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How liposome encapsulation affects antimicrobial and antioxidant properties of Hydroxytyrosol and Hydroxytyrosol oleate

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Hydroxytyrosol (HOTyr), a plant-derived phenolic compound particularly abundant in olive chain products and by-products, is well recognized for its antioxidant activity and a wide spectrum of biological activities including anti-inflammatory, anti-cancer, anti-viral and anti-bacterial activity. However, due to the high hydrophilic character, HOTyr exhibits adverse pharmacokinetic properties, preventing its potential therapeutic use, which can be overcome turning to nanotechnology through the development of suitable nanosystems.

Here we report on an investigation aimed to explore the *in vitro* antimicrobial and antioxidant activities of HOTyr and Hydroxytyrosol oleate (HOTyrOL), a synthetic fatty acid derived by the acylation of HOTyr ethanolic function with oleic acid, which is characterized by an increased lipophilicity compared to HOTyr. Furthermore, the effect on HOTyr and HOTyrOL biological activities after their encapsulation in liposomes was deeply investigated and analyzed. Liposomes were formulated with natural phosphocholine (DOPC, DMPC and DPPC) and cholesterol, in presence or absence of a synthetic cationic amphiphile.

The antimicrobial activity of HOTyr and HOTyrOL, in free form or conveyed in liposomes, was examined against two strains of *Staphylococcus aureus*, wild type strain (ATCC 25923) and MRSA (ATCC 33591), to determine the *Minimum Inhibitory Concentration* (MIC) and the *Minimum Bactericidal Concentration* (MBC). Finally, HOTyr and HOTyrOL antioxidant capacity was assessed by reactions with the 2,2-diphenyl-1-picrylhydrazyl radical, the galvinoxyl radical and the ABTS radical cation, both in free form and in liposomes.