

News & Comments

Critical Area of Synergistic Antibacterial Action

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Staphylococcus aureus SA that is resistant to isoxazolyl penicillins and cefradine or has a positive *mecA* gene is known as methicillin-resistant SA. *Methicillin-Resistant SA* (MRSA) is a common pathogen that causes necrotizing pneumonia, severe septicemia, and necrotizing fasciitis and is resistant to a wide range of medications. MRSA is linked to the creation of bacterial biofilm, which is one of the most important factors.

Vancomycin is the first line of defence against MRSA infection because it is a glycoside. The cure rate of vancomycin against MRSA was found to be 80%.

To date, much of the study on luteolin antibacterial properties have focused on SA. However, no research has been done on luteolin's antibacterial efficacy and mechanism against MRSA. Lutein and vancomycin were combined in this study to see if they had a synergistic impact on MRSA in vitro, and to establish a new scientific basis for treating MRSA infection clinically.

The experimental materials included Tryptic Soy Broth (TSB) medium, Mueller-Hinton (MH) agar (Oxoid), drug susceptibility disks (Hangzhou Tianhe Microbial Reagent Co., Ltd.), vancomycin (Sigma, USA), 98% luteolin (Institute of Natural Medicine, Henan University), crystal violet solution (GBCBIO Technologies Inc.) and 0.5 McFarland turbid metric tube (Shanghai Xinrui Instrument Co., Ltd.). The experimental apparatus mainly included a constant temperature incubator (NAPCO, USA), optical microscope (Shanghai Huxing Optical Instrument Co., Ltd.), 96-well cell culture, USA) as well a WalkAway-96 automatic bacterial identification and drug susceptibility analyser. The hospital's clinical laboratory isolated ten MRSA strains and delivered them. VITEK 32 and 16S rRNA were used to identify all of the isolated bacteria. The quality control strains were SA ATCC25923 (from the National Institutes of Food and Drug Control).

The drug susceptibility test demonstrated that none of the 10 clinical isolates of MRSA was luteolin- of vancomycin-resistant strains. Luteolin and vancomycin had average MICs of 0.1380.032 mg mL⁻¹ and 1.460.23 g mL⁻¹ against the 10 MRSA strains, respectively. After combining luteolin and vancomycin, the MICs of luteolin and vancomycin decreased to 0.0660.013 mg mL⁻¹ and 0.3710.036 mg mL⁻¹, respectively, according to the susceptibility test results of combined medicines. The MICs before and after the combination of luteolin and vancomycin were significantly different ($p < 0.05$). MRSA prevalence and detection rates in South Africa are rising each year. Vancomycin, a glycopeptide antibiotic drug, has become the treatment of choice for severe MRSA-induced infections around the world.

Vancomycin can kill Gram-positive bacteria by interfering with the cell wall manufacturing stage, which



involves the integration of the mucopeptide terminal D-Ala-D-Ala dipeptide into mitotic cells. Luteolin is a flavonoid that can be found in natural Chinese herbal medicine such as wild chrysanthemum and honeysuckle. It possesses anti-inflammatory, antibacterial, anticancer, and antiviral properties. The FIC results after combining luteolin and vancomycin showed that the combination had a synergistic or additive effect against MRSA, but no indifferent or antagonistic effect. Following the use of vancomycin in conjunction with other antibiotics, the doses of two antimicrobials were reduced and both MIC50 and MIC90 were decreased gradually.

In conclusion, luteolin has anti-MRSA properties in vitro. In conjunction with vancomycin, luteolin can increase vancomycin activity while also lowering the MPC of vancomycin alone and the antibiotic dose.

JOURNAL REFERENCE

Sun, Y., F. Sun, W. Feng, Q. Wang, F. Liu, P. Xia and X. Qiu, 2022. Luteolin and vancomycin synergistically resisted methicillin-resistant *Staphylococcus aureus*. *Int. J. Pharmacol.*, 18: 164-170.

KEYWORDS

Staphylococcus aureus, methicillin-resistant, Vancomycin, MRSA infection, luteolin's antibacterial efficacy

