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## Brucellosis in a Veterans' Hospital, 1963

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### ABSTRACT

In Canada, about 100 sporadically occurring cases of brucellosis are reported yearly. Three patients were admitted to one Montreal hospital in the first seven months of 1963; all were employed in or around a packing plant. One had pain and electrocardiographic changes suggestive of *Brucella myocarditis*; he recovered promptly. Symptoms of neurasthenia and anxiety are common and were observed in two of these three cases. Two had positive blood cultures; the third showed conclusive agglutination to *Br. abortus* (1:10,240). In some patients with frequent previous exposures to infection the agglutination response may be equivocal and difficult to interpret. All three patients responded well to tetracycline; streptomycin and corticosteroids also have a role in the therapy of some cases. There may also be some place for combined antibiotic and vaccine therapy. The program of control of the disease in cattle in Canada is aimed at eradication by 1967.

### SOMMAIRE

Au Canada, on rapport chaque année environ 100 cas sporadiques de brucellose. Dans un hôpital montréalais, au cours des sept premiers mois de 1963, on a admis trois malades qui travaillaient tous dans une entreprise de conserve de viande. Chez l'un, qui se plaignait de douleurs, l'électrocardiogramme présentait des changements caractéristiques d'une myocardite à brucella. Sa guérison a été rapide. Des symptômes de neurasthénie et d'anxiété sont courants et ont été observés dans 2 de ces 3 cas. L'hémoculture était positive dans deux cas; le troisième présentait un test d'agglutination positif (1:10,240). Chez certains malades qui ont été fréquemment en contact avec l'agent infectieux, la réaction d'agglutination peut être équivoque et d'interprétation difficile. Les trois malades ont bien réagi à la tétracycline; la streptomycine et les corticoïdes peuvent jouer un rôle utile pour traiter certains malades. Une association d'antibiotiques et de vaccin peut avoir sa place dans l'arsenal thérapeutique. D'après le programme en cours, la maladie devrait être éliminée dans le bétail canadien à partir de 1967.

NOTIFICATION was given of about 100 cases a year of human brucellosis in Canada<sup>1</sup> until 1963, when there was a marked fall in the reported incidence of this disease.<sup>2</sup> It is possible that in some of these cases the diagnosis was based on doubtful clinical or serological grounds. On the other hand, it has been pointed out<sup>3</sup> that many cases are not reported because they are of subclinical severity, and

that the true incidence is probably higher than the official figures; it has been estimated, for example, that the actual incidence in the U.S.A. may be 10 times the reported figure.<sup>4</sup>

A review of the number of admissions in the five years 1958-62 in four teaching hospitals of McGill University and the University of Montreal revealed a relatively low incidence of cases severe enough to require hospitalization. Thus the admission of three cases to Queen Mary Veterans' Hospital, Montreal, in the first seven months of 1963 was considered to justify a report and a review of some aspects of the disease at the present time.

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These three cases all occurred in occupationally exposed individuals. This appears to be the common mode of infection at present, whereas 15 to 30 years ago the disease was more commonly milk-borne and occurred in epidemics rather than sporadically as it does now.

#### CASE REPORTS

**CASE 1 (Fig. 1a).**—This 42-year-old Dieppe veteran was a truck driver who was employed up to the time of admission picking up garbage and refuse at various places, including a packing plant where he handled discarded carcasses of animals. He was admitted to hospital on January 7, 1963, with a six-week history of diffuse aches and pains, alternating chills and sweats, anorexia, 35-lb. weight loss and a slight dry cough. On examination he had an elevated temperature. His pulse rate was 128 per minute and remained elevated, and his blood pressure was 106/70 mm. Hg. Both liver and spleen were enlarged. His erythrocyte sedimentation rate was 36 mm. per hour and his leukocyte count was 4250 per c.mm. with a moderate neutropenia. Radiographs of his chest were negative.

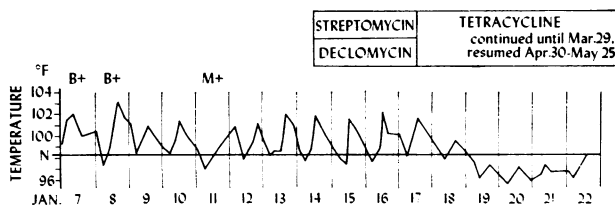


Fig. 1a.—Brucellosis: Clinical course of Case 1.

