Influence of wall material on the release of microencapsulated omega-3 fatty acids by in vitro digestion

C. Folgado-Dorado, Caceres/ES; J. Ruiz-Carrascal, Caceres/ES; T. Antequera, Caceres/ES; J.C. Solomando, Caceres/ES; T. Perez-Palacios, Caceres/ES

Meat and Meat Products Research Institute (IProCar) - University of Extremadura

carlosfd@unex.es

Introduction

The use of microcapsules of omega-3 rich oil seems to be an appropriate vehicle of EPA and DHA to enrich food, being also important the bioaccessibility of these bioactive compounds. Maltodextrin is being preferably used as wall material in omega-3 microcapsules while vegetal protein have been less studied (Perez-Palacios et al., 2022).

Objetive

This study aims to evaluate the influence of two different wall materials, pea protein isolate (PPI) and chitosan-maltodextrin(C-M), on the bioaccesibility of EPA and DHA of algae oil microcapsules.

Methods

- Two types of algae oil emulsions, with chitosan-maltodextrin and pea protein isolate as wall materials, were prepared and followed subjected to spray-dry to obtain the respective types of microcapsules.
- The release of fat and EPA and DHA at the end of oral, gastric and intestinal phases was determined by *in vitro* digestion (Fig.1) following the methodology of Wang et al. (2009).
- The fatty acids composition was analyzed by gas chromatograph, equipped with a flame ionization detector (GC-FID)

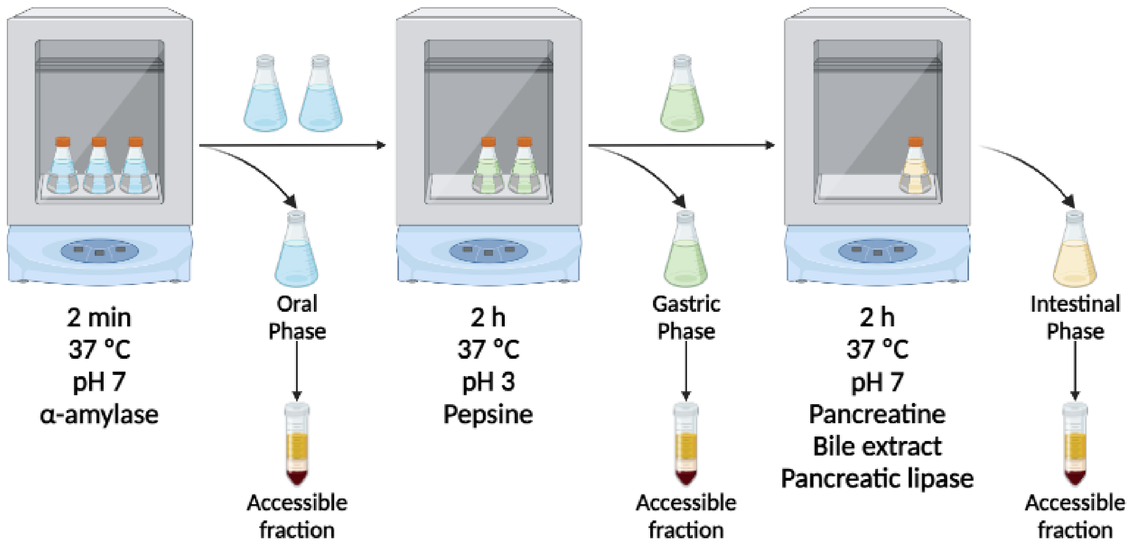

Figure 1 – Experimental model of *in vitro* digestion.

Results and Discussion

In both types of microcapsules, the highest percentage of fat release occurred during the intestinal phase (Fig. 2). The same situation occurs when we focus on EPA (Fig.3) and DHA (Fig. 4) fatty acids separately, however, notable differences were observed between the two types of microcapsules across each phase. The release of fat, EPA, and DHA was significantly higher during the oral phase for PPI microcapsules, while it was lower during the gastric and intestinal phases compared to C-M microcapsules. Consequently, the bioaccessibility of EPA and DHA in C-M microcapsules (69.67% and 65.83%, respectively) was substantially greater than that in PPI microcapsules (26.87% and 42.64%, respectively).

