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EUROPEAN MATERIALS 2021: Advancement and Smartness of Bio-materials for Targeted Drug Delivery: Jitendra Kumar - ICAR-National Dairy Research Institute, Karnal-132001, Haryana, India

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Abstract

Antibiotic-loaded milk exosome drug delivery nanosystems hold significant promise to improve the efficacy of existing antibiotics for the treatment of targeted bacterial infections. These nanosystems minimizing the antibiotic load in the environment, treatment cost, side effects and lowering the risk of the development of antibiotic resistance against pathogenic bacteria. In this context, we developed antibiotic loaded-milk exosomes containing antibacterial hydrophilic drug D-(-)-α aminobenzylpenicillin (ABP) for the eradication of gram-positive Staphylococcus aureus (S. aureus). The developed mEs-ABP nanosystems were characterized by different techniques and the killing efficacy of the mEs-ABP towards S. aureus was confirmed by colorimetric, spot-on lawn antimicrobial assay and agar gel diffusion method. Antibiotic D-(-)-α aminobenzylpenicillin loaded-milk exosomes (mEs-ABP) nanosystems were produced via encapsulation of ABP in the milk-exosomes. The developed mEs-ABP nanosystems have more targeted drug delivery ability which is showing more killing efficacy. The mEs-ABP demonstrated 53.8% higher bactericidal efficacy against the targeted bacterium S. aureus. Compared to the free D-(-)-α aminobenzylpenicillin at the same dose. The novel antibody-enabled mEs-ABP showed greater potential for improving the treatment potency of bacterial infections, minimally affecting the side effect and antimicrobial resistance.

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