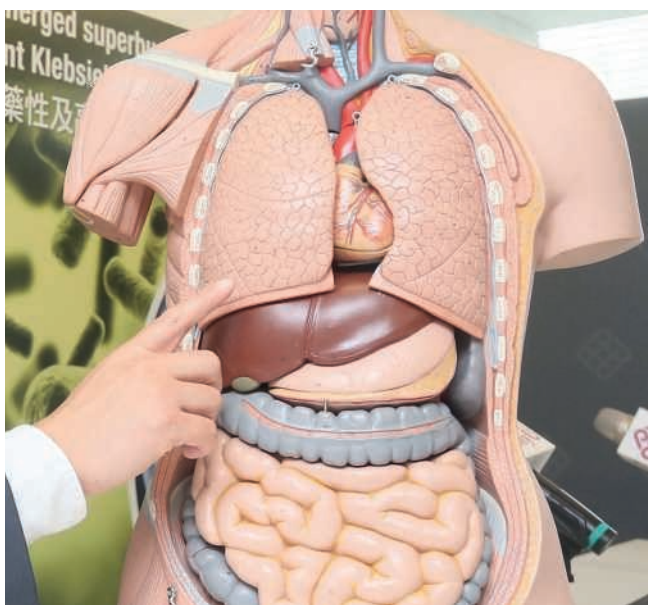


Discovery of a new superbug

A molecular study by a researcher at **THE HONG KONG POLYTECHNIC UNIVERSITY** has led to the discovery of an emerging superbug and the mechanisms underlying fatal infections.



A researcher at The Hong Kong Polytechnic University

(PolyU) has discovered a superbug that may cause pneumonia to become fatal.

Pneumonia is usually a treatable respiratory infection. But an outbreak of the condition in a Zhejiang hospital in 2016 killed five patients whose severe pneumonia eventually led to septicaemia and multiple organ failure.

An investigation by Chen Sheng, a professor of PolyU's Department of Applied Biology and Chemical Technology, in collaboration with Zhang Rong from the Second Affiliated Hospital of Zhejiang University, found the culprit in a carbapenem-resistant *K. pneumoniae* (CRKP) strain, a type of a previously-defined superbug. All strains from the five patients belonged to the ST11 type, the most prevalent and transmissible CRKP in Asia. These pathogens, with genes resistant to carbapenem and other common antibiotics, make infections hard to treat. Further acquisition of hypervirulence plasmids would make these strains evolve into a real superbug, known as ST11 carbapenem-resistant hypervirulent *K. pneumoniae* (ST11-CR-HvKP), which is simultaneously hyper-resistant, hypervirulent and highly transmissible.

This superbug, detectable by the polymerase chain reaction (PCR) method, not only infects lungs and cause pneumonia, but also invades the bloodstream and other organs. Its hypervirulence and phenotypic resistance to common antibiotics make the infections incurable even for healthy people with normal immunity.

According to Chen's study, even colistin, the last-resort drug for carbapenem-resistant infections, used alone or in combination with other drugs, is

ineffective in fighting ST11 CR-HvKP. Ceftazidime/avibactam might be more successful, but clinical data from the United States suggests ST11 CR-HvKP may quickly develop resistance to this antibiotic.

ST11 CR-HvKP strains proliferate in the human intestinal tract and possess a mucoid outer layer, which enables them to adhere to various materials, including the surface of medical devices and other surfaces in a hospital setting. Chen's data shows that medical equipment, such as ventilators and catheters, might be transmission sites for these new strains. Human-to-human transmission may also be possible, but clinical settings are most vulnerable.

"Improved infection prevention is needed to control further transmission of this superbug in the ICU," says Chen. "This calls for novel prevention strategies."

In Hong Kong, the prevalence of ST11 CR-HvKP strains was previously unknown. To address this issue, the research team screened patients in Hong Kong hospitals and found that the prevalence of CRKP among clinical *K. pneumoniae* strains remains low. However, CR-HvKP was detected among CRKP strains.

"We need to be cautious about this newly emerged, highly transmissible strain," says Chen. "More extensive molecular epidemiological studies are required to assess the potential threat it might pose to the healthcare system in Hong Kong in the near future." ■

* The results of the study were published in the *The Lancet Infectious Diseases* in August and November 2017.

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