



FACT SHEET:

Burkholderia pseudomallei

Burkholderia pseudomallei and human infection

Burkholderia pseudomallei is a species of bacteria that has been found in soil and environmental waters mainly in tropical areas of South-East Asia and northern Australia. Recent evidence indicates this microorganism may also occur in other tropical and subtropical areas around the world.

Burkholderia pseudomallei causes a disease called melioidosis when it infects humans. This disease can develop into a number of different forms, including:

- pneumonia (infection of the lungs)
- septicaemic pneumonia (infection throughout the bloodstream, as well as the lungs)
- abscesses of internal organs, including the liver, spleen and prostate gland
- urinary tract infections
- skin ulcers

Infections usually occur as a result of the contamination of skin cuts and abrasions with soil or muddy water, or by the inhalation of airborne dust or contaminated water droplets. Infection may occur after drinking water containing the bacteria, but this is very rare.

Symptoms usually develop within three weeks of exposure, but in some cases illness may not occur until several months after the initial infection. Melioidosis can be a severe and life-threatening disease, and it requires prompt medical diagnosis and appropriate antibiotic treatment. About 80% of people who contract melioidosis have one or more risk factors which make them more susceptible to this disease. The most common risk factors are diabetes, hazardous alcohol use, chronic lung disease and chronic renal disease. Other risk factors include rheumatic heart disease and/or congestive cardiac failure, cancer, and conditions or medications causing immunosuppression. Healthy people can also be infected, although illness is usually less severe. Melioidosis sometimes occurs in children, but this is relatively rare. Infections also occur in animals and birds, but the spread of the disease from animals to people, or from one person to another, is very uncommon.

In Australia, melioidosis occurs mainly in the Top End of the Northern Territory, far north Queensland and the Kimberley region of Western Australia. Routine surveillance for this disease is carried out in the Northern Territory, Western Australia and Queensland. The number of cases each year varies from about 40 to 140, with high numbers occurring in high rainfall years. About 85% of cases occur in the wet season.

To reduce risks of melioidosis infection, health agencies in far northern Australia advise people to:

- wear sturdy waterproof footwear when walking, gardening or digging in wet soil
- wear gloves when handling soil, especially in the wet season
- wash any skin wounds promptly and thoroughly, then cover with a waterproof dressing
- wear a mask covering your nose and mouth if using a high pressure spray hose around soil

In addition, those with risk factors are advised to avoid exposure by staying indoors during periods of heavy winds and rain.



***Burkholderia pseudomallei* in water supplies**

Two outbreaks of melioidosis during the 1990s were linked to *Burkholderia pseudomallei* in public water supply systems in remote communities in northern Australia.

In 1997 five cases of melioidosis were diagnosed within six weeks in a remote community in Western Australia. All cases were infected with *Burkholderia pseudomallei* bacteria of the same genetic type. Bacteria of this type were also found in a water sample from a backyard water tap in the community. The investigation suggested that soil disturbed by recent construction activity could have entered the water supply through an aerator that was open to the atmosphere or through damaged pipes. Conditions in the aerator may have permitted the bacteria to grow, and the outbreak occurred after the chlorine supply for the water system ran out. A further two cases of melioidosis with delayed symptom onset were later identified, bringing the total to seven. All cases had risk factors for infection, and there were three deaths associated with this outbreak. The water treatment system was subsequently modified, the aerator removed and a reliable chlorination system established. No further cases were recorded.

In the Northern Territory, a total of nine cases occurred in a remote community over a 28 month period, from 1994 to 1996. There were four fatalities in this outbreak. The community was serviced by an unchlorinated bore water supply. Genetic testing of the *Burkholderia pseudomallei* bacteria was carried out for eight patients, and six patients had the same genetic type. A water sample from a storage tank also contained bacteria of the same genetic type. Remedial work, including the cleaning of tanks and the replacement of some pipes in the water supply system, was carried out, but chlorination was not implemented. An educational program was carried out to raise community awareness about risk factors for melioidosis. No further cases attributable to the outbreak strain occurred, but a case from an unrelated strain occurred in the same community in 1999.

Although both of these outbreaks showed linkage between the *Burkholderia pseudomallei* genetic type in the drinking water supply and the human cases, it is not clear whether infection arose from drinking the water. It is possible that people may have been infected through inhalation of water aerosols or skin contact with water, or by accidental aspiration (when water or food goes 'down the wrong way' into the lungs when swallowing).

Management of *Burkholderia pseudomallei* risks in water supplies

Management of microbial risks in water supplies traditionally focuses on harmful microorganisms that originate from sewage or animal waste, rather than environmental organisms which occur naturally in soil or water. However, research has shown that *Burkholderia pseudomallei* bacteria can be killed by chlorine disinfection provided that the chlorine concentration and treatment time are adequate. Ultraviolet light has also been reported to be an effective treatment method, although evidence is limited. Risks in surface water and groundwater supplies in tropical regions can be effectively managed by appropriately designed water treatment and disinfection practices, and the proper maintenance of water pipes and tanks to prevent contamination by soil.

In contrast, private household water supplies are generally not disinfected, and recent evidence suggests that *Burkholderia pseudomallei* may be present in up to 30% of private bores in some regions of northern Australia. Given that only a very small number of melioidosis infections have ever been associated with drinking water supplies, health agencies do not currently advise any specific precautions to prevent *Burkholderia pseudomallei* exposure from household water supplies.



Trends in occurrence

Increases in the rate of melioidosis cases are associated with heavy rainfall, severe storm events and tropical cyclones. In addition, the proportion of cases with pneumonia symptoms rises following these severe weather events, supporting the view that infections are caused by the inhalation of airborne droplets of muddy surface water generated by heavy rain and strong winds.

Two isolated cases of melioidosis were reported after heavy rains in normally arid, tropical locations in central Australia in 1999 and 2001. In early 2011, a temporal cluster of six cases occurred in the subtropical zone, where no cases had been recorded during the previous 20 years. The area had received more than three times the average rainfall as a result of the weather pattern surrounding a tropical cyclone about 1500 kilometres to the north. These observations indicate that *Burkholderia pseudomallei* bacteria may survive in dry soil for many years, and may become a health risk to vulnerable people if favourable wet weather conditions occur.

These observations suggest that the increasing frequency of extreme events predicted by climate change models may be associated with an increase in the number of melioidosis cases and the occurrence of some cases outside the usual geographic range of the disease in Australia.

More information is available from the Northern Territory Centre for Disease Control

http://www.health.nt.gov.au/Centre_for_Disease_Control/Publications/CDC_Factsheets/index.aspx

References

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