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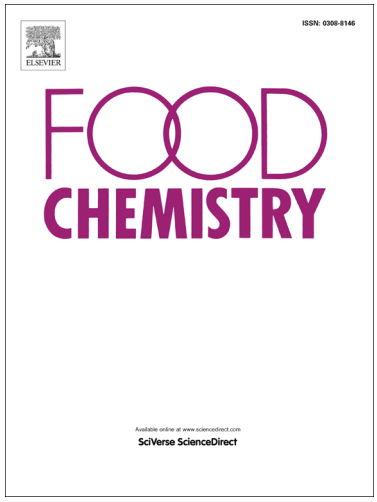

Interferences of anthocyanins with the uptake of lycopene in Caco-2 cells, and their interactive effects on anti-oxidation and anti-inflammation *in vitro* and *ex vivo*

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ACCEPTED MANUSCRIPT

Interferences of anthocyanins with the uptake of lycopene in Caco-2 cells, and their interactive effects on anti-oxidation and anti-inflammation *in vitro* and *ex vivo*

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Abstract

Lycopene was combined with the glucosides of each of the six common anthocyanidins at 3 different ratios to investigate their interactions on antioxidant and anti-inflammatory activities, and cellular uptake. The bioactivity interaction between lycopene and anthocyanins was studied in both chemical and cellular models. Anti-oxidative synergy was not seen in any of the tested lycopene-anthocyanin mixtures, nor in the models studied. When lycopene was paired with the methoxylated anthocyanins, the anti-inflammatory effect on the inhibition of the cytokine IL-8, which is a pro-inflammatory biomarker, was increased by 15-69% of the expected additive activity, indicating synergistic interaction between the compounds. The cellular uptake of lycopene was significantly impaired by the presence of the anthocyanins: reduced by 50-80% at the lycopene: anthocyanin combinatory ratios of 2.5:7.5 μM (1:3) or 5:5 μM (1:1). The reduced intracellular lycopene content might be partly responsible for the antagonistic cellular antioxidant property seen in some of the tested mixtures.

1. INTRODUCTION

Phytochemicals in food materials can interact with each other and produce synergy or antagonism of their individual biological activities. Anti-oxidative synergy is seen in several mixtures of hydrophilic phytochemicals: anthocyanins and flavonols, flavan-3-ol and flavonols, tea polyphenols; or in lipophilic phytochemical mixtures: mixed carotenoids, carotenoids and α-tocopherol; and in flavonoid-carotenoid mixtures: carotenoids and flavonols, carotenoid and isoflavans (Phan, Paterson, Bucknall, & Arcot, 2018). The combination of phytochemicals can also show antagonistic antioxidant

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