Agglutination for *Br. abortus* was positive at a titre of 1:2560, and for *Br. melitensis* at 1:1280. In due course three blood cultures and one bone-marrow culture were positive for *Br. abortus*, typed by the Laboratory of Hygiene, Department of National Health and Welfare, Ottawa.

Treatment was started with streptomycin and demethylchlorotetracycline (Declomycin). After three days, because of a diffuse macular rash and edema of the eyelids, the streptomycin was discontinued and tetracycline was substituted for demethylchlorotetracycline. Thereafter the chills and sweats subsided, and his temperature was normal by January 19. He had some dizziness and left nerve deafness of some years' standing, and this was another reason for discontinuing the streptomycin.

His condition had improved remarkably, when on January 24 he experienced a low retrosternal pain aggravated by breathing. No pericardial rub was heard. The electrocardiogram (ECG), which had been normal on admission, exhibited a series of changes in the next few days, the T waves being flattened on January 24, inverted on January 25 and back to normal on January 28 (Fig. 1b). Meanwhile the pain also subsided. The serum glutamic oxaloacetic transaminase (SGOT) level was 54 units. It was felt that the patient had suffered from pericarditis or myocarditis due to the *Brucella* infection. The rapid recovery favoured the latter diagnosis.

Convalescence continued and he was discharged on March 8. Administration of tetracycline was continued

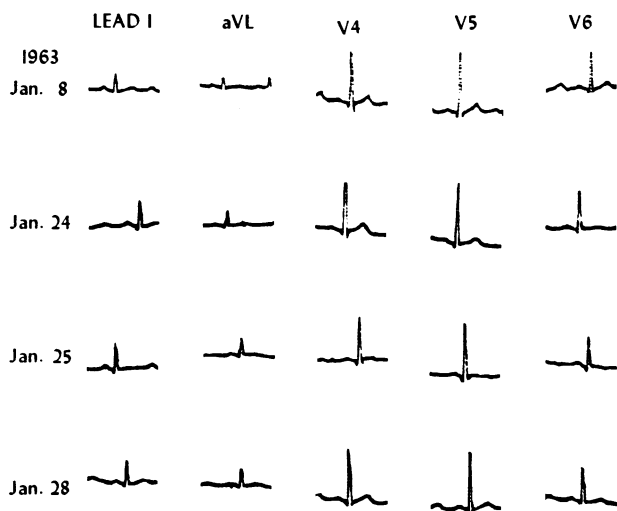


Fig. 1b.—Brucellosis: Case 1. Serial electrocardiograms showing possible evidence of myocarditis.

until March 29, when he was seen in the clinic and appeared quite well, though easily fatigued.

On April 26 he was seen again in the clinic, complaining of being easily fatigued, dyspepsia, depression and anxiety. He was readmitted and administration of tetracycline was resumed. However, all findings suggested inactivity of the brucellosis (agglutination level was then 1:320) and he was discharged on tranquilizers. He had developed polycythemia and gout, apparently unrelated to his brucellosis.

He returned to work about July and was seen in the clinic in September 1963 and January 1964. He was still said to be "rather nervous".

**CASE 2 (Fig. 2).**—This 43-year-old veteran was seen in the General Practice Outpatient Clinic on March 29 with slight fever, laryngitis and polyuria. He was given demethylchlorotetracycline (Declomycin) for four days, with some relief.

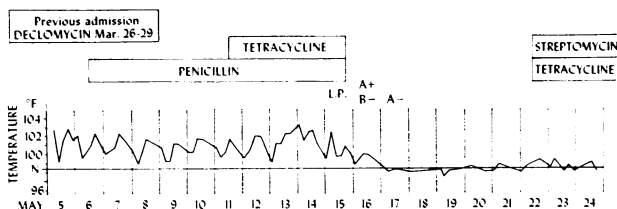


Fig. 2.—Brucellosis: Clinical course of Case 2.

Five weeks later, on May 8, he was admitted with a three-week history of severe headache, sweating, fever and occasional vomiting.

On examination his temperature was elevated and his pulse rate was 110 per min. No enlargement of the liver or spleen was detected. He was felt at first to be suffering from a local cellulitis related to an old skull injury, and penicillin therapy was started, with no appreciable effect. Tetracycline was added on May 11 on an empirical basis, and four days later there was a lysis of his fever.

