Topical Antimicrobial Activity Of EPA, DHA, Oleic, Linoleic, Linolenic
And Palmitoleic Acids In Wounds

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Background: Our group has demonstrated that oleic, linoleic, linolenic, EPA, DHA and palmitoleic acids have important immunomodulatory properties that accelerate the wound healing process when applied topically. Objective: The aim of this study is to evaluate the antimicrobial action of oleic, linoleic, palmitoleic, EPA, DHA and linolenic acid, in vivo and in vitro. Procedure and Results: In vivo: In rats with wounds treated with isolated fatty acids or PBS, the predominant bacterial species were isolated, selected, and identified. In vitro: Bacterial growth (S. aureus, E. coli, and S. epidermidis) was evaluated using fatty acids in TSB medium. Additionally, fatty acids were tested in an agar-based disc diffusion assay and the inhibition halos were measured. Our data showed that, in vivo, wounds treated with oleic and palmitoleic acids presented coagulase negative Staphylococcus spp and Staphylococcus aureus bacteria, while wounds treated with linoleic acid developed only coagulase negative Staphylococcus spp. In vitro, oleic and linoleic acids inhibited the growth of S. aureus and S. epidermidis, but only inhibited the growth of E. coli at high concentrations in the disk diffusion and growth assays. Additional studies have been performed to identify the possible mechanisms involved in fatty acids antimicrobial activity: (i) maintenance of the acidic pH; (ii) biofilm formation; (iii) destroying the plasma membrane/bacterial wall; (iv) inhibition of the enzymatic activity of the bacteria: (v) prevention of entry of nutrients into the cell; (vi) generation of toxic products of auto-oxidation/peroxidation and (vi) increasing immune functions of the host. Conclusion: The microbiota in wounds treated with oleic or palmitoleic acids differ from those treated with linoleic acid. Oleic and linoleic acids inhibit the development of Staphylococcus aureus and Staphylococcus epidermidis and at higher concentrations, that of Escherichia coli. EPA, DHA and linolenic acids did not appear to inhibit the growth of these bacteria.

Key Words: Fatty acids, bacteria, wound.