Genetic characterization and epidemiology of multidrug-resistant gram-negative ESKAPE pathogens, including extremely drug-resistant strains at a Naval hospital in Thailand

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Multidrug resistant (MDR) gram-negative ESKAPE pathogens are one of the biggest threats to global public health and infections due to MDR strains resulting in a significant healthcare burden. We collected 150 clinical isolates of MDR gram negative ESKAPE pathogens at Queen Sirikit Naval Hospital in Thailand from October 2016 - May 2017, performed isolate whole genome sequencing (WGS), and determined epidemiology by in silico multi-locus sequence typing (MLST) techniques. All 32 (100%) of identified A. baumannii isolates were extremely drug resistant (XDR) and harbored at least one carbapenemase gene (31/32 carried blaOXA-23, 1/32 carried blaNDM-1). MLST analysis showed 24/32 (75%) A. baumannii were assigned to ST-2, a prominent global strain. A total of 43 XDR K. pneumoniae isolates were identified with 43/43 (100%) of the isolates harboring CTX-M ESBL gene variants (blaCTX-M-15 (93%), -27, or -55). The carbapenemase genes blaNDM-1 and blaOXA-48 variants were found in 30/43 (69.8%), with 29/43 (67%) carrying both. Moreover, two K. pneumoniae isolates carried the transferable colistin resistance gene mcr-1. MLST analysis showed 31/43 (72.1%) K. pneumoniae isolates belong to ST-16. A total of 43 XDR K. pneumoniae isolates were identified with 43/43 (100%) carrying at least one extended spectrum β-lactamase (ESBL) gene (blaCTX-M-14, -15, -27, -55, or blaVER-5). The carbapenemases blaNDM-4 and blaKPC-2 were each detected in a single E. coli isolate. MSLT analysis of the 84 E. coli isolates separated them into 22 different ST groups with three primary STS: 33/84 (40%) ST-131, 10/84 (12%) ST-1193 and 8/84 (9.5%) ST-648. The identification and characterization of these pathogens demonstrates the spread of gram-negative ESKAPE pathogens at Queen Sirikit Naval Hospital. These findings serve to highlight the urgent need for continued surveillance and intervention measures of XDR bacterial pathogens, especially A. baumannii ST-2 and K. pneumoniae ST-16 in Thailand and Southeast Asia.

Recent Publications:

Biography

Apichai Srijan is a Senior Microbiologist at the Armed Forces Research Institute of Medical Sciences. He has his expertise in enteric diseases and antimicrobial resistance studies for more than 30 years. As an independent investigator, he develops the new research proposals, submit the proposals/protocols, get the research funding and progress the report and publish findings. As a Senior Microbiological Consultant, he provides microbiology support to research studies in the department; provide training to new technicians and/or visitors; refresh laboratory practices to other technicians and provide training and field laboratory setup. As a Field Coordinator, he is responsible for POC supply request, specimen receiving and transferring with sites etc. He is also responsible for preparation of manuscript and generating publication.

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