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Inhibition of gram-positive bacteria by liquorice extracts; Identification of a potential new food grade antimicrobial

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The public is demanding foods that are more natural and less processed; this has led to a search for new antimicrobial substances from other sources including plants. Liquorice plant is used as a traditional medicine in different countries around the world to treat many diseases including bacterial infections and also commonly used as flavouring in food products. The aim of this study is to evaluate the anti-bacterial activity of a *Glycyrrhiza glabra* extract as a natural preservative. This particular extract is derived from the waste material left over after processing of the plant material for food production. Antibacterial activity of liquorice extract was screened against eight species of Gram-negative and Gram-positive bacteria, including *Listeria monocytogenes*, *Listeria innocua*, *Staphylococcus aureus*, *Enterococcus faecalis* and *Bacillus subtilis*. The Gram-negative bacteria include *Pseudomonas aeruginosa*, *Escherichia coli* and *Salmonella typhimurium* but none of these were affected by the extract. For all of the Gram-positive bacteria tested, growth was inhibited as monitored using optical density, but the cells were not killed since the cells were still viable when plated out. The Minimum inhibitory concentration [MIC] and Minimum bactericidal concentration [MBC] of the extract was also determined and a concentration of 50 µg ml⁻¹ was found to have a strong bacteriostatic effect on Gram-positive bacteria. Microscopic analysis indicated that there were changes in cell shape and results using a bioluminescent reporter strain indicated that cell energy levels were reduced. Together these results suggest that the extract is inhibiting the growth of Gram-positive bacteria only by damaging the cell wall and/or membrane.

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