

RESEARCH ARTICLE

# Effect of three edible oils on the intestinal absorption of caffeic acid: An *in vivo* and *in vitro* study

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## Abstract

Polyphenolic antioxidants are mainly absorbed through passive paracellular permeation regulated by tight junctions. Some fatty acids are known to modulate tight junctions. Fatty acids resulting from the digestion of edible oils may improve the absorption of polyphenolic antioxidants. Therefore, we explored the effect of three edible oils on the intestinal absorption of caffeic acid. Rats were fed with soybean oil and caffeic acid dissolved in distilled water. Caffeic acid contents in the plasma collected up to 1 hr were quantified. The experiment was repeated with coconut oil and olive oil. Component fatty acids of the oils were individually tested *in vitro* for their effect on permeability of caffeic acid using Caco-2 cell monolayers. Highest absorption of caffeic acid was observed in animals fed with coconut oil. *In vitro* transport percentages of caffeic acid in 2.5 mmol/L solutions of fatty acids were 22.01±0.12 (lauric), 15.30 ± 0.25 (myristic acid), 13.59 ± 0.35 (linoleic acid), 3.70 ± 0.09 (oleic acid) and 0.10–2.0 (all other fatty acids). Lauric acid and myristic acid are the two major fatty acids present in coconut oil. Therefore, these fatty acids may contribute to the higher absorption of caffeic acid in the presence of coconut oil.

## Introduction

Polyphenols are naturally occurring secondary metabolites found in plants. Edible sources of polyphenolic substances are vegetables, fruits, cereals, and beverages such as tea, coffee and wine. Long term consumption of diets rich in plant polyphenolic substances has been reported to confer protection against development of cardiovascular diseases, cancers, diabetes, osteoporosis and neurodegenerative diseases [1–3]. Polyphenols can also inhibit cholesterol uptake and 5-lipoxygenase activity [4]. Bioavailability of phenolic substances is important in evaluating the health benefits of phenolic substances. Bioavailability of a substance indicates the fraction of an ingested nutrient or compound that reaches the systemic circulation and the specific sites where it can exert its biological action [5]. Even though a compound has strong antioxidative or other biological activities *in vitro*, *in vivo* biological activity depends on the ability of the compound to reach the target tissue [6]. An absorption study conducted with human subjects