Rangiferine Brucellosis In Alaskan Canids

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Rangiferine Brucellosis In Alaskan Canids

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Abstract

The first known case of rangiferine brucellosis caused by Brucella suis biotype 4 in a sled dog has been proven by isolation of the organism from the naturally infected animal. The infection was undoubtedly contracted from eating raw, infected barren-ground caribou, Rangifer tarandus granti, in which the disease is enzootic. Limited experience with infections in sled dogs suggests that the disease may run a comparatively mild course in them. Serological evidence indicating the natural occurrence of the disease in wolves, Canis lupus, also is reported for the first time.

Introduction

Rangiferine brucellosis is now a relatively well known enzootic disease of Rangifer spp. (reindeer and caribou) in Eurasia and North America. The causative organism has been clearly demonstrated to be a strain of Brucella (B. suis biotype 4) peculiar to Rangifer. Brucellosis of domestic canines caused by various species of Brucella also is well known. Recently Szefres and Tomé have reported natural infections of B. abortus biotype 1 in foxes on Argentine cattle ranges. McCaughey has found serological evidence of B. abortus in foxes in Northern Ireland, and naturally infected foxes have also been reported in Russia. The author of the present communication for several years has been concerned over the possible role of wild and domestic canines in the epidemiology of rangiferine brucellosis in Alaskan big game ruminants and mamals. Only recently has it been possible to make significant progress in exploring this possibility. Because of the relative difficulty of obtaining suitable study material from wild canines (i.e., foxes and wolves) in areas where they may come in contact with infected caribou, it seemed practical first to determine whether the disease is ever contracted by sled dogs which in some native villages are fed large amounts of raw, sometimes infected, caribou. The purpose of the present communication is to report the first known, natural case of rangiferine brucellosis in a canine host. At a later date when more extensive information is available, a more detailed communication on the disease in both wild and domestic canines will be presented.
Materials and Methods

Serological and bacteriological procedures used are essentially those described by Alton and Jones1 unless otherwise noted. Tissues were minced with sterile scissors and streaked on petri plates containing Brucella (Albimi) agar with actidione, bacitracin and polymixin. Hematology was done on heparinized blood taken just before euthanasia. The leukocyte count was made using a hemocytometer. Packed cell volume was determined by the micro-capillary method and hemoglobin concentration was measured by the cyanmethemoglobin method. The leukocyte differential was made after the dried blood film had been stained with Wright’s stain. Serum samples for serology were taken from settled whole blood and frozen without addition of preservatives. Both fresh and frozen tissue samples were successfully used in isolating B. suis biotype 4 from the case reported below.

Results

The possibility that rangiferine brucellosis does naturally occur in Alaskan canines was first suggested by serological tests of sled dogs from Anaktuvuk Pass. Twenty-three sera taken from members of seven dog teams in May 1967, yielded two reactors with titres of 2+, 1:160 and 2+, 1:640 in the rapid plate agglutination test using B. abortus antigen. These two reactors were the surviving members of a team of eight. According to their owner, his team had come down with the “sweats” several months earlier during mid-winter and all but two had eventually died. Considering that other biotypes of Brucella have not been observed to be a direct cause of death in infected canines2 and also, that the team in question was known to have been very poorly cared for by its owner, it does not seem likely that rangiferine brucellosis was more than indirectly involved in the team’s demise. The very low plane of nutrition of the team (probably near starvation) and exposure to very low temperatures may have contributed to the establishment and severity of the disease. Another group of infected dogs was discovered at Kobuk in May, 1969. Serum samples from the infected team and other teams at the village were taken again in July and September 1969, and one of the reactors was brought into the laboratory for study:

The subject was a medium-sized, two-year-old bitch of mixed breeding. In May she had agglutination and complement fixation titres of 1:2560 and 1:640, respectively, and at sacrifice in July the brucella titres were 1:640 and 1:1280, respectively. Just before sacrifice she was given a physical examination and a blood sample was taken for serology and differential cell count. The results of the pre mortem examination are included in Table 1. No gross pathological lesions were encountered during necropsy. The results of the bacteriological examination of selected tissues are shown in Table 2. Histopathological studies of selected tissues were negative. The organism was typed using the procedures recommended by Alton and Jones.1 These data will be published in detail elsewhere when more isolates have been studied.

