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STABILITY IN THE PRESENCE OF IRON AND ANTIOXIDANT ACTIVITY IN A MODEL OF THE GASTRO-INTESTINAL TRACT OF REFERENCE AND BACTERIAL CAROTENOIDS.

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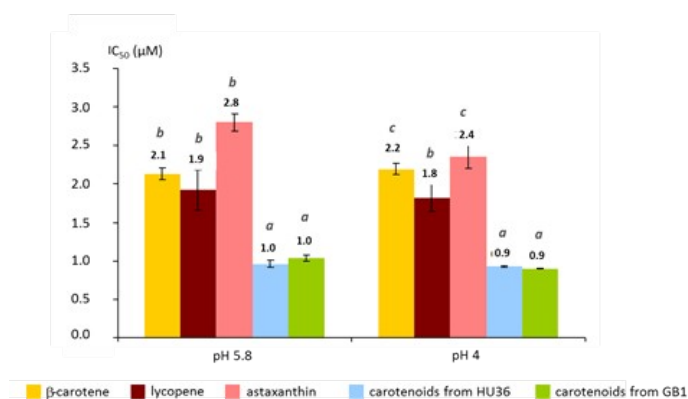
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The stomach is a bioreactor [1] in which macro- and micro-nutrients can interact. Stability of carotenoids in the gastro-intestinal tract could be challenged in the presence of pro-oxidant species like iron, which is present in food and especially in red meat. Moreover, in gastric conditions, dietary lipid peroxidation may be especially fast due to high dioxygen concentrations, acidic pH and constant mixing [2]. Thus in the presence of polyunsaturated fatty acids and iron, lipid peroxidation could produce deleterious oxidized lipids in the stomach. In sufficient concentration in this compartment, carotenoids could exert antioxidant activity to protect polyunsaturated lipids and prevent the formation of compounds deleterious for human health.

We studied the stability of carotenoids in the presence of dietary iron in a mildly acidic (pH 4) micellar solution as a simple model of postprandial gastric conditions [3]. The oxidation was initiated by free iron (Fe^{II}, Fe^{III}) or by heme iron (metmyoglobin, MbFe^{III}). Fe^{II} and metmyoglobin were found much more efficient than Fe^{III} at initiating β -carotene oxidation. For β -carotene, UPLC/DAD/MS and GC/MS analyses revealed a complex distribution of β -carotene-derived products including (Z)-isomers, epoxides and cleavage products of different chain lengths. The mechanism and potential nutritional consequences of iron-induced carotenoid oxidation will be discussed.

A model of lipid peroxidation in the gastro-intestinal tract was previously set up in the laboratory [4]. We compared the ability of various carotenoids (lycopene, β -carotene, astaxanthin, and mixtures of bacterial carotenoids) to inhibit the iron-induced peroxidation of linoleic acid micelles at two different pH of the stomach during the digestion [5]. Under these conditions, newly identified carotenoids from spore-forming bacteria [6], were found to have greater antioxidant than the reference carotenoids. Results will be discussed

taking into account differences in chemical structures which might induce different localization at the lipid/water interphase or inside the micelle.



Antioxidant activity of reference carotenoids and bacterial carotenoids from 2 different *Bacillus* strains (HU36 and GB1) at pH 5.8 and 4. IC₅₀ = inhibitory concentration necessary to reduce oxidation by half. The lower the value, the greater the antioxidant capacity of the carotenoid.

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- [1] J. Kanner; T. Lapidot; *Free Radical Biol. Med.*, **31**, 1388-1395 (2001).
- [2] T. Lapidot, R. Granit and J. Kanner, Lipid peroxidation, *J. Agric. Food Chem.*, **53**, 3293-3390 (2005)
- [3] C. Sy; O. Dangles; P. Borel; C. Caris-Veyrat, *Free Radical Biol. Med.*, **63**, 195-206 (2013)
- [4] E. Vulcain ; P. Goupy ; C. Caris-Veyrat ; O. Dangles, *Free Radical Res.*, **39(5)**, 547-563 (2005)
- [5] C. Sy; C. Caris-Veyrat; C. Dufour; M. Boutaleb; P. Borel; O. Dangles, *Food & Function*, **4(5)**, 698-712 (2013)
- [6] L. Perez-Fons, S. Steiger, R. Khaneja, P. M. Bramley, S. M. Cutting, G. Sandmann and P. D. Fraser, *Biochim. Biophys. Acta*, **1811**, 177-185 (2011)