling and tenderness of the upper third of the right tibia. Laboratory studies revealed a white count of 11,100 with a differential of P/77, L/20, E/3; and a blood culture was negative for brucella. X-rays: chest, negative; right tibia large, osteomyelitic abscess of the upper third; cervical and thoracic spine, negative. The abscess of the tibia was evacuated. Culture of the exudate was negative for brucella. He was then discharged from the hospital on June 10, 1939. The sinus of the tibia continued to drain for a month. He continued to have intermittent attacks of pain, weakness and fever. He lost weight, and became addicted to morphia and drank excessively. He obtained voluntary entrance to a mental hospital because of an anxiety state. Following this he was improved and the addiction to morphia was eradicated. The pain and swelling over the tibia finally abated completely after penicillin therapy.

His last admission to the University Hospitals was July 16, 1945, when he came in because of periodic sweats and continued fatigue. He had episodes of vomiting associated with persistent shoulder-strap pain on the right for six months. He had had right upper quadrant distress for 6 weeks and an unproductive cough. Physical examination: temperature, normal. There was a mass in the right upper quadrant consistent with the liver. Laboratory investigation showed a leucocyte count of 12,550 with a differential of P/63, L/36, E/1. Sedimentation rate was normal. Agglutinins were present in a titer of 1:640 for brucella, negative for B. tularense. Blood culture negative for Brucella. Liver function studies revealed minimal changes. X-rays: the gastrointestinal tract was normal; cholecystogram, normal functioning gall bladder with non-opaque stones.

A cholecystectomy was done on August 14, 1945. No calculi were found but a pericholecystic abscess was accidentally drained into the peritoneal cavity. In addition he had two abscesses on the superior surface of the dome of the right lobe of the liver measuring 3 x 4 cm. Culture of this exudate revealed Brucella suis. Part of the surgical procedure consisted of washing out the abdominal cavity with saline and introducing penicillin solution. The patient made an uneventful convalescence. The last note on this patient is that he shot his mother and he himself attempted suicide which was unsuccessful.

In summary, then, this is a patient who had had chronic brucellosis over a period of many years with many vague complaints including pain, weakness, fever, chills and an osteomyelitis. Initially, the intradermal skin test was positive, but agglutinins were not present in the blood for at least two years. The organism was never recovered from the blood. It is of interest that, although this patient had an extensive suppurative condition in the right upper quadrant, he had minimal fever and very little systemic reaction.

Treatment

There is no disease where an evaluation of therapy has been so confused as that which exists for brucellosis. Undoubtedly, much of the confusion is due to the fact that many of the cases of chronic brucellosis treated and reported have not been proved as having had brucellosis. In other words, inadequate laboratory data and other information have resulted only in presumptive diagnoses. If therapy is to be evaluated on a sound basis in this disease, in both acute and chronic cases, the diagnoses must rest upon sound bacteriological data. For this reason we have selected 18 cases proved bacteriologically as the basis of discussion for therapy.

1. Sulfonamides

Reported experimental investigations do indicate that the sulfonamides are bacteriostatic for some strains of Brucella[9,10,11,12]. Furthermore, there have been clinical reports indicating that acute cases of brucellosis with bacteremia have responded coincident with the administration of the sulfonamides[13,14,15]. During the past eight years all of the commonly used sulfonamides have been evaluated in the treatment of patients with proved brucellosis at the University Hospitals. It is our policy to hospitalize these patients for at least three weeks and give them at the present time doses of either sulfadiazine or sulfamerazine so that a blood concentration of 10 mgm. per 100 cc. of blood is maintained over this period of time. It does not appear that none of the readily absorbed sulfonamides has any advantage over the other in treatment. We have not used the poorly absorbed sulfonamides such as sulfaguanadine and sulfasuxidine. Fourteen of the 18 cases received sulfonamide therapy. Case 2 (Table 1) had subacute bacterial endocarditis due to Brucella abortus and 40 days of therapy with sulfanilamide was without effect. In the remaining 13 cases the results were as follows: nine of the patients have not had relapses after one course of treatment with a sulfonamide. These patients have remained well for one to five years. It is of interest that patients 1 and 4 (Table 1) had spondylitis and they have been in good health for four and five years respectively. The remaining four patients obtained only temporary or partial benefit following treatment with sulfadiazine. Patient 10 had a relapse with fever and bacteremia a few weeks after the completion of therapy. After a second course of treatment with sulfadiazine he became afebrile and felt considerably improved but the bacteremia persisted. Patient 11 had a relapse with fever after treatment but bacteremia was not demonstrated. After a second course of therapy with sulfadiazine the fever abated and he has felt well for one year. Patients 16 and 17 became afebrile after treatment but the bacteremia persisted.

In summary, then, sulfonamide therapy appears to be of some benefit in patients with chronic brucellosis and bacteremia. This statement applies only to infections due to Brucella abortus.

However, none of the sulfonamides are entirely satisfactory and some patients may relapse while others may still have a persistent bacteremia. In an attempt to evaluate the sulfonamides more accurately, experiments were carried out by one of us (Dr. Wondell Hall) using the chick embryo. Eleven day chick embryos may be readily infected with freshly isolated strains of Brucella abortus or Brucella suis by injecting the organism directly into the allantoic sac. Using a large number of eggs, multiple dilutions of freshly isolated strains of brucella were injected, and then 24 hours later a control series were treated by injecting sodium sulfadiazine directly into the allantoic sac. In this manner it was definitely proved that sulfadiazine afforded protection to these chicks. A typical experiment is summarized in Table 9.

Table 9

Eleven day chick embryos infected with Br. abortus (Strain #552) and results of treatment with 10 mgs. sod. sulfadiazine.

Materials Injected into Embryos		Viability of Embryos (Hrs. after injection)							
		24	48	72	96	120	168	192	216
Br. abortus 10^{-2}	Sod. sulfadiazine	7/7	7/7	7/7	7/7	2/7	2/7	2/7	2/7
10^{-3}	Sod. sulfadiazine	7/7	7/7	6/7	6/7	5/7	5/7	5/7	4/7
10^{-4}	Sod. sulfadiazine	7/7	7/7	7/7	6/7	4/7	4/7	3/7	3/7
10^{-5}	Sod. sulfadiazine	7/7	7/7	7/7	7/7	5/7	5/7	5/7	5/7
10^{-2}		7/7	7/7	7/7	7/7	4/7	2/7	0/7	0/7
10^{-3}		7/7	7/7	7/7	7/7	4/7	4/7	0/7	0/7
10^{-4}		7/7	7/7	7/7	7/7	4/7	3/7	2/7	0/7
10^{-5}		7/7	7/7	7/7	6/7	5/7	4/7	3/7	1/7
Sterile medium	Sod. sulfadiazine	7/7	7/7	7/7	7/7	5/7	5/7	5/7	5/7
Viability control		3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3

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Thus, of 28 infected chick embryos treated with sulfadiazine, 14 were still alive at the end of 216 hours after being infected. On the other hand, only one of 28 control chicks was viable at this time. Since the sulfonamides were only partially successful, clinically and experimentally, in affording protection against brucella, observations have been carried out with the antibiotic agents such as penicillin and streptomycin.

2. Penicillin.

It is the general opinion of most investigators that strains of brucella are resistant to penicillin so that little benefit may be anticipated in the treatment of patients having brucellosis. However, occasional strains of Brucella abortus do appear to be quite sensitive to penicillin. Successful treatment with penicillin was carried out in patient 15 (Table 1). This individual, a 41 year old farmer, had been totally incapacitated for over 11 months and was unable to carry on with his farm work. The organism isolated from this patient's blood was Brucella abortus and it was proved to be sensitive in vitro to 0.1 of a unit per cc. of penicillin. He was given 1,100,000 units of penicillin over a period of

nine days and following this recovered completely. The bacteremia was eradicated and he has been well for over one year. On the other hand, patient 17 had an infection due to Brucella abortus. This strain proved to be highly resistant to penicillin. Although she received over 9,000,000 units of penicillin the drug was without effect upon her clinical course. Subsequently, she improved with sulfadiazine therapy though the bacteremia persisted.

