Selective Coprecipitation of Polyphenols in Bioactive/Inorganic Complexes

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We investigate the formation of bioactive/inorganic coprecipitates of polyphenols (catechins) with calcium carbonate and calcium phosphate. Extracted from the leaves of Camellia sinensis, catechins are efficient free radical scavengers, but their purported benefits from the perspective of prevention, health and nutritional physiology are accompanied by unpleasant organoleptic characteristics: they are notoriously bitter. Selective complexation of polyphenols with metal salts is a possibility to mask or inactivate bitterness and/or off-flavors. We produce such complexes using a continuous coprecipitation process; gallated catechins are preferentially included in the coprecipitates [1], resulting in a selective encapsulation. For coprecipitates based on mixed carbonate/phosphate mineral matrices, we find a strong influence of excess calcium chloride present in the reactant solutions on the encapsulation efficiency and observe a positive correlation of the carbonate to total anions molar ratio with the catechin load. The composition and structure of the coprecipitates are investigated by elemental analysis, scanning force and electron microscopy, X-ray powder diffraction, and liquid chromatography coupled to tandem mass spectroscopy (LC/MS-MS). We quantify the release kinetics in different model environments to predict the behavior of the catechins from the coprecipitates in model media simulating the conditions during oral ingestion and storage. The dissolution data suggest that the release profile can be influenced and fine-tuned via the anion composition of the mineral carrier [2].

Figure 1.: Schematic of continuous coprecipitation of phytochemicals with metal salts

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