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Antimicrobial effects of virgin coconut oil and its medium-chain fatty acids on Clostridium difficile

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Abstract

Clostridium difficile is the leading cause of hospital-acquired antibiotic-associated diarrhea worldwide; in addition, the proliferation of antibiotic-resistant C. difficile is becoming a significant problem. Virgin coconut oil (VCO) has been shown previously to have the antimicrobial activity. This study evaluates the lipid components of VCO for the control of C. difficile. VCO and its most active individual fatty acids were tested to evaluate their antimicrobial effect on C. difficile in vitro. The data indicate that exposure to lauric acid (C12) was the most inhibitory to growth ($P<.001$), as determined by a reduction in colony-forming units per milliliter. Capric acid (C10) and caprylic acid (C8) were inhibitory to growth, but to a lesser degree. VCO did not inhibit the growth of C. difficile; however, growth was inhibited when bacterial cells were exposed to 0.15-1.2% lipolyzed coconut oil. Transmission electron microscopy (TEM) showed the disruption of both the cell membrane and the cytoplasm of cells exposed to 2 mg/mL of lauric acid. Changes in bacterial cell membrane integrity were additionally confirmed for VCO and select fatty acids using Live/Dead staining. This study demonstrates the growth inhibition of C. difficile mediated by medium-chain fatty acids derived from VCO.

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