In conclusion, then, penicillin is not recommended routinely in the treatment of brucellosis.

3. Streptomycin

Early experimental work indicated that brucella were sensitive to the action of streptomycin, although only a few patients have been reported as having been treated with streptomycin[16, 17]. Considerable caution has been exercised in the interpretation of results. It would appear that streptomycin will afford some relief to patients with acute and chronic brucellosis, but there is some doubt as to whether the infection will be completely eradicated by the drug. We have not had the opportunity of treating any patients with streptomycin. However, one of us (Dr. Wendell Hall) has evaluated streptomycin experimentally using the infected chick embryo. The experiments were carried out as described for sulfadiazine. The results of a typical experiment are shown in Table 10. Thus it will be seen that of 20 infected embryos, 11 were still viable 122 hours after the infection,

Table 10

Eleven day chick embryos infected with Br. abortus (Strain #488) and results of treatment with 300 units streptomycin (Merck #181).

Materials Injected	into Embryos	Viability of Embryos (Hours after Injection)						
		24	48	72	96	120	168	192
Br. abortus 10^{-2}	Streptomycin	5/5	5/5	5/5	5/5	4/5	4/5	4/5
10^{-3}	Streptomycin	5/5	5/5	4/5	4/5	4/5	3/5	3/5
10^{-4}	Streptomycin	5/5	5/5	4/5	4/5	3/5	2/5	2/5
10^{-5}	Streptomycin	5/5	5/5	5/5	3/5	3/5	2/5	2/5
10^{-2}		5/5	5/5	5/5	4/5	2/5	0/5	0/5
10^{-3}		5/5	5/5	5/5	4/5	0/5	0/5	0/5
10^{-4}		5/5	4/5	4/5	4/5	3/5	0/5	0/5
10^{-5}		3/5	3/5	3/5	2/5	2/5	2/5	0/5
0.2 cc. tryptose broth	Streptomycin	5/5	4/5	4/5	3/5	3/5	3/5	3/5
Viability control		5/5	5/5	5/5	5/5	5/5	5/5	5/5

while all of the 20 controls were dead. It is of interest that cultures of the allantoic fluid from viable embryos treated with streptomycin still showed the presence of brucella. In other words, though the chick embryo was protected by the drug, the organisms were not eradicated. This appears to be similar to experience in human beings.

4. Vaccines

We have had little experience with the vaccines in the treatment of brucellosis. None of the 18 patients included in this report received vaccine therapy. The most widely used vaccine is a heat-killed preparation containing the three species of brucella.

Many physicians have expressed enthusiasm following the treatment of patients having chronic brucellosis with the use of a heat-killed vaccine. In patients with chronic brucellosis and a demonstrable bacteremia we can see little logic immunologically in introducing dead organisms into the patients' tissues. While patients with chronic brucellosis may have experiences relief following the use of vaccines, there is some question concerning the specificity of the material for brucellosis[18]. There is a good possibility that the beneficial results may be due to nonspecific activity. Reports would indicate that typhoid-paratyphoid vaccines given to patients with chronic brucellosis has resulted in benefit for the patient[19].

5. Artificial fever therapy

Following the report of Prickman and his associates[20] at the Mayo Clinic that artificial fever therapy is effective in the treatment of chronic brucellosis, we have treated a few patients with the Kettering hypertherm and coincident with several courses of fever therapy, the patients have been benefited. However, none of the present 18 cases received this type of therapy. Artificial fever therapy should be further evaluated.

