Case Report


trace of consuming unpasteurized milk from a cow. The cow was in the same stable as the horses, and the ill woman’s son milked the cow.

Introduction

Streptococcus equi subsp. zooepidemicus is a member of the group C streptococci, together with Streptococcus equi subsp. equi, Streptococcus dysgalactiae and Streptococcus equisimilis. It is recognized as either a commensal or a pathogen in a wide host range of animals: horses, cattle, swine and guinea pigs (Berenguer et al., 1992). It is by far the most common cause of wound infections and causes respiratory tract infections of foals and young horses, including purulent nasal discharge and abscesses of submandibular lymph nodes in some cases (Downar et al., 2001).

It appears to be a zoonosis, principally seen in patients consuming unpasteurized milk or dairy products or those in close contact with horses (Barnham et al., 1989). A variety of superficial and deep clinical infections in humans have been described, the most serious including septicemia, meningitis, pneumonia, septic arthritis and post-streptococcal glomerulonephritis (Arditi et al., 1989; Balter et al., 2000; Barnham et al., 1989; Downar et al., 2001; Edwards & Roulson, 1988).

Case report

The patient was a 72-year-old woman who had a history of previous myocardial infarction 3 years before. She awoke on the morning of presentation complaining of confusion. She subsequently became comatose and febrile and was taken to a nearby hospital. On admission, she was unconscious, agitated, and her temperature was 39.4 °C, blood pressure 140/90 mmHg and heart rate 100 beats min⁻¹. She had neck stiffness and Babinski’s sign was demonstrated on the left. Other systemic findings were normal. The white blood cell count was 40.8 × 10⁶ cells⁻¹ (95.9 % segmented neutrophils, 3.1 % lymphocytes and 1.0 % monocytes) and the erythrocyte sedimentation rate was 70 mm h⁻¹. The serum fibrinogen was 11.5 g l⁻¹. A lumbar puncture revealed a cloudy cerebrospinal fluid (CSF) containing 2500 × 10⁶ segmented neutrophils (normal range up to 5 × 10⁶). The CSF protein concentration was 3.5 g l⁻¹ (normal range 0.15–0.45 g l⁻¹) and glucose 3.5 mmol l⁻¹, with concurrent plasma level of 8.2 mmol l⁻¹. Gram-positive diplococci were seen on Gram-stain smear of the CSF. The patient was administered ampicillin, gentamicin and rifampicin intravenously. CSF cultures showed S. equi subsp. zooepidemicus, while blood cultures remained sterile. The patient’s course in the hospital was initially complicated by continued stupor during the first 5 days of treatment. However, over the next 24 h she became afibrile and able to communicate. She stayed at the hospital for 3 weeks, the antibiotic therapy remained unchanged, and she made a continued recovery.

When she woke up and was able to communicate, the diagnosis of S. equi subsp. zooepidemicus in her CSF was already established. She confirmed that she had three horses. She denied direct contact with the horses and said that the only person who had close contact with the horses was one of her sons. He took care of the horses, fed them and took two of them out of the stable from time to time, while the third horse always stayed in the stable. When he took the horses out, he used the same mouth-bit to guide both. In the same stable as the horses were two cows, and the son who took care of the horses was also milking the cows every day. He did not wash his hands after taking care of the horses or before milking the cows.

Oropharyngeal and nose swabs taken from the woman with meningitis and her three sons, who lived in the same household, were negative for S. equi subsp. zooepidemicus. However, nasopharyngeal swabs from two of the three horses tested positive.

