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CASE REPORT

Brachybacterium muris Detected in a Hepatocellular Carcinoma Patient with Pleural Effusion: A Case Report

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Background: *Brachybacterium muris* is a species of Gram positive and strictly aerobic bacterium. It was first reported in 2003 after being isolated from the liver of a laboratory mouse strain. It was also found on human skin and nasal cavity. Herein, we present the first case pleural effusion infection in humans caused by *Brachybacterium muris*.

Case Presentation: A 65-year-old man was admitted to our hospital for a 4-week history of fever, accompanied by chills, occasional abdominal pain, occasional chest tightness and shortness of breath. On the day of hospitalization, thoracentesis was performed and 1000mL of yellow cloudy fluid was released. Result of pleural fluid culture was positive and *B. muris* was identified using 16S rDNA amplification and sequence comparisons.

Conclusion: To our knowledge, this is the first report of pleural effusion infection caused by *B. muris*. *B. muris* can be pathogenic in humans.

Keywords: *Brachybacterium muris*, pleural effusion, infection

Background

Genus *Brachybacterium* was first discovered and isolated in 1988.[1] Up to now, there were 25 child taxa with a validly published and correct name (https://lpsn.dsmz.de/genus/brachybacterium). Genus *Brachybacterium* can be isolated from various environmental samples, such as seawater,[2] plant roots and branches,[3,4] river,[5] surface of cheeses,[6] coastal sand[7] and soil.[8] A few studies have also reported the isolation of this genus from human samples.[9–11]

Brachybacterium muris was first reported in 2003 after being isolated from the liver of a laboratory mouse strain.[12] In 2017, *Brachybacterium muris* was also isolated from Chaka Salt Lake (Qinghai, China).[13] *Brachybacterium muris* was also found in human samples, such as human nasal cavity[14] and skin.[15] However, to our knowledge, there are no reports of the species *Brachybacterium muris* infecting humans and causing disease. We herein report the first case of *Brachybacterium muris* isolated from pleural effusion.

Case Presentation

A man with a medical history of hepatitis B for more than ten years was diagnosed with hepatocellular carcinoma in June 2021. The patient accepted treatment with radiofrequency on July 1, 2021. But in March 2022, the hepatocellular carcinoma recurred and he underwent radiofrequency treatment again. In November 2022, this 65-year-old man presented to Tianjin Third Central Hospital (Tianjin), with a 4-week history of fever, accompanied by chills, occasional abdominal pain, chest tightness and shortness of breath. On admission, this patient presented chronic liver disease face, liver palm and loss of breath sounds in the right lung. The patient had decompensated cirrhosis of the liver with a Child-Pugh classification of B and a small amount of ascites.

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On the day of hospitalization, thoracentesis was performed and 1000mL of yellow cloudy fluid was released. Laboratory tests of whole blood showed the following results: white blood cell count 2.17 × 10^9/L (neutrophil 77.1%), red blood cell count 3.06 × 10^{12}/L, hemoglobin 90 g/L and platelet count 46 × 10^9/L. His serum hepatitis B surface antigen and hepatitis B core antibody were 13.41 IU/mL and 8.78 IU/mL, respectively. His procalcitonin level in serum was 0.33 ng/mL. The result of G test was 114.30pg/mL. The G test detects (1,3)-b-D-glucan, a component of the cell wall of fungi. Pleural effusion tests revealed a white blood cell count of 2.3 × 10^9/L with 20% neutrophils and 80% lymphocytes. The specific gravity of the pleural fluid was 1.015 and the Rivalta test result was positive. The above results suggest that the pleural fluid was exudative and the patient had a pleural fluid infection. Empirical anti-infective treatment with piperacillin/tazobactam was initiated after collection of pleural fluid for culture. A 4.5g of piperacillin/tazobactam was dissolved in 100mL of saline and administered intravenously every 8 hours, three times a day. The next day the patient underwent thoracentesis drainage and released 700 mL of pleural fluid. Two days after the patient received anti-infection and intermittent pleural fluid release treatment, the patient's temperature returned to normal.

The infecting agent was isolated from pleural fluid by performing in vitro culture and then the infecting agent was purified in blood agar culture. Next, the organism was subjected to matrix-assisted laser desorption/ionization time-of-fight mass spectrometry (MALDI-TOF MS) analysis. We used a Vitek MS system. Unfortunately, our database did not include this microorganism. We outsourced microbial sequencing to Beijing RuiBio BioTech Co. The microorganism was identified using 16S rDNA amplification and sequence comparisons. Two primers were used. Their sequences were "AGAGTTTGATCATGGCTC" and "TAGGGTTACCTTGTTACGACTT". Comparison with sequences in the BLAST database (http://www.ncbi.nlm.nih.gov/BLAST) revealed that the sequence has 99.131% similarity to the *Brachybacterium muris* sequence (GenBank accession number NR 024571.1). The sequence was attached in Supplementary 1. As shown in Figure 1, culture on blood agar plate grew white, moist, and smooth colonies after 24 h of incubation at 35 °C in a 5% CO2 atmosphere.

Figure 1 Culture on blood agar plate.

Discussion and Conclusion

Brachybacterium muris is a species of Gram positive, strictly aerobic, yellow-pigmented bacterium. The cells are coccoid during the stationary phase, and irregular rods during the exponential phase. It was first isolated from the liver of a laboratory mouse. The species was first described in 2003, and the name is derived from the Latin muris (mouse). The optimum growth temperature for *B. muris* is 25–37 °C. It can grow in the 15–42 °C range and in pH 6.0–9.0.[12] *B. muris* have been reported in the literature to be found in human skin/faeces.[15,16] However, there are few reports of human diseases caused by this bacterium.

In this case, the patient had a history of hepatitis B-related liver cancer and was treated with radiofrequency. The infecting organism may have come from the environment or from the patient's skin. It was not entirely clear that how he got the infection. Empirical treatment with piperacillin/tazobactam seemed to be effective, as he experienced significant relief of the infection two days after the administration of the drug. We identified the isolated strains by MALDI-TOF and 16S rRNA sequencing.

In summary, we present the first case of pleural effusion infection caused by *B. muris*. The organism was identified by 16S ribosomal RNA gene-sequencing analysis. Although human infection is rare, *B. muris* can be pathogenic in humans.

Consent for Publication

Written informed consent was provided by the patient for the publication of the case details and images. Institutional approval was obtained to publish the case details.

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Disclosure

The authors report no conflicts of interest in this work.

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