In summary, there is no satisfactory treatment for brucellosis today. Evaluation of any therapeutic agent in this disease is beset with many difficulties. Patients selected for treatment should have the diagnosis established beyond any doubt, that is, the organism should have been recovered from either the patient's tissues or body fluids. Only confusion will result from the evaluation of therapy in patients with presumptive chronic brucellosis. It should be pointed out that brucellosis is a disease where spontaneous remissions and relapses occur. Many patients with acute brucellosis will experience relief which at times is permanent after a brief period of rest in bed. Patient 9 (Table 1) in the present series had chronic brucellosis with a persistent bacteremia. He received no specific therapy and his blood cultures became sterile. This patient apparently was in good health as he was accepted into the U. S. Army.

Conclusions

Brucellosis is endemic in Minnesota and there appears to be an increase in the incidence of the disease in the human population. The reservoir of brucellosis is in domestic farm animals, particularly cattle and swine. Eradication of the disease therefore depends upon controlling the infection in animals. This offers many problems. However, the disease can be more efficiently controlled in human beings. A large proportion of patients seen at the University Hospitals have contracted the disease through the ingestion of raw milk. In view of this, every effort should be made to prohibit the sale of unpasteurized milk for human consumption in this state.

It is also apparent that considerable caution must be exercised by physicians in the diagnosis of brucellosis. Inadequate clinical and laboratory data are too frequently utilized in arriving at a diagnosis, particularly in individuals suspected of having chronic brucellosis. There still remains a need for a specific therapeutic agent for brucellosis.

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III. GOSSIP

At the midwinter meeting of the Council on Medical Education and Hospitals, I will attempt to present the probable development in general medical practice in the future. I am using as my case history (there must be many others which have not been reported) an idealistic young physician who decided to go into public health because he was told that preventive medicine was the best way of bringing the greatest good to the largest number with the least expense. Accordingly he took graduate training in public health and received his certification. His first position was that of health officer in a county in a midwestern state, and although he was fairly successful according to public health standards he was not satisfied as he was forever telling the public about the services which medicine provided but when the people went for these services they were not available. He felt that he should not blame the doctors for this as he was not certain that his gospel could be practiced in the way in which he was preaching it, so he decided to try out the proposals he had been recommending. His family were nicely located in comfortable surroundings and it was difficult to ask them to leave but they said they were willing if he wanted to go. Many physicians have had their careers blocked by families unwilling to make the necessary sacrifices to see them through a period in which their living circumstances would be altered but which would bring them greater financial returns and personal satisfaction in the future. Our young doctor selected an unpromising community without special facilities for practice or living; it had large numbers of poor people, and there was little hope that the future would be much different. He believed that the first concern of a general medical practitioner should be obstetrics, for through obstetrics the physician becomes the real family adviser. Every general physician should practice good obstetrics and be prepared to meet any maternal or infant emergency as this is one place in general practice when a man is on his own. His next contact with the family is in the care of the infant, and after that, with the other children. It is a logical step into school work and for this our man was well prepared by his public health training and experience....In setting up his office his greatest concern was to equip it with as many diagnostic facilities as he was able to use. These naturally included good general examination equipment, use of special apparatus (ophthalmoscope), x-ray, and a general laboratory. Instead of saying that he could not do his own laboratory work without a trained technician, he found a young girl who graduated high in her high school class, who could not go away to school, so he trained her. His laboratory included a photoelectric cell for color determinations, electrocardiograph and other less common pieces of diagnostic equipment. He feels that after he has cared for his obstetric and pediatric cases, his next service to the community is in the emergency care of acute medical and surgical cases. He does not believe that he should treat complicated medical cases and he refers all his surgery. Since starting his practice he has developed a small hospital, but only for obstetric and for an occasional emergency patient. He occupies a prominent place in community life and is well liked by every one. After his people saw what manner of man he was they were so grateful to him for coming, that 1500 turned out to honor him at a reception. He possesses a good personality, but his bedside manner is simply that of an honest physician who believes in diagnosis first and then treatment, and in referring all patients that he is not competent to treat. I asked him if he had lost caste in his community because he does not do surgery and he is firmly of the opinion that he has not....Is he the general practitioner we should be training? ....