Actinobacillus equuli Septicemia: an Unusual Zoonotic Infection

CHRISTOPHER ASHHURST-SMITH,1 ROBERT NORTON,1* WENDY THOREAU,2 AND MARGARET M. PEEL3

Department of Clinical Microbiology, Townsville General Hospital,1 and Cardiology, Mater Hospital, Pimlico,2 Townsville, Queensland, and Microbiological Diagnostic Unit, Department of Microbiology and Immunology, University of Melbourne, Parkville, Victoria,3 Australia

Received 1 June 1998/Accepted 11 June 1998

We describe the isolation of Actinobacillus equuli from the blood of a 53-year-old butcher with septicemia. This species of the genus Actinobacillus is primarily associated with animals and animal diseases, especially septicemia in foals. This is the first report of the isolation of A. equuli from a human with septicemia.

Although the genus Actinobacillus includes species associated with human diseases and sources, such as Actinobacillus actinomycetemcomitans and A. urea, most species are commensals or pathogens of animals, especially cattle, horses, and pigs (10, 13). As components of the oropharyngeal flora of these animals, A. lignieresii, A. equuli, and A. suis may cause bite wound infections in humans (4, 6, 9, 13). An aerogenic A. equuli-like bacterium has also been described from an infected horse bite wound (9). However, systemic human disease due to A. equuli has not been previously reported. We describe here the isolation of A. equuli as the causative agent of septicemia in a butcher who had cut his thumb.

A 53-year-old man presented in an acute state of profound septic shock. Three days earlier, he had sustained a cut to his left thumb while at work as a butcher. Three years previously, he had received a mitral valve replacement for mitral regurgitation. He had remained well for the 2 days following the thumb injury but then developed fever, confusion, and nausea and collapsed.

Upon admission, the patient was drowsy, confused, febrile, and hypotensive. His heart sounds were clear, with normal prosthetic sounds and a soft midsystolic murmur. The injury site did not show any obvious signs of infection. There were no clinical stigmata of infective endocarditis. An echocardiogram showed good function of his prosthetic valve, with no evidence of endocarditis. A computerized tomographic scan of the brain was normal.

Treatment with intravenous fluoxacillin, gentamicin, and benzylpenicillin was commenced. Blood was collected and cultured every 6 h of admission and the commencement of antibiotic therapy. The patient improved, his fever resolved, and normal cerebral status returned. Treatment with benzylpenicillin was continued for a total of 4 weeks, after which the patient was discharged.

After 24 h of incubation at 35°C, a gram-negative bacillus was detected in the blood culture system in two of the three blood culture vials. The motility test was negative. Overnight incubation of subcultures revealed small grey-white colonies on both the aerobic and anaerobic plates of Columbia agar (Becton Dickinson Microbiology Systems). The growth was sticky. Growth on MacConkey agar (Becton Dickinson Microbiology Systems) was weakly positive. Conventional biochemical reactions and other characteristics were determined as previously described (13), and acid production from carbohydrates was assessed with the API 20E identification system (bioMérieux, Marcy-l’Etoile, France) and Minitek carbohydrate-impregnated paper discs (Becton Dickinson Microbiology Systems). The growth characteristics and biochemical reactions (Table 1) suggested an identification of A. equuli (6, 13), which was confirmed by the Microbiological Diagnostic Unit at the University of Melbourne, Melbourne, Australia.

Actinobacillus spp. are members of the family Pasteurellaceae. Close similarities exist among the genera within this family, especially between Actinobacillus and Pasteurella. Re-examination of some identified isolates has shown that misidentifications across the two genera have occurred (2, 8). Four biochemical tests are of particular value for their differentiation. These are β-galactosidase (as determined by hydrolysis of o-nitrophenyl-β-D-galactopyranoside), urease activity, and growth on MacConkey agar, which are usually positive for Actinobacillus spp., and indole production, which is always negative. All four tests should be used as an initial step in the identification of species belonging to these genera, as the test results for Pasteurella spp. tend to be more variable.

Species differentiation within the actinobacilli may also present difficulties (1, 2). A. equuli can be differentiated from the closely related A. lignieresii by meliobiose and trehalose fermentation (6, 9, 13). The former produces a positive result in both substrates, but the latter ferments neither. While A. suis also ferments meliobiose and trehalose, it differs from both A. equuli and A. lignieresii in its hydrolysis of esculin and hemolysis of sheep blood (6, 9, 13).

A. actinomycetemcomitans differs from other species in the genus in that it does not grow on MacConkey agar or in the absence of an atmosphere containing increased carbon dioxide, does not produce urease, and is usually oxidase negative. It has been suggested that this species should be removed from the genus Actinobacillus and placed in the genus Haemophilus (11), but this proposal has not been generally accepted (7).

A. equuli is the causative agent of sleepy foot disease, an acute and often fatal septicemia of newborn foals (10). In adult horses, A. equuli has been associated with endocarditis, meningitis, metritis, and abortion. The species also causes disease in pigs (10). It has been isolated, along with A. lignieresii, from laboratory rodents (8). A. equuli is prevalent in horses in Australia, where it has been reported to cause equine neonatal...
TABLE 1. Growth characteristics and biochemical reactions of case isolate of *A. equuli*

<table>
<thead>
<tr>
<th>Characteristic or reaction</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic and anaerobic growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth on MacConkey agar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catalase (weak)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxidase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urease (Christensen’s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate reduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>β-Galactosidase (ONPG)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphatase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acid from slant and butt of TSI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acid from glucose, lactose, maltose, mannose, melibiose, raffinose, sucrose, trehalose, and xylose</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**a** ONPG, 4-nitrophenyl-β-D-galactopyranoside.
**b** TSI, triple sugar iron agar.
**c** MRS broth, Oxoid CM359 (see reference 9).

septicemia (12), pleuropneumonia (3), and peritonitis (5). The species has not been reported in pigs in Australia. It is likely that our patient was occupationally exposed to the bacterium and that the cut on his thumb provided a portal of entry to his bloodstream.

Correct identification of *Actinobacillus* species according to current schemes of classification depends on adequate biochemical characterization and awareness of the possible presence of these bacteria in sites such as bite wounds inflicted by horses, pigs, or sheep. Occupational or recreational activities may provide important clues for establishing an early diagnosis. This awareness, in conjunction with an appropriate range of biochemical tests, should lead to the correct identification of species of *Actinobacillus*, even in unusual zoonotic infections.

**REFERENCES**


