***Letter to the Editor***

# Clinical utility of string test as a screening method for hypermucoviscosity-phenotype *Klebsiella pneumoniae*

Dear Editor,

Hypermucoviscosity (HMV) phenotype is a known virulent factor of *Klebsiella pneumoniae*,[1] which can be confirmed by a simple method, the string test. A positive string test is defined as the formation of viscous strings of >5 mm in length when a loop is used to stretch the colony on an agar plate (Fig. 1A).[2] Here we propose the possible clinical utility of the string test as routine microbiological surveillance for the highly virulent organism, HMV-phenotype *K. pneumoniae*, by presenting two cases of massive hemoptysis.

**Case 1:** A 76-year-old woman receiving dabigatran and aspirin presented with several days' history of cough and respiratory distress. The patient was admitted with a diagnosis of pneumonia (Fig. 1B) and immediately intubated due to massive hemoptysis. The sputum obtained by bronchoscopy showed bloody and purulent secretion. Blood and sputum cultures revealed HMV-phenotype *K. pneumoniae*, but she was treated well with antibiotic therapy.

**Case 2:** An 85-year-old woman was diagnosed with Legionella pneumonia. The patient was intubated due to respiratory failure, and hemodialysis was introduced due to acute renal failure. One month later, hemoptysis suddenly began, and soon after, the patient fell into severe respiratory failure and cardiopulmonary arrest. Although the patient was immediately resuscitated, she died due to respiratory failure. HMV-phenotype *K. pneumoniae* was detected from blood and sputum samples after her death.

*K. pneumoniae* is one of those emerging significant pathogens (or "ESKAPE" pathogens) that can be highly drug-resistant and potentially cause severe infections.[3] The organism is a common pathogen of community-acquired pneumonia and the HMV-phenotype strain is known to be involved at rates of 17–45%.[4] As far as we are aware, epidemiological data on nosocomial HMV-phenotype *K. pneumoniae* infection is insufficient in Japan. However, nosocomial infection by the HMV-phenotype strain is considered to occur less frequently than community-acquired infection. For example, in Taiwan, it was reported that incidence rates for HMV-phenotype strains were 15.2% (7/46 cases) in nosocomial cases, but 48.6% (51/105 cases) in community-acquired cases.[4]

Although rare, HMV-phenotype *K. pneumoniae* can contribute to invasive syndromes[5] and infection precaution against nosocomial transmission of such strains is required, especially in intensive care units (ICUs) where critically ill patients are gathered. For that, development of an available screening test would be essential. For methicillin-resistant *Staphylococcus aureus*, the efficacy of a progressive screening test using polymerase chain reaction has been reported. However, the usefulness of microbiological surveillance for *K. pneumoniae* has not been described clearly. The string test is a classical but simple, rapid, and readily available screening method for HMV-phenotype *K. pneumoniae*. Incorporation of the string test into daily practice of ICU microbiological surveillance may lead to more appropriate infection precautions. Many patients in ICU receive anticoagulant or antithrombotic therapy. Once the organism was recognized, transmission of the pathogen could be preventable by strengthening infection precautions such as hand washing. Simultaneously, we need to be aware that non-HMV positive strains can also be highly virulent when the organisms possess virulent genes such as *rmpA* or *magA*.

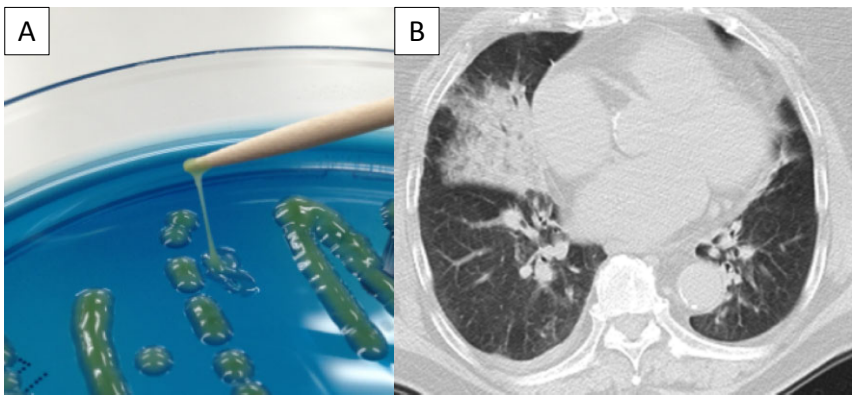


**Fig. 1.** String test and chest computed tomography for identification of hypermucoviscosity-phenotype *Klebsiella pneumoniae*. A positive finding of the string test is defined as the formation of viscous strings of >5 mm in length on an agar plate (A). Consolidation of right middle lobe caused by hypermucoviscosity-phenotype *K. pneumoniae* was seen in Case 1 (B).

 

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## CONFLICT OF INTEREST

NONE.

## REFERENCES

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