Outbreak Reports

Emergence of Autochthonous Melioidosis in Two Inland PLADs — China, 2021

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Summary

What is already known about this topic?

Melioidosis, a tropical infectious disease caused by *Burkholderia pseudomallei* (BP) infection, is endemic in the southern coastal provincial-level administrative divisions (PLADs) of China.

What is added by this report?

Three melioidosis cases, including two in young children and one in a 19-year-old female, were reported in Anhui and Jiangxi (two inland PLADs of China) respectively, in 2021. None of the patients had a travel history to a melioidosis-endemic area. All the BP isolates belonged to the same sequence type (ST51), which had been reported from elsewhere in Southeast Asia.

What are the implications for public health practice?

This is the first report of autochthonous melioidosis cases in inland Chinese PLADs. Surveillance and prevention and control work should be strengthened in this region.

On July 23, 2021, the Anhui CDC reported two cases of melioidosis in children (Patients A and B) from Huainan City, Anhui Province (Figure 1). The primary investigation indicated that the two patients were brothers and had no travel history. In late September, another indigenous case of melioidosis (Patient C) was confirmed in Fuzhou City of Jiangxi Province. Given that melioidosis was not known to be endemic in inland areas of China, such as Anhui and Jiangxi (*1*), the Institute of Communicable Disease Control and Prevention of China CDC (ICDC), Anhui CDC, and Jiangxi CDC initiated a joint investigation to identify the potential source of infection and any relationship between the patients.

INVESTIGATION AND RESULTS

Patient A, the first patient, was an 11-year-old boy living with his grandparents in Huainan. On July 15, he experienced a sudden onset of fever. The next day, he received empirical therapy at a community hospital, but later, his illness worsened as he developed a high fever (41 °C) and chills. In the evening, the boy was sent to a local municipal hospital where computerized tomography revealed a pneumonic infection, and he was given intravenous antibiotics for treatment. On July 17, the boy fell into a coma, and he was transferred to a tertiary hospital in Hefei City, Anhui Province and admitted to the intensive care unit (ICU). On July 18, the boy's condition deteriorated, and he died of septic shock and multiple organ failure in the afternoon. On July 19, one bacterial strain was isolated on blood culture, and a rapid identification using the matrix-assisted laser desorption ionization-time of flight mass spectrometry technology (Bruker Biotyper MS system) revealed the pathogen to be *Burkholderia pseudomallei* (BP). The isolate was then subjected to biochemical assay (Vitek 2 system) and 16S rRNA sequencing and confirmed as BP by Anhui CDC.

Patient B (4-year-old) was Patient A's younger brother, and the two boys usually spent time together. On July 16 (the day after Patient A fell ill), Patient B became febrile (40 °C) and was sent to a tertiary hospital in Hefei and admitted to the ICU. As there was no clinical improvement after anticipated treatment, he was further transferred to a comprehensive teaching hospital in Shanghai Municipality 4 days later. His condition gradually improved, and he was discharged from the hospital on September 25. No isolate was cultured from Patient B, but DNA fragments of BP were identified in his blood sample by next-generation sequencing (NGS).

Patient C was a 19-year-old female college student from Fuzhou City in Jiangxi Province. She spent her entire summer vacation, from July 10 to September 7, in Shangrao City, Jiangxi Province, where she frequently paddled in a pond to pick lotus seedpods in her spare time. After returning home from Shangrao,

FIGURE 1. Geographic distribution of the three melioidosis cases in Anhui and Jiangxi Provinces, China, 2021.
Note: *Burkholderia pseudomallei*-endemic PLADs /regions (Hainan Province, Guangdong Province, Guangxi Zhuang Autonomous Region, Fujian Province, Hong Kong SAR, and Taiwan, China) in China are indicated with green shading.
Abbreviation: PLAD=provincial-level administrative division; SAR=Special Administrative Region.

the patient developed a fever and chills and sought treatment at a municipal hospital in Fuzhou. Subsequently, a BP strain was isolated from her blood sample in the hospital laboratory, and the Jiangxi CDC confirmed the microbiological diagnosis on September 22.

To identify the etiology and epidemiological factors of the infections in Patients A and B, the ICDC and local CDC in Anhui Province conducted a field investigation. Through case searching, no further cases with signs and symptoms similar to those in Patients A and B were found in the community in which they lived. No family members (including grandparents and three cousins) or close contacts had a similar illness.