Discussion

In view of the fairly extensive literature on canine brucellosis involving other species and/or biotypes of Brucella, it is not surprising that rangiferine brucellosis appears to be a common infection of sled dogs in areas where infected caribou or reindeer are used as dog food. Similarly, it may be expected to be common in wild canines and indeed, three of only seven wolves (Canis lupus) thus far tested have yielded serum complement fixation titres of 1:20, 1:40, and 1:160, the
### TABLE 1. Antemortem condition of a sled dog infected with Brucella suis biotype 4.

<table>
<thead>
<tr>
<th>Observation</th>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (rectal)</td>
<td>101.8 °F*</td>
<td>Normal</td>
</tr>
<tr>
<td>Heart rate</td>
<td>108/minute</td>
<td>&quot;</td>
</tr>
<tr>
<td>Lung sound</td>
<td>—</td>
<td>&quot;</td>
</tr>
<tr>
<td>Physical exam. in general</td>
<td>—</td>
<td>&quot;</td>
</tr>
<tr>
<td>Blood count:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCV</td>
<td>43</td>
<td>&quot;</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>14 gm. %</td>
<td>&quot;</td>
</tr>
<tr>
<td>WBC</td>
<td>14,500</td>
<td>&quot;</td>
</tr>
<tr>
<td>Differential count:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>26%</td>
<td>&quot;</td>
</tr>
<tr>
<td>Monocytes</td>
<td>6%</td>
<td>&quot;</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>20%</td>
<td>&quot;</td>
</tr>
<tr>
<td>Segmenters</td>
<td>48%</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

### TABLE 2. Occurrence of Brucella suis type 4, in selected tissues of a sled dog.

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Results[1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandibular lymph nodes</td>
<td>+++</td>
</tr>
<tr>
<td>Mesenteric lymph nodes</td>
<td>+++</td>
</tr>
<tr>
<td>Popliteal lymph nodes</td>
<td>+++</td>
</tr>
<tr>
<td>Subscapular lymph nodes</td>
<td>++</td>
</tr>
<tr>
<td>Mediastinal lymph nodes</td>
<td>—</td>
</tr>
<tr>
<td>Spleen</td>
<td>+</td>
</tr>
<tr>
<td>Liver</td>
<td>—</td>
</tr>
<tr>
<td>Lung</td>
<td>—</td>
</tr>
<tr>
<td>Kidney</td>
<td>—</td>
</tr>
<tr>
<td>Heart muscle</td>
<td>—</td>
</tr>
</tbody>
</table>

[1] Numbers of colonies observed on plate cultures were scored as follows: 1-10, +; 10-100, ++; over 100, +++.

[2] Two or more attempts to recover organisms in culture were made.
latter also giving an agglutination titre of 1:160. We expect to find serological
evidence of infection also in red and arctic foxes. Whether other carnivorous
or omnivorous mammals and birds also prove to be natural carriers remains to
be seen. However, it should be kept in mind that workers have demonstrated
natural or experimental infections of brucellae in various rodents, insectivores,
mustelids, and birds. Of these, ground squirrels (Citellus) are common on the
Alaskan ranges of infected caribou and reindeer herds. Rementsova has demonstrat-
ed the survival of brucellae in the suslik, a Russian species of Citellus, for
740 days. Whether Citellus is an important reservoir of rangiferine brucellosis
remains to be seen. Korol recently reported on "self perpetuating" brucella
infections in murid rodents in Russia.

Since grizzly bears commonly feed on
the remains of caribou and sometimes
take live young or adults in areas where
enzootic rangiferine brucellosis occurs,
it seems likely that they also are some-
times exposed to the disease. Apparently
no one has reported natural or experi-
mental infections of brucellosis in ursids.
Sylvatic brucellosis in Alaska may prove
tobe as widely distributed among wild
host species as it is elsewhere.

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Pass collected the wolf sera. The work was
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