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The role of gastric emptying in β-carotene absorption during simulated in vitro digestion

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Abstract

Introduction: The availability of β-carotene from provitamin A rich foods in order to improve the provision of vitamin A in humans through food-based approaches is an important factor in mitigating micronutrient deficiencies. However, the extent of intestinal absorption (and subsequent availability of carotenoids to target tissues) is dependent on meal preparation, components of the meal and other intrinsic factors during gastro-intestinal (GI) digestion. Gastric emptying (GE), dictated by the caloric value of a meal, has been suggested as a critical component in determining β-carotene absorption. Indeed, dietary intake of high energy meals may just unravel the underlying factors associated with low uptake of dietary carotenoids during digestion. While several studies have reported the uptake of β-carotene as an individual pure compound under different digestive conditions[1], very few studies have assessed the effects of dietary carotenoids embedded in an energy dense meal, as would normally be consumed, on GI transit time and subsequent nutrient release.

Materials and Methods: In this study, we investigated the role of meal composition, particularly its caloric value, in modulating gastric emptying and thus the absorption of β-carotene. A step-by-step *in vitro* semi-dynamic model that simulates adult gastric digestion[2] was used on a prepared standard meal whose caloric value was estimated based on the Atwater system as described elsewhere with the assumption that the caloric density of the meal will assume a linear GE rate of 2kcal/min.

Results: Preliminary results indicate that, short transit times of 40 minutes, mimicking early GE, have the highest concentration (3.84 ± 0.014; Mean SD) and therefore, highest bioaccessibility (55.7%) compared to the longer transit time of 160 minutes (0.81 ± 0.002; Mean SD) and (11.8%) for β-carotene concentration and bioaccessibility from a standard meal, respectively.

Discussion: The results suggest that gastric behaviour of the food determines the kinetics of bioaccessibility that may not result in low β-carotene release and ultimately low bioaccessibility from the embedded matrix.

Conflict of Interest

There is no conflict of interest

References

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