

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 from 21-40% in different countries. Further, *Burkholderia pseudomallei* is a highly resilient environmental pathogen and can live as a free-living bacteria in soil, water as well as a parasite within amoeba, fungi, and animal cells. It is known to have developed adaptation to stressful environmental factors like salinity, iron levels, and oxidation. In this case report, we demonstrate the presence of *Burkholderia pseudomallei* in a 3-4 feet deep pipeline repair pit that had with a rusted iron pipeline located in a busy market area in Kotla, South Delhi. Since it is known that the presence of iron in the 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 a few hundred meters away, wherein 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 a 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 environments for many years [1]. It has been shown that soil with 20% moisture can help harbor this pathogen for 439 days [2]. It has also been shown that *Burkholderia pseudomallei* is present in soil depths of >30cm and has poor nitrogen, carbon, and high water 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 bacteria from the 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 the tendency to play~~ 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~~ pneumonia [1]. The route of transmission includes inhalation, ingestion, and through skin abrasions.

In a study, this pathogen was ~~found~~ in slaughtered pigs brought to market ~~areas~~ 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 ~~the~~ skin is considered ~~as a~~ the main route, and in common people, inhalation and ~~ingestion of~~ ~~ingesting~~ contaminated water is considered ~~as a~~ ~~main~~ the primary route [11]. Further unconventional outbreaks involving lab personnel garment contamination ~~has~~ have been reported in ~~the~~ USA [11].

Melioidosis has ~~the~~ involvement of ~~the~~ lungs, liver, and the skin. Children and people with occupational hazards suffering ~~with from~~ melioidosis could have ~~a~~ higher chance of skin manifestation. A rapid image analysis system could be useful for preliminary screening with photographs of lesions ~~s~~ at home, ~~the~~ school for children, and in Krishi ~~Vigyan~~ Kendra (translating ~~into~~ Indian language to ~~farmers~~ ~~scientific centre~~) farmer's scientific center), 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, ~~and~~ children, with ~~the aid of~~ tools like ~~the~~ soil health card [portal](#) developed by ~~the~~ Indian government that can shortlist farms, crops grown, ~~and~~ lands of low soil nutrition. Moreover, such preliminary screening could give rise to awareness among ~~the~~ public.

Gap Analysis

1. 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 areas 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. [\(Reference\)](#)

2. [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~~ quickly (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 sewers and drinking lines 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~~ Soil adhered to underground pipeline under repair at the geo location 28.57146135895692, 77.22482533623553 tested positive for the pathogen *Burkholderiapseudomallei*.



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 a 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 the 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 still being determined. ~~If such municipal repairs are not listed in the C & D Act, then that could be recommended.~~ That could be recommended if such municipal repairs are not listed in the C & D Act,
- 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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