The epidemiological investigation indicated that the boys had no travel history and no history of contact with pets or animals, and all outdoor activities were performed within their residential community. Considering the rarity of person-to-person spread of melioidosis (*2*), the coincidence of onset times and the similarity in their clinical manifestations, Patients A and B were suspected to have been exposed and infected at the same time. Thus, the subsequent investigation focused on the potential exposure source in the community in which they lived. According to local residents, the community is located in a lowland of suburban Huainan, and the yards are prone to flooding after rainfall. The grandparents of Patients A and B mentioned that the two boys lived with them because their parents worked and resided in another city. In addition, the boys' parents' home was in the same community (approximately 300 meters away from the grandparents' home), and sometimes they returned home to fetch items. The grandfather recalled that before the children's illnesses, there had been heavy rainfall lasting several days, leading to flooding

in their community, and during this time, the two boys had walked back and forth to their home several times. The physical examination records of the hospital indicated that both children had skin lesions on their feet and legs due to scratching after mosquito bites. Combining these circumstances, especially the high risk of exposure caused by rainfall and skin wounds (*2*), we inferred that Patients A and B were possibly infected through skin contact with contaminated water or soil while out in the floodwaters. In September, investigators collected environmental samples (30 soil samples and 10 water samples) around their apartment building and screened the samples for BP. However, no BP was detected by culture or polymerase chain reaction (PCR) assay (*3*). This result was not surprising because the environmental distribution of BP is often unstable and the isolation process is complicated and might be influenced by multiple factors. For Patient C, exposure to pond water during her vacation in Shangrao City was a potential risk factor as she had abrasions on her foot from scratching mosquito bites at that time.

Two clinical isolates obtained from Patients A and C were further confirmed (API 20 NE, real-time PCR, and specific antigen detection) and genetically analyzed by the ICDC. Multilocus sequence typing (MLST) (*4*) was used to identify the genomic relationship between them. Surprisingly, despite the remote distance (over 600 kilometers) between these two patients, the isolates had identical sequences, meaning they were the same type (ST51, allelic profile: 3,1,2,3,1,4,3). This indicated that these two isolates might share a common origin, and a more comprehensive investigation is needed to identify their source. Further online query of the global BP MLST database (http://bpseudomallei.mlst.net/) showed that the ST51 had previously been detected in Malaysia (70), Singapore (43), Thailand (13), and Hainan Island, China (2).

In response to the emergency events caused by melioidosis, local CDCs and health departments in Huainan and Fuzhou conducted epidemiological investigations, undertook environmental disinfection, and educated the local residents on how to prevent this disease. No new cases were reported.

DISCUSSION

Melioidosis is a potentially fatal disease caused by BP, a bacterium that inhabits soil and water in tropical areas and infects humans through inoculation, inhalation, or ingestion (*2*). Given the influence of multiple inherent factors such as its soil-dwell niche, sensitivity to ultraviolet light and poor ability to be transmitted from person-to-person, BP is typically confined to a restricted geographic range (*2*–*3*,*5*). In particular, environmental strains and indigenous cases have been historically identified from only coastal endemic PLADs/regions in China, including Hainan Province, Guangdong Province, Guangxi Zhuang Autonomous Region, Fujian Province, Hong Kong Special Administrative Region, and Taiwan, China (*1*) (Figure 1). Outside these locations, all confirmed cases have been imported.

However, several studies have demonstrated that, even though rare, BP can spread over a long distance (*6*–*7*), as evidenced by its distribution across the global tropics. The transmission mode might be via soil, river water, animals or human activity or through air during an extreme weather event (*6*–*8*). In the two events of this report, although BP was not discovered from the environment, the epidemiological data suggested that all the infections were associated with environmental exposure and were probably autochthonous, implying that BP might have disseminated to and become endemic in Anhui and Jiangxi provinces. Indeed, with the rapid expansion of traffic and trade services in recent years, mass transportation of animals and plants may increase the risk of BP dispersion from endemic regions to other locations (*2*). Therefore, on the basis of the epidemiological investigation, the geographic closeness of Anhui and Jiangxi to endemic coastal PLADs in China and the sequence type matches between the clinical isolates and those from Hainan and Southeast Asia, we suggest that BP introduction from an original endemic area to the inland PLADs is a plausible explanation for its presence, although the exact origin remains to be determined.

The temporal and spatial closeness of such two events, and the identical ST between their isolates, might imply a more recent transmission of BP to Anhui and Jiangxi Provinces. However, we also could not exclude the possibility that the bacterium had been present there for a long time but unrecognized. There appears to be mounting evidence that BP can persist in temperate and more arid environments for tens of years, but melioidosis cases merely arise following extreme weather events in these regions.

In conclusion, the results of this investigation together with the large number of melioidosis cases in endemic PLADs, such as Hainan Province (*1*), hint at the possibility that the epidemiology of melioidosis might be changing and that the public health strategy

targeting melioidosis needs to be updated in the mainland of China. Therefore, we recommend that melioidosis be included on the national reportable disease list, health education be implemented to improve awareness of this disease, and sentinel and environmental surveillance work targeting this disease be performed. In the clinic, melioidosis should be considered as a differential diagnosis for febrile patients in southern China, and the diagnostic and treatment capability for the disease should be enhanced in medical centers.

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