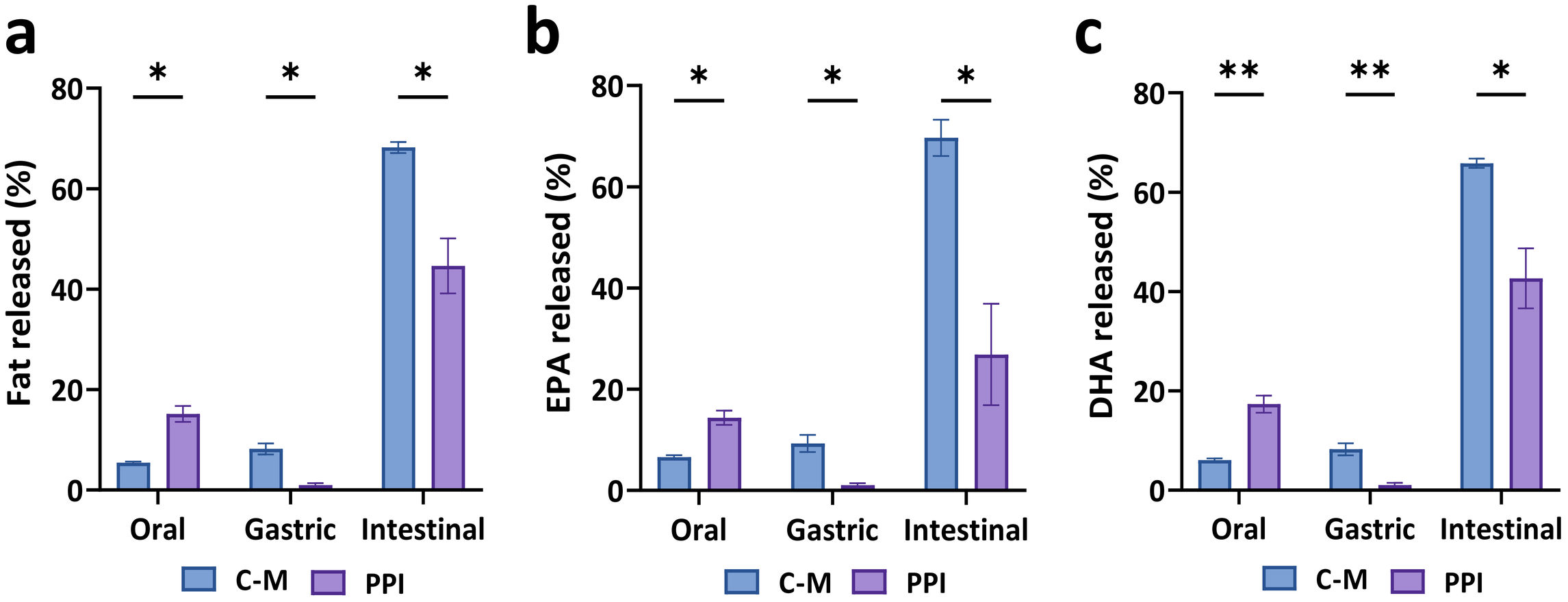

Figure 2 – Percentage of (a) fat, (b) EPA and (c) DHA release during the different stages *of in vitro* digestion. Significant differences in release are indicated by * ($p < 0.05$ in Student's t-test) or ** ($p < 0.01$ in Student's t-test).

Conclusions

The bioaccessibility of EPA and DHA was significantly higher in C-M microcapsules compared to PPI microcapsules. This observation suggest the crucial role of the microcapsule wall material in enhancing the bioaccessibility of omega-3 fatty acids.

Bibliography

1. Perez-Palacios, T. et al. Recent Developments in the Microencapsulation of Fish Oil and Natural Extracts: Procedure, Quality Evaluation and Food Enrichment. Foods 11, 3291 (2022).
2. Wang, Q., Gong, J., Huang, X., Yu, H. & Xue, F. In vitro evaluation of the activity of microencapsulated carvacrol against Escherichia coli with K88 pili. J. Appl. Microbiol. 107, 1781–1788 (2009).

Acknowledgments

Unión Europea - Fondo Europeo de Desarrollo Regional (FEDER), Junta de Extremadura - Consejería de Economía, Ciencia y Agenