TRANSFER OF CHLOROPHYLL PIGMENTS FROM AN OILY MATRIX TO THE INTESTINAL EPITHELIAL CELLS

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OBJECTIVE
The present work is focused on examining the factors affecting the transfer of chlorophylls from an oily food matrix to the intestinal epithelial cells during the digestive process. It was studied both chlorophyll a (Chl a) and chlorophyll b (Chl b) as the major chlorophyll derivatives present in processed vegetables common at the diet; pheophytin a (Phy a), pheophytin b (Phy b), pyropheophytin a (Pyphy a), pheophorbide a (Pho a) and pheophorbide b (Pho b).

RESULTS Y DISCUSSION

Digestive stability
- The chlorophylls were transformed widespread into pheophytins at the stage of gastric digestive process (Fig. 1).
- Besides the acid pH, the type of food matrix also affects the digestive stability of the chlorophylls. The oily matrix exerted a slight protective effect against the phytol de-esterification in chlorophyll a digestion (40% of chlorophyll forms with Mg after digestion).
- Allosterization reactions involving C-13β oxidation by triplet molecular oxygen (Fig. 1: hydroxyderivatives and lactones) were also found and affected chl a (10.7±0.6 %) and chl b (11.7 ± 1.9 %) equally (p<0.05).
- Dephylated chlorophyll derivatives were not detected. The detection of these compounds in human faeces is associated with the metalism of the flora of the large intestine (Femurez et al. 2001).

% Retention
- The retention of pigments after digestion of Chl a (51%) and Chl b (49%) were not significantly different (p<0.05).
- The retentions were of the same order for all of them; phy a (70%), phy b (66%), phyphy a (62%), phy b (75%) and pheophytin a (74%) and significantly higher (p<0.05) than those chlorophylls, demonstrating a high stability.

% Absorption
- All compounds resulting from the digestion of chl were actually taken up by Caco-2 cells.
- Uptake of chlorophyll forms with Mg (b series)
- Absorption: Phythlated compounds: Pheophytin, Pyropheophytin: 3.7%.
- Phyphylated compounds: Pheophytin B, Pheophorbide B: 3%
- AMF from spinach puree digestion (Femurez et al. 2001): 5.9%

CONCLUSIONS
The structural changes of the chlorophyll pigment, mainly the de-esterification of phytol, significantly increases – by an estimated 65-fold – its transfer from the food matrix to the intestinal epithelial cells during digestion, making it more bioavailable. It also found marked differences in the transport route: pheophytin a and pheophorbide a absorption by passive diffusion, pheophorbide a and pynofofoerida b showed facilitated transport (active) in the lower range of concentrations tested.

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REFERENCES

MICELLAR FRACTION SEPARATION

IN VITRO DIGESTION

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