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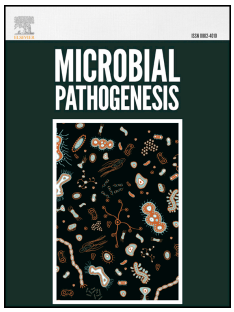

Antimicrobial activity of nanoemulsion on drug-resistant bacterial pathogens

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ABSTRACT

The appearance of drug-resistant (DR) bacteria in the community is a crucial development, and is associated with increased morbidity, mortality, healthcare costs, and antibiotic use. Natural oil nanoemulsions (NEs) have potential for antimicrobial applications. In the present study, we determined the antimicrobial activity of an NE against DR bacterial pathogens *in vitro*. The NE comprised *Cleome viscosa* essential oil, Tween 80 nonionic surfactant, and water. We found that an NE with a droplet size of 7 nm and an oil:surfactant (v/v) ratio of 1:3 was effective against methicillin-resistant *Staphylococcus aureus* (MRSA), DR *Streptococcus pyogenes*, and DR extended-spectrum beta-lactamase (ESBL)-producing *Escherichia coli*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa*. Fourier-transform infrared (FTIR) spectroscopy revealed that NE treatment modified the functional groups of lipids, proteins, and nucleic acids in DR bacterial cells. Scanning electron microscopy (SEM) showed damage to the cell membranes and walls of NE-treated DR bacteria. These alterations were caused by bioactive compounds with wide-spectrum enzyme-inhibiting activity in the NE, such as β-sitosterol, demecolcine, campesterol, and heneicosyl formate. The results suggest that