Returns of the flesh-eating bacteria

Chuan Chiang-Ni

Department of Microbiology and Immunology, College of Medicine, Chang Gung University, Taoyuan, Taiwan

Molecular Infectious Disease Research Center, Chang Gung Memorial Hospital at Linkou, Taoyuan, Taiwan

Abstract

Streptococcus pyogenes (group A *Streptococcus*, GAS) is a gram-positive human pathogen that causes diseases including pharyngitis, wound infections, scarlet fever, necrotizing fasciitis, toxic shock syndrome and is responsible for more than 500,000 deaths annually worldwide. The global resurgence of scarlet fever and invasive GAS infections have been reported in the past few decades. In Europe, the emergence and expansion of the toxigenic $M1_{UK}$ clone is recognized for the potential for the increased incidence of invasive disease. In East Asia, outbreaks of scarlet fever were reported in Hong Kong and China, and GAS isolates carried a 64.9 kb integrative and conjugate element (ICE-*emm*12) encoding macrolide-resistant *ermB* gene and a 46.4 kb prophage encoding superantigens SSA and SpeC and the DNase Spd1 (ΦHKU.vir) were over presented in scarlet fever isolates. Furthermore, the unusual outbreak of invasive disease caused by acapsular *emm*89 GAS isolates was reported in England (1). We continuously collected and analyzed GAS isolates since 2012. The acapsular *emm*89 was the top eight prevalent *emm*-type in Chang Gung Memorial Hospital at Linkou. Although the hyaluronic acid capsule is considered the anti-phagocytic factor of GAS, our study showed that the absence of the hyaluronic acid capsule in GAS impairs the selective autophagy-mediated elimination in phagocytic cells, subverting the understanding of the capsule in GAS pathogenesis (2). The *emm*12 isolates carried the ICE-*emm*12 and ΦHKU.vir in Taiwan were phylogenetic closely related to *emm*12 isolates in Hong Kong, suggesting that these isolates would share the same origin. Notably, the scarlet fever-associated mobile genetic elements were transferred from *emm*12 isolates to *emm*1 (including $M1_{UK}$ clone), *emm*11, *emm*89, and *emm*90 isolates in Taiwan (3). The acquisition of mobile genetic elements such as prophages is an important genetic event in shaping GAS pathogenesis; therefore, expanding scarlet fever-associated elements in Taiwan would alter the virulence of GAS isolates and the prevalence of *emm*-type over time. More importantly, with the continuous evolution of GAS, this human-restricted pathogen would be again a non-ignorable threat to our society.

References

Turner CE, Abbott J, Lamagni T, Holden MT, David S, Jones MD, Game L, Efstratiou A, Sriskandan S*. 2015. Emergence of a new highly successful acapsular group A *Streptococcus* clade of genotype *emm*89 in the United Kingdom. mBio. 6:e00622. https://doi.org/10.1128/mBio.00622-15.

Shi YA, Lu SL, Noda T, Chiu CH, Chiang-Ni C*. 2024. Capsule-deficient group A *Streptococcus* evades autophagy-mediated killing in macrophages. mBio. 15:e0077124. https://doi.org/10.1128/mbio.00771-24.

Chiang-Ni C*, Hsu CY, Yeh YH, Chi CY, Wang S, Tsai PJ, Chiu CH. 2024. Detection of toxigenic $M1_{UK}$ lineage group A *Streptococcus* clones in Taiwan. J Microbiol Immunol Infect. 57:269-277. https://doi.org/10.1016/j.jmii.2024.01.004.