PIRATES, PATHOGENS AND POTABLE WATER

Our speaker on 1 November 2000 was Dr Tim Inglis, a medical microbiologist from PathCentre in Perth. Tim presented slides as he spoke and he mentioned his involvement with the microbiological aspects of several cases of melioidosis that occurred in recent years in an unidentified Aboriginal community in the Kimberley. The core part of his delivery comprised a paper entitled ‘About Melioidosis’ that is published at www.e-tiology.com/melioid1 (with the last character in the string being the numeral one). The paper is reproduced below with Tim Inglis’s permission. Copyright remains with the author.

About Melioidosis

Melioidosis is an enigmatic disease found in the tropics, particularly in Southeast Asia and Northern Australia. Infection ranges from rapidly fatal septicaemia, with or without pneumonia, to more chronic soft tissue involvement involving almost any part of the body. A notable feature of melioidosis is recurrence months or even years after the initial acute infection. Cases have been reported in which acute infection occurred after a disease-free interval of decades after presumed environmental exposure.

Exposure

Infection occurs as a result of environmental exposure to the Gram negative bacillus, Burkholderia pseudomallei. This species is found in soil and surface water throughout the main endemic area. Occupational or recreational exposure to soil or muddy water is thought to increase the risk of infection. But the condition of the exposed person is also a major determinant factor in the development of disease, since diabetes and chronic renal failure result in a higher risk of severe infection. Direct person-to-person disease is extremely rare. Outbreaks also seem to be unusual.

Bacterial ecology

B.pseudomallei is able to survive in water for prolonged periods without any form of nutrient and is tolerant of a range of adverse environmental conditions such as low pH. B.pseudomallei also has a notable ability to survive inside the phagocytic cells that normally clear up residual infection. The bacillus produces a variety of toxins but the details of how important they are in the process of infection have yet to be worked out. An arabinose utilising variant was described recently which is only very rarely isolated from clinical specimens but is much more commonly isolated from the environment. This less pathogenic variant has been named B.thailandensis by some authorities.

Laboratory Diagnosis

Infection is diagnosed by culture of B.pseudomallei from blood, sputum or other focal site, as indicated by the clinical presentation, or by rising antibody titre. A rapid immunodiagnostic test is available. Confirming the identity of a suspected B.pseudomallei culture isolate can be difficult. Some commercial culture identification systems are prone to misidentify B.pseudomallei as other species such as Chromobacter violaceum, Burkholderia cepacia or Pseudomonas aeruginosa. A PCR protocol can be used to confirm the identity genotypically. Alternatively, agglutinating antisera can be used to test suspect colonies. Many laboratories in the endemic zone use a selective agar (Ashdown's selective agar, or ASA) to isolate B.pseudomallei from non-sterile sites. If so, care should be taken since ASA inhibits the growth of some strains, particularly the more mucoid variants that lack the characteristic rugose colony appearance (Fig).

Antibiotic Therapy

Severe infection is treated with intravenous Ceftazidime or a carbapenem (Imipenem or Meropenem). There is debate over the best approach to convalescent and maintenance therapy to prevent recurrent acute infection. The results of conventional susceptibility testing are only poorly predictive of eventual outcome, perhaps due to the importance of host factors and the ability of B.pseudomallei to survive inside human cells where antibiotics may be less effective.

Prevention

There is work under way on several vaccine candidates but as yet no vaccine for human use. Environmental control of melioidosis may be possible in specific circumstances, but would be unworkable in the main endemic area owing to the extent of contamination of soil and water.

Veterinary Aspects

Epizootics have been described in a variety of animals, both domestic and wild, terrestrial and aquatic. However, there is little evidence for a major animal source for human B.pseudomallei infection. In some locations, animal infection may provide early warning of potential human melioidosis risk.

Some unanswered questions:

Is melioidosis commoner in other parts of the tropics, or in temperate climates?

What precipitates delayed onset and late-recurring acute infection?

How, exactly, does exposure to B.pseudomallei usually occur?

Why does B.pseudomallei cause such a spectrum of disease when other closely related Burkholderia species don't?

Can laboratory diagnosis be made more reliable, more sensitive and quicker?

Can in vitro antibiotic susceptibility testing be more predictive of clinical outcome?

Can the mortality rate of acute septicaemic infection be reduced?

What is the best combination and duration of antibiotic therapy for preventing recurrence or relapse?

Can a vaccine prevent disease and mortality in the main endemic area?

What lessons can be learnt from animal melioidosis?

T J J Inglis, May 2000

Editor's note: The figure and the selected reading list that form part of the above paper are available on the Web site identified at the top of this article.