Antibacterial effect of plant oils rich in medium chain fatty acids and their possible interactions with antibiotics

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Statement of the Problem: The alarming situation in the field of antimicrobial resistance in both human and veterinary medicine call for potent alternatives. One of the promising compounds is Medium-Chain Fatty Acids (MCFA). The aim of our study was to evaluate the effect of vegetable oils rich in MCFA (hydrolyzed or non-hydrolyzed forms) towards a spectrum of pathogenic and beneficial bacteria, and to study its combinatory effect with oxacillin towards S. aureus.

Methodology & Theoretical Orientation: The Minimum Inhibitory Concentrations (MIC) of A. aculeatum, Attalea speciosa, Astrocaryum murumuru, Astrocaryum vulgare, Cocos nucifera, Cuphea ignea and Elaeis guineensis oils and free MCFA were determined by the microdilution method. The analysis of possible interactions of the oils and lauric acid with oxacillin was tested by the checkerboard method (Fractional Inhibitory Concentration, FIC). The determination of distinctive MIC of oxacillin, palm oils and lauric acid, as well as their combinatory effect evaluation by FICs, was performed in 96-well microtiter plates in three independent experiments, each performed in triplicate.

Findings: The hydrolyzed oils were active against all tested pathogens (Clostridium perfringens, Enterococcus cecorum, Listeria monocytogenes, and Staphylococcus aureus), at 0.14-4.5 mg/ml, while the same oils did not show any effect on commensal bacteria (Bifidobacterium spp. and Lactobacillus spp.). Tucuma and Cuphea seed oils showed the strongest antibacterial activity. Unhydrolyzed forms of all tested oils exerted no antibacterial effect. Very interesting finding was done in the combinatory effect testing, where the combinations of lauric acid and plant oils with oxacillin caused antagonism (FIC ≥ 4). This effect was observed in all tested bacterial strains.

Conclusion & Significance: The plant oils rich in MCFA can serve as potent antibacterial compounds. However, there is a risk of antagonistic effect with certain antibiotics. This finding need to be further studied.

Recent Publications

Biography
Eva Skrivanova is a Microbiologist and Nutritionist at the Institute of Animal Science in Prague and Czech University of Life Sciences in Prague, Czech Republic. Her expertise is evaluation of antibacterial effect of various plant extracts, their combinations with antibiotics, both in vitro and in vivo, using animal models. Furthermore, her projects aim to study nutritional impact of antioxidants and enzymes as the feed additives in food animals and their effect of oxidative stability of animal products.