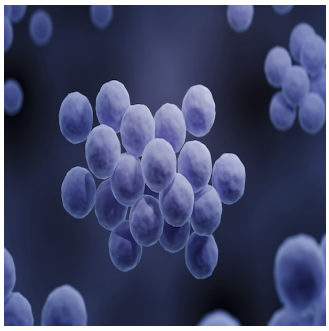
ICU
MANAGEMENT & PRACTICE

Novel Lipopeptide Effective Against Staphylococcus Aureus



A novel antibacterial lipopeptide produced by the bacterium *Serratia marcescens* is highly effective in killing *Staphylococcus aureus*, one of the most significant pathogens in humans.

Staphylococcus aureus is among the five most common causes of hospital-acquired infections, often leading to life-threatening infections following surgery. Since the introduction of antibiotics in the early 1940s, *S. aureus* has developed resistance to most classes of antibiotics, including penicillin. Over the last six decades, only two new classes of antibiotics have been introduced. One of these, daptomycin, is also a lipopeptide.

A paper recently published in Microbiology Spectrum provides the first insight into the mode of action of the lipopeptide serrawettin W2-FL10, derived from *Serratia marcescens*. This lipopeptide targets the cell membrane of *S. aureus*, causing lesions that result in the leakage of intracellular components and, ultimately, cell death.

Serrawettin W2-FL10 is not toxic to mammalian cells. This makes it a promising therapeutic agent for treating bacterial infections in humans. Additionally, the smaller structure of this lipopeptide (five amino acids and a C10 fatty acid chain) compared to daptomycin (13 amino acids and a C10 fatty acid chain) suggests significantly lower manufacturing costs for serrawettin W2-FL10.

The study investigated the antibacterial activity, cytotoxicity, and mechanism of action of the non-ionic, cyclic lipopeptide serrawettin W2-FL10 against *S. aureus*.

Isolated bacterial strains from wastewater samples produced biosurfactants effective against antibiotic-resistant and disease-causing bacteria. In polluted environments, bacteria naturally produce biosurfactants to protect themselves and outcompete other bacteria. Pigmented and non-pigmented *S. marcescens* strains produce a wide range of broad-spectrum antimicrobial compounds.

W2-FL10 demonstrated potent activity against Gram-positive bacteria, including *S. aureus*, *Enterococcus faecalis*, *Enterococcus faecium*, *Listeria monocytogenes*, and *Bacillus subtilis*, with minimum inhibitory concentration (MIC) values ranging from 6.3 to 31.3 µg/mL. However, it showed no activity against Gram-negative bacteria.

Key parameters contributing to the antimicrobial activity of lipopeptides include hydrophobicity and net charge. Serrawettin W2-FL10 is a relatively small and moderately amphipathic lipopeptide with a neutral charge. This lipopeptide showed potent activity against eight of the nine Gram-positive bacteria tested, with *B. subtilis* showing some resistance. This resistance is possibly due to the production of a surfactin complex containing anionic lipopeptides, which has been shown to antagonise activity by binding to the potent antimicrobial peptide gramicidin S. W2-FL10 exhibited nearly identical activity against five of the nine bacteria in the test panel, indicating similar bacterial targets, concentrations, and modes of action. Conversely, W2-FL10 exhibited its highest activity, outperforming melittin, against the *L. monocytogenes* and *E. faecalis* reference strains.

From these findings, the lipopeptide serrawettin W2-FL10 emerges as a promising candidate for further investigation into its antimicrobial properties.

Source: Stellenbosch University

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