A neurosurgical consultant saw him on May 14 and suggested the patient's transfer to the neurosurgical service for lumbar puncture and observation. He was thus on the neurosurgical ward on May 16, when the

agglutination reaction was reported positive to a titre of 1:10,240 for *Br. abortus* and 1:5120 for *Br. melitensis*. By that time he had had tetracycline for four days and no positive cultures were obtained from blood or bone marrow.

He was then practically afebrile and for a while no further treatment was prescribed. It was thought by some that with such a high degree of immunity, as shown by the agglutination titre, no further treatment was necessary. On May 22, however, he was started on a three-week course of tetracycline (500 mg. every six hours initially, and later three times daily) and streptomycin (0.5 g. twice daily) for two weeks.

This man was a construction worker, and enquiry revealed that he had worked for one week in December 1962 on construction at a packing plant. His nearest contact with animals occurred when he was working 20 feet from a pile of carcasses.

He was discharged from hospital on June 7. He returned to be presented at ward rounds in July, at which time he said that he felt perfectly well except for a tendency to sweat more readily and more profusely than before his illness.

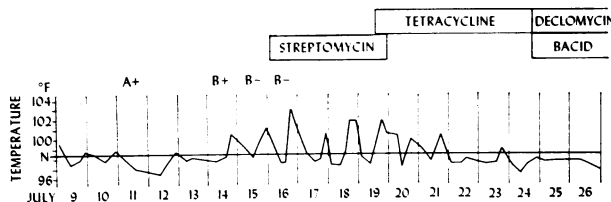


Fig. 3.—Brucellosis: Clinical course of Case 3.

CASE 3. (Fig. 3).—A 42-year-old slaughter-house employee was admitted on July 9, 1963. His chief complaints were nervousness and irritability, diarrhea, night sweats and a loss of 24 lb. in spite of good appetite. Neither temperature nor pulse rate was remarkable at first, but during the period of observation both became elevated. On examination he was thin and showed a tremor of the extended hands. The symptoms were all suggestive of hyperthyroidism, but though the eyes were prominent, there was no true exophthalmos and no goitre. The spleen was palpable and, considering his occupation, brucellosis seemed a diagnostic possibility. Blood taken on July 11 showed agglutination of *Br. abortus* to 1:5120 and *Br. melitensis* to 1:560. When the physicians approached him with this information the next day, he informed them that he had discussed his illness with his friends from the packing house, and that they were sure he had "the brucellose". Of the cultures of blood taken from this patient one was negative, one contaminated and one positive for *Br. abortus*. His leukocyte count was 6200 per c.mm., his sedimentation rate was 30 mm. per hr., and his serum thyroxine iodine was normal.

From July 16 to 19 he was treated with streptomycin alone, with little effect. A change to tetracycline on July 19 was associated with resolution of his fever by lysis. On July 24 demethylchlortetracycline (Delcomycin) was substituted for tetracycline, because of the claim that it causes less irritation of the bowel. Also, because of his diarrhea at that time, he was started on the preparation Bacid, which contains a human *Lactobacillus acidophilus* culture in high concentration. By maintaining normal intestinal flora, it is claimed that this preparation helps to control in-

testinal irritation due to antibiotics. On July 29 he was discharged and instructed to continue taking demethylchlortetracycline and Bacid to complete a total course of three weeks on these medications.

At the time of his discharge the diarrhea and sweats had ceased, but on September 30 and October 30 when he was seen in the clinic he was reported to be feeling generally weak and perspiring heavily. There was no fever and the spleen was not palpable.

In summary, these three cases emphasize the following points. First, all three men were employed by or around a packing-house. Secondly, the clinical diagnosis in at least two of the three was admittedly delayed, but there was eventually enough suspicion in all three cases to lead to the performance of agglutination tests which were strongly positive for *Br. abortus*. Positive blood cultures were obtained in two cases. Apparently the bacteremia was suppressed in the case of the other patient by antibiotic therapy. The trials of treatment with various drugs indicated the marked response to tetracycline. These cases emphasize two particular complications of brucellosis, namely myocarditis and neurasthenia. These observations warrant comment on the epidemiology, diagnosis, treatment and complications of brucellosis.

