

Adherence to Construction & Demolition Policies over Underground Pipeline Repair can prevent spread of *B. pseudomallei*

Abstract

Burkholderia pseudomallei is a Gram –negative bacterium that can cause the fatal disease of Melioidosis with mortality ranging in different countries from 21-40%. Further *Burkholderia pseudomallei* is highly resilient environmental pathogen and can live as a free living bacteria in soil, water as well as a parasite within amoeba, fungi, animal cells. It is known to have developed adaptation to stressful environmental factors like salinity, iron levels, oxidation. In this case report, we demonstrate the presence of *Burkholderia pseudomallei* in a 3-4 feet deep pipeline repair pit that had rusted iron pipeline located in a busy market area in Kotla, South Delhi. Since it is known that presence of iron in soil helps this pathogen to survive longer, soil associated with rusted underground pipelines might aid in its persistence. Another sample located in the same market few hundred meters away, where in it was dredge mud resulted in the detection of non-pathogenic *B. thaliandensis*. This indicates that underground soil with a water pipeline leakage and with pipeline made of iron could have chance of harboring *Burkholderia pseudomallei*.

Thus the construction and demolition (C&D) policies that govern the dismantling of underground repair pipelines especially in crowded areas needed to be followed as it is not only dust that pollutes but also human pathogens.

Background

Burkholderia pseudomallei is an environmental pathogen and it is non-sporulating but is known to survive in harsh environment for many years [1]. It has been shown that soil with 20% moisture can help harbor this pathogen for 439days [2]. It has also been shown that *Burkholderia pseudomallei* is present in soil depths of >30cm and poor nitrogen, carbon and highwater content [3]. In general the presence of this bacterium is associated with rainfall since it adds to the soil moisture and dark clouds are known to protect soil bacterium from UV spectrum of sunlight [4]. To survive the harsh environment of soil, *Burkholderia pseudomallei* can be found to be associated with protozoans like *Acanthamoeba* spp,

Hartmannella spp., and *Naegleria* spp [5]. It can even be found to be associated with plant legumes [6]. Although *B. pseudomallei* can survive in soil with low iron content, presence of high iron content in soil is known to increase its persistence [1,7]. It is also known that *B. pseudomallei* to be associated with soft bore water of acidic pH, high iron level and low salinity.

The occupational risk factors are those with farming, construction, children with tendency of playing with soil and the health factors that can result in higher risk include diabetes, Thalassemia, chronic renal disease [1] and in cystic fibrosis patients who tend to have higher salt content in their lungs than normal [8]. The symptoms include widespread and non-specific like fever, septicemia, and localized skin manifestation, pneumonia [1]. The route of transmission includes inhalation, ingestion and through skin abrasions.

In a study, this pathogen was in slaughtered pigs brought to market area in Uganda [9]. One other study showed that the ambient distribution of *Burkholderia pseudomallei* in Taiwan during typhoon season indicated its presence to be 6.94 copy/m³ [10]. In agricultural workers, infection through skin is considered as a main route and in common people, inhalation and ingestion of contaminated water is considered as main route [11]. Further unconventional outbreaks involving lab personnel garment contamination has been reported in USA [11].

Melioidosis has involvement of lungs, liver and the skin. Children and people with occupational hazards suffering with chronic melioidosis could have higher chance of skin manifestation. A rapid image analysis system could be useful for preliminary screening with photographs of lesion at home, school for children and in Krishi vigyan Kendra (translating in Indian language to farmers scientific centre) wherein further referrals could be advised. Screening of lesion pictures could be used towards further referrals of people seemingly normal but with lesions namely farmers, children with the aid of tools like soil health card [portal](#) developed by Indian government that can shortlist farms, crops grown, lands of low soil nutrition. Moreover such preliminary screening could give rise to awareness among public.

Gap Analysis

- The well-known environmental sources of this pathogen causing Melioidosis include paddy farmland, playgrounds and infection peaks during monsoon season. But what if

there are other sources of this pathogen. This brief report brings out other potential sources next to human occupation. One such is repair works and demolition works in open market area and transporting them in open rickshaws. Although there are existing policies in India that state, vehicles carrying construction and demolition wastes (C&D Wastes) need to be covered with plastic sheets to prevent dust emissions, it does not state that it can't be dismantled in public places as it considers only dust emission but not pathogenic bacteria. ([Reference](#))

- [US EPA](#) recommendation states the distance between drinking water pipe and sewer should be 10ft. Further, in saturated soil conditions, microbes can move several meters in short periods of time (Abu-Ashour et al, 1994). This transport could be aided by water flowing out of the sewer (exfiltration). Hence it could be dangerous to have sewer line and drinking line with leakage adjacent to one another as it can contaminate.

Results

Soil adhered to underground pipeline that was under repair work at the geo location 28.57146135895692, 77.22482533623553 tested positive for the pathogen *Burkholderia pseudomallei*.



Figure 1 Pipeline repair pit and Scrapped rusted metal pipeline transported in cycle rickshaw without cover. Right bottom – food vendor near pit repair selling rotis that can lead to ingestion of soil dust particles that can harbour the bacterial pathogen. Centre in the bottom – water being collected from broken pipeline.

Recommendations

- Dismantling and breaking of underground pipelines in crowded market areas should be prevented since underground pipelines could harbor *B. pseudomallei* and could easily result in spread of this pathogen. Instead such pipelines could be removed intact and taken to a remote place for scrapping.

- Also, if such repairs of municipal pipelines come under construction and demolition act is unknown. If such municipal repairs are not listed in the C & D Act then that could be recommended.
- Another recommendation is apart from dust emission, there is also the presence of pathogenic bacteria from C&D waste and hence can't be scrapped in public places.

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