

Insight into mechanism in Staphylococci bacteria

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Singapore: A recent study by a research team from the Institute of Biological Chemistry (IBC) in Taiwan, led by distinguished research fellow Andrew H-J Wang, has increased understanding of the molecular mechanism of antibiotic resistance in the Staphylococci bacteria. The team found that multiple antibiotic resistance regulator TcaR in *Staphylococcus epidermidis* can bind to single-stranded DNA (ssDNA) and inhibit its replication. It is hoped that the findings, published online in the scholarly journal *PLoS One* on September 21, 2012, will aid the development of new treatments for Staphylococci infection.

The Staphylococci bacteria are one of the most common causes of bacterial infection. They can cause a wide variety of diseases in humans through invasion and toxin production, and also by producing biofilm to protect themselves from the host immune system and the action of antibiotics. *Staphylococcus aureus* is the most well-known species as it is the cause of many antibiotic resistant hospital- and community-acquired infections. The protein TcaR from the multiple antibiotic resistance repressor (MarR) family of proteins is known to be responsible for the regulation of antibiotic resistance and biofilm formation in Staphylococci. However, the detailed mechanism of this action is unknown.

In this study, the team used electrophoretic mobility shift assay (EMSA), circular dichroism (CD), and Biacore analyses to show that the TcaR protein can interact strongly and cooperatively with ssDNA, thereby identifying a new role for MarR family proteins. In order to investigate the regulation mechanism of the ssDNA binding ability of TcaR, the team further used electron microscopy to reveal the TcaR-ssDNA complex. Their study also showed that TcaR could inhibit viral ssDNA replication and provide viral resistance against ssDNA phage in *E. coli*. Overall, the study suggests that TcaR plays a role in regulation of DNA replication.

The MarR family proteins are involved in multiple antibiotic resistance. They are sensors of changing environments, allowing pathogenic bacteria to survive and persist in a dynamic environment. Up to now, the knowledge of MarR family protein-nucleic acid interaction has been limited to double-strand DNA (dsDNA), this is the first study showing that an MarR family

proteins also interact with ssDNA.

"It is very exciting that we present the first attempt to investigate the TcaR-ssDNA interaction. We anticipate that the results of this work will extend our understanding of MarR family proteins and broaden the development of new therapeutic strategies for Staphylococci," said Mr Wang.

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