Microbiological methods

Swabs were inoculated directly onto one blood agar plate containing 5 % sheep blood and then enriched in brain...
heart infusion broth. The blood agar plates were streaked for isolated colonies and incubated for up to 48 h at 37 °C in aerobic atmospheric conditions. After overnight incubation at 37 °C, the swabs from the brain heart infusion broth were inoculated onto another blood agar plate, which was incubated as previously stated. Colonies of Gram-positive cocci that were catalase-negative and β-haemolytic on the blood agar plates were agglutinated with streptococcal grouping reagents A, B, C, G and F (Slidex Strepto-Kit; bioMérieux). Those isolates that agglutinated in the group C reagent were identified using API 20 Strep strips (bioMérieux). The original colonies isolated on blood agar appeared mucoid. The present S. equi subsp. zooepidemicus showed sensitivity in vitro to penicillin, ampicillin, erythromycin, chloramphenicol, ceftriaxone and vancomycin. PFGE was performed to determine the genetic relatedness of three strains (one isolate from CSF of the patient and two isolates from nasopharyngeal swabs from the two horses). Agarose plugs containing genomic DNA were digested with Smal (Gibco, BRL) and electrophoresis was carried out using a clamped homogeneous electric field device (CHEF-DRII; Bio-Rad Laboratories), with ramped pulse times beginning with 5 s and ending with 35 s, at 200 V for 19 h. The gels were stained with ethidium bromide (0.4 μg ml⁻¹) for 15 min and photographed. PFGE patterns of the isolates from the two horses and the woman were identical (Fig. 1).

Discussion
The patient described in this case report was a woman who lived in a household with her three sons. Only one of the sons took care of their three horses and two cows, who were in the same stable. One horse had mild symptoms of upper respiratory tract infection, cough with no respiratory secretions, while the other two were healthy. The cows were healthy. One of the S. equi subsp. zooepidemicus isolates was from the horse with the symptoms of respiratory disease, while the other isolate was from the healthy horse, the one that was also taken out for a walk (asymptomatic carrier). We speculate that the ill horse might have illness due to its older age (10 years old; she was mother of the other two). The man caring for the horses used the same mouth-bit for the two horses carrying S. equi subsp. zooepidemicus when he took them for a walk outside the stable. The third horse, without S. equi subsp. zooepidemicus, was never taken out of the stable. Bacterial spread might have been via the mouth-bit from horse to horse to hands, and then to milk. However, since the mouth-bit and cows’ teats were not swabbed, and the organism was not found on the man’s hands, we can not be sure about the means of transfer of the bacterium.

The patient never gained access to the stable or had close contact with the horses. The only one of her sons who took care for the horses and cows did not wash his hands before milking, which was done manually. Low et al. (1980), Shah et al. (2001), Downar et al. (2001) and Ural et al. (2003) reported a case of S. equi subsp. zooepidemicus meningitis linked to close contact with horses. Although the patient denied such contact, meningitis might occur due to indirect contact with them. The patient had a habit of consuming unpasteurized milk, like her three sons. Consumption of unpasteurized cow’s milk and milk products has been implicated as the source of infection in a few reports previously (Balter et al., 2000; Barnham et al., 1987; Edwards & Roulson, 1988).

Meningitis in the old woman, while her sons stayed healthy, might be explained by her advanced age and the previous heart attack. Previous authors have noticed that serious infection with S. equi subsp. zooepidemicus has mostly been reported in patients over the age of 70 years or in neonates, and it seems to be rare in healthy young adults (Barnham et al., 1987; Bradley et al., 1991). Cardiovascular disease, in a survey in 1991, has proved to account for 20.5 % of all the underlying diseases found in patients with group C streptococcal bacteraemia (Bradley et al., 1991). We speculated that host factors may account for a difference in risk. In the review by Arditi et al. (1989), six of 13 patients suffering from central nervous system infections caused by group C streptococci died, and Bradley et al. (1991) and Shah et al. (2001) proved that advanced age decreases the survival rate for these patients. Although invasive group C streptococcal infections are associated with a mortality rate of 25–40 % (Berenguer et al., 1992; Bradley et al., 1991), combined therapy with ampicillin, gentamicin and rifampicin for our patient was successful.

The patient survived, and in follow-up evaluation 6 months after she was discharged from the hospital she

Fig. 1. PFGE of Smal-restricted genomic DNA of the isolates. Lanes: 1 and 5, λ ladder; 2, isolate from the patient; 3, isolate from the ill horse; 4, isolate from the healthy horse.
proved that she was in a good health with no neurological sequelae.

Boiling or pasteurization of raw milk is recommended mainly to kill *Mycobacterium tuberculosis*, since this organism is the most serious threat. However, other bacteria, especially originating from animals or acquired by secondary contamination, might spoil the milk, causing serious diseases. To prevent the outbreak of illness caused by zoonotic organisms, adequate boiling or pasteurization of raw milk is needed.

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**References**


