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Curcumin bioavailability from oil in water nano-emulsions: *in vitro* and *in vivo* study on the dimensional, compositional and interactional dependence.

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Abstract

Although nanocarriers can enhance the bioavailability of free curcumin in the blood, a systematic study on the parameters that affect such enhancement is still missing. In this work we focused the attention on a nanocarrier represented by an oil in water nano-emulsion coated with a thiol modified chitosan and carried out a comprehensive study on the effects that parameters such as size, co-delivery of piperine and degree of chitosan modification can exert on curcumin bioavailability and quantified their impact. We obtained an unprecedented pharmacokinetic profile of curcumin with the best formulation, represented by a combination of a small nano-emulsion size (110 nm), co-delivery of curcumin and piperine (weight ratio 100:1) and a high degree of chitosan thiolation (14-15%). Then, we assessed its anti-inflammatory properties after oral administration in rats at low doses (≤ 0.1 times the volume administered in the pharmacokinetic study). Furthermore, the proposed food grade nano-emulsions loaded with curcumin did not show any cytotoxic effect on normal fibroblasts, while they were able to promote death in colon cancer cells in agreement with the common knowledge of the selective action of curcumin.

Keywords: curcumin; piperine; nano-emulsions; chitosan; 2-iminothiolane; colon cancer.

1. Introduction

Curcumin, a bioactive compound isolated from the rhizome of the *Curcuma longa* plant, has a long history of use in traditional Chinese and Indian medicine. An interesting example concerns the common use of curcumin

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