In reviewing the present knowledge and ideas about the disease, particular reference has been made to two recent monographs<sup>5, 6</sup> and to the Report on Brucellosis by the Joint FAO/WHO Committee.<sup>7</sup>

#### EPIDEMIOLOGY

By way of review it will be recalled that there are three main types of *Brucella*, namely *melitensis*, *abortus* and *suis*, affecting particularly goats, cattle and swine, respectively, but also numerous other animal species. Certain characteristics are usually seen in each type of brucellosis in humans although all cases do not conform to type. Infections caused by *Br. melitensis* tend to run a severe septicemic or "undulant" type of course, whereas those due to *Br. abortus* tend to cause a mild grippe-like illness. Infections by *Br. suis* tend to lead to various localized granulomatous lesions in bones, spleen, liver, lungs and other organs.

In Canada most cases are apparently due to *Br. abortus*, the infection being acquired from cattle, though the cases from the far north are caused by a strain which may be either *Br. melitensis* or *Br. suis* (Danish variety), probably carried by caribou.<sup>8</sup> From the nature of our domesticated animal population, *Br. melitensis* is not likely to be a serious threat. However, it has been observed in the United States that as *Br. abortus* infection becomes controlled, that due to *Br. suis* becomes more prominent.<sup>9</sup> Thus a program of control of swine infection may have to be considered in the future. The danger of the disease being maintained in the wild animal population must also be considered.<sup>8, 10</sup>

Though undulant fever was originally discovered as a milk-borne disease caused by *Br. melitensis* transmitted from infected goats in Malta, it is much less likely for clinically evident disease to be caused by milk from cows infected with *Br. abortus*.<sup>5</sup> Pasteurization has practically eliminated this form of infection in urban populations, although it seems probable that farmers' families will always drink unpasteurized milk. Thus there is now a tendency for brucellosis to become an occupational disease of farmers, veterinarians and packing-house workers. The surest way of acquiring the disease appears to be the handling, with lacerated hands, of the aborted fetus of a cow suffering from Bang's disease, but the next most certain type of exposure is that of a worker on infected carcasses in a packing-plant. Infection can also be passed by contamination of ground<sup>5</sup> as seems likely in Case 2 in this report. In a recent epidemic of *Br. suis* infection in a packing-house in Iowa, it was shown that infection was carried considerable distances through the air by aerosol suspensions.<sup>11, 12</sup>

The elimination of the animal source of infection is the obvious method of control of the disease, and will be discussed in a subsequent section of this article.

#### DIAGNOSIS

There are few new features of value in clinical diagnosis. The importance of occupational history is emphasized in the three cases described in this report, and fever and splenomegaly without neutrophilia in farmers, packing-house workers and veterinary surgeons should lead to a strong suspicion of brucellosis. Not only those with acute febrile illness, but patients with a milder, more chronic course should be considered as possible cases of this disease. In some cases the fever is of a low-grade type or may even be absent, and the chief indications of the infection may be symptoms of sweating, trembling, anorexia and "nervousness".

No case is completely proved unless the organism can be grown from the patient. With proper techniques, before antibiotics are given, positive cultures can be obtained from the blood in a high percentage of febrile cases. Failing this, positive cultures are occasionally obtained from the bone marrow, when the blood has been sterile.<sup>13</sup> Positive cultures have also been obtained from cerebrospinal fluid, duodenal drainage, urine (in patients with pyelonephritis), arterial blood, excised lymph nodes, and from various granulomatous lesions removed at operation.<sup>14</sup>

Failing positive cultures, presumptive evidence of *Brucella* infection may be obtained from studies of serum agglutinin levels. Standardization of suspensions is important and in Canada suspensions are available through governmental public health laboratories, with the Laboratory of Hygiene in Ottawa controlling the standardization. A four-fold

rise in the agglutinin titre in the course of the disease, or a titre above 1:320, is good evidence of current or very recent brucellosis. Titres of 1:80 to 1:320 are common among those exposed by occupation to infection, and may indicate subclinical infection in the past. Where there is no such occupational exposure, titres of 1:80 to 1:160 with typical clinical features call for repeated cultures and agglutination tests.

In some cases, particularly those with localized granulomatous lesions, the cultures may be negative, and agglutination may be absent or minimal. The appearance of relatively low titres later in the illness may be highly significant. Such sera should be investigated for "blocking antibodies". For this purpose laboratories should keep on hand a standard positive serum free of blocking antibodies. In other cases, positive agglutinations can be demonstrated by carrying the titrations to higher dilutions to surpass the "pro-zone" negativity caused by the blocking antibodies.<sup>15, 16</sup>

The precipitin type of test, as used for spot tests on cattle, is a good qualitative test, but it is difficult to obtain comparative quantitative titres of circulating antibodies in human cases with this test.

Rarely, false-positive agglutinations are caused by cross-immunity reactions to plague infection or cholera inoculation. Other misleading rises in antibody titre may come from the "booster" effect of Brucellergin and other substances used in skin tests. These tests are of little help in diagnosis, and are only indicated when cultures and agglutination tests leave room for doubt.

#### COMPLICATIONS

Complications of brucellosis are numerous, and involve nearly all systems in the body. As cardiac and psychoneurotic complications were emphasized in our cases, these only will be discussed here.

##### *Cardiac Complications*

One of the commoner causes of death from brucellosis has been subacute bacterial endocarditis,<sup>5, 6, 17</sup> though it is possible that this complication will be less common and less frequently fatal with the advent of effective antibiotic therapy. Non-fatal endocarditis has also been described,<sup>18</sup> and attention has been drawn to the association of brucellosis and calcific aortic stenosis, though an etiological connection has not been established.<sup>19</sup>

In the myocardium, small abscesses, lesions resembling Aschoff bodies, and in some cases curious focal accumulations of lymphocytes and mononuclear cells have been described.<sup>17</sup> Spink<sup>5</sup> has stated that there is no satisfactory evidence that the myocardium or conducting system is specifically affected in brucellosis, but Moeschlin<sup>20</sup> considered that he had found evidence of "myocardial damage" in 11 cases after ECG studies, and

Panuccio<sup>21</sup> also felt that two out of 137 cases of brucellosis which he reviewed showed evidence of myocarditis.

In such cases the doubt always arises whether apparent myocarditis is directly due to the infection or, on the other hand, whether it may be due to coronary arteriosclerosis which is aggravated by the infection. In Case 1 in this report there seems to be no doubt that some active process disturbed the myocardium, and the short duration favoured an infective process rather than coronary artery disease.

### *Psychoneurotic Complications*

Case 3 emphasizes the fact that at the onset the symptoms may resemble those of an anxiety state. At least two of our three patients were also left with "neurasthenia" for some months after the disease. For such patients reassurance that the disease is self-limited and will clear up before long is more important than repeated courses of therapy. Where compensation is a factor, motivation towards rehabilitation may not be very strong.

In some cases reported in the literature, subjective symptoms such as arthralgia, fatigue, headache and nervousness have persisted for years, but psychological studies have revealed that these symptoms are more closely related to the pre-illness personality structure than to the infection.<sup>22</sup>

On the other hand, chronic infection by *Brucella* does occur. One of the most vivid accounts of such prolonged illness is the autobiographical description by Alice Evans<sup>23</sup> of her own infection with *Br. melitensis*. This was before the days of antibiotic therapy, but even now, when there are drugs which are effective in the majority of infections, a number of chronic cases remain refractory to treatment. These are usually cases in which there is localized brucellosis of the bones, lymph nodes, lungs and other organs, but there are also some more general infections in which there is a tendency to relapses. In a recent study of laboratory-acquired infections at Johns Hopkins, one-third of 60 patients had recurrences of acute illness, with bacteremia or secondary rise of the agglutination titre.<sup>24, 25</sup>

"Chronic brucellosis", on the other hand, has been advanced as a diagnosis to explain various cases of chronic debility, and it is important that the diagnosis should not be accepted without adequate proof by culture, antibody response or demonstration of localized disease.

### TREATMENT

The three cases presented in this report all illustrate the effectiveness of tetracycline in treating this infection. Chloramphenicol is also effective but has no advantages over tetracycline. A course of three weeks' treatment, with a dosage of 500 mg. tetracycline every six hours, is recommended.<sup>7, 26</sup>

If the first course is well tolerated, it can be repeated in six to eight weeks if a relapse occurs.

It is doubtful if more than three courses are helpful unless suppuration is present.

Usually it is recommended that streptomycin 1-2 g. daily be given along with tetracycline for two weeks. Spink<sup>26</sup> is of the opinion that this is only necessary in cases of infection due to *Br. suis* and *Br. melitensis*, while milder *Br. abortus* infections can be treated with tetracycline alone.

Treatment with streptomycin alone has the disadvantage that though it is lethal for extracellular brucellae, the intracellular organisms are protected against the drug.<sup>27</sup> Penicillin and ampicillin<sup>28</sup> are inferior to tetracycline in effectiveness for this condition and their use is not indicated.

The institution of therapy may lead to a Herxheimer-like reaction said to be due to liberation of endotoxins. Such a reaction can be prevented by giving adrenocorticotrophin (ACTH) or a glucocorticoid along with the antibiotic. Steroid therapy may be indicated also in very severe infections, as the patient experiences symptomatic relief in 24 hours, whereas with antibiotics alone improvement does not usually occur for several days. Such steroid therapy carries the usual risk of dissemination of bacteria from well-localized lesions and should be restricted to a period of 72 hours and reserved for seriously ill patients.<sup>7, 29</sup>

When local suppurative or granulomatous lesions are present, the response to antibiotics may be slight, and excision of the lesion frequently may be indicated.

There remains the consideration of the low-grade, relapsing, so-called "undulant" fever, without a localized excisable lesion. Critical assessments of antibiotic therapy for various types of infection have led in the past few years to the view that greater attention should be paid to the host's reactions to the parasitic invasion. Thus in cases of typhoid treated with chloramphenicol, relapses appear to be more frequent in those treated in the earlier stages before specific immunity has developed. These observations have led to trials of booster doses of vaccines while continuing the antibiotic therapy in the immediate post-febrile period.<sup>30, 31</sup>

It seems reasonable to apply such principles of treatment to brucellosis as well as to other infections. Although in the case of brucellosis the specific agglutinating antibodies have not been shown to be the actual globulins that confer protective immunity, evidence from past experience suggests that a good response in terms of the production of agglutinating antibodies usually indicates that the patient is attaining a state of protective immunity and will shortly throw off the infection. Where granulomatous lesions are present, there are obvious analogies between brucellosis and other chronic bacterial or mycotic infections. Treatment with various types of vaccine was given an extensive trial in pre-antibiotic days.<sup>32-36</sup> The main difficulties centred round the preparation of vac-

cines in such a way that the significant antigenic fractions were preserved. Some success was reported with Brucellin, a culture filtrate without bacterial cells.<sup>33</sup> Inoculation with a live attenuated strain (S19) of *Br. abortus* has been effective in producing protective immunity in young cattle but it is too apt to produce clinical illness for use in humans.<sup>5</sup> *Brucella* vaccines killed by heat<sup>34</sup> or nitrous oxide<sup>35, 36</sup> were used with apparent good effect in several series of cases. It was shown that long-drawn-out cases could be brought into a recovery phase by such treatment. Whenever Brucellin or vaccine was given, preliminary testing was necessary, and subsequent dosage required careful control in order to avoid reactions.

At the present time, acute brucellosis responds to antibiotic therapy but there is still a considerable tendency to relapse.<sup>26</sup> Pending the complete elucidation of the immune status of such cases, it would seem reasonable that when a patient shows a poor response in agglutination titre near the end of the accepted three-week course of antibiotic therapy, preliminary intradermal tests, followed by desensitizing or larger doses of Brucellergin or vaccine should be tried.

#### CONTROL OF ANIMAL INFECTION

Not only is the control of infection in animals desirable from the point of view of restricting the spread of the disease to humans, but it is also indicated for economic reasons in the livestock field, to prevent loss of calves.

Earnest attempts have been made in Canada to control the disease in cattle, and the Health of Animals Branch of the Department of Agriculture believes that the disease will be controlled by 1967.<sup>37</sup>

A system of control by areas has been employed. In these areas a twofold program has been introduced, combining calthood vaccination with testing of adult cattle, including *Brucella* ring tests on pooled milk and blood agglutination. Where the animals show a positive titre of 1:100 or greater, or in the case of vaccinated cattle a titre of 1:200, their slaughter is ordered.<sup>38</sup>

Preliminary testing has been completed in Manitoba, Prince Edward Island, New Brunswick and Nova Scotia, and will be completed in Saskatchewan shortly. The target date for all Canada is March 1966. In the course of this program, which was instituted in 1957, the general level of infection in cattle has been reduced from an estimated 4.5% to 1.5%. During this period 149,000 reactor animals have been slaughtered and \$10.3 million paid in compensation to owners.<sup>37</sup>

The weak link in this chain appears obvious from the observations in this paper, and lies in the packing-houses. During the period in which large numbers of infected cattle have been and will be ordered slaughtered, the exposure of the packers to infection is well recognized. In Manitoba control

measures as described above resulted in considerable success between 1959 and 1963. However, the intensive slaughter of infected cows was reflected in a rise in human cases (presumably in animal handlers) from an actual figure of eight or nine up to 1957, to 31 in 1961, and back again to about 10 in 1963.<sup>39</sup> All possible measures to prevent exposure in the packing-houses must be employed. Instructions for careful handling are issued by the authorities, including the use of gloves and careful disposal of waste by incineration. The observations in the Iowa packing-house epidemic suggest that care is necessary in regard to air-borne infection. Infections of retail butchers or consumers are probably comparatively rare.

Following control of infection in cattle, the disease may still be carried by swine, as has been noted in the United States, and control measures in herds of swine will have to be undertaken as has been done in the case of cattle.

Control in sheep, goats and horses will hardly constitute a problem in Canada, but a study of the infection in wild creatures will be necessary to determine whether certain species may act as carriers and reinfest the domestic herds after control has been established.

#### SUMMARY

Three cases of acute infection with *Brucella abortus* occurring in a veterans' hospital in the first seven months of 1963 are reported.

All three cases occurred in men who had been employed in some capacity about one packing-house. This fact draws attention to this type of exposure to infection which has been emphasized in the literature.

One patient had chest pain and showed electrocardiographic changes probably caused by myocarditis due to *Brucella*.

Current problems of diagnosis and treatment are reviewed and the program of control of animal infection in Canada is discussed.

The authors wish to record their thanks to Dr. G. W. Halpenny, Chief of the Medical Division, Queen Mary Veterans' Hospital, for permission to report these cases.

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## The Significance of Ventricular Premature Beats in the Diagnosis of Septal Infarction

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### ABSTRACT

Two hundred and twenty electrocardiograms containing premature ventricular beats were reviewed. Twenty of these contained premature ventricular beats of a myocardial infarction pattern, that is, one consisting of a significant Q wave followed by an R wave. A review of the case histories of these 20 patients disclosed that all 20 had angina pectoris and/or myocardial infarction. Postmortem examinations were performed in seven, and the presence of myocardial infarction was verified. In three instances, only the premature ventricular beat disclosed the myocardial infarction pattern while the normally conducted beats did not. In these three cases the postmortem examination confirmed the presence of septal infarction.

### SOMMAIRE

Les auteurs passent en revue 220 électrocardiogrammes comportant des systoles prématurées. Parmi ceux-ci, on en comptait 20 dont les systoles prématurées relevaient d'un infarctus du myocarde, c'est-à-dire montrant une onde Q significative, suivie d'une onde R. L'étude des dossiers cliniques de ces 20 malades révéla que tous souffraient d'angine de poitrine et d'infarctus du myocarde ou de l'une des deux affections. Chez sept malades, la nécropsie a confirmé la présence d'un infarctus du myocarde. Dans trois cas, seule la systole prématurée a permis de déceler la pathologie d'infarctus myocardique, alors que les battements normalement transmis ne la décelaient pas. Dans ces trois cas, l'examen post-mortem a confirmé la présence d'un infarctus du septum.

IT IS well known that in a small percentage of otherwise typical cases of myocardial infarction the electrocardiogram may not show a diagnostic pattern. Occasionally, however, ventricular premature beats may occur which display the characteristic features of myocardial infarction and which may lead to the correct electrocardiographic diagnosis.<sup>1-7</sup> It is the purpose of this paper to present three such cases, supported by autopsy confirmation.

The authors reviewed 220 electrocardiograms containing premature ventricular beats. In 20 tracings the premature beats were of a pattern that

suggested myocardial infarction; that is, the complexes were made up of a significant Q wave followed by a definite R wave and sharply inverted or upright T wave, depending on the age of the lesion.

Premature ventricular beats occurring in lead aVR were disregarded, as negative initial deflections may occur normally in this lead. Similarly, QS complexes were disregarded, since in precordial leads premature complexes of the QS variety may only indicate that the origin of the complex underlies the electrode.

The case histories of all 20 patients in whom the ventricular premature beats suggested myocardial infarction were reviewed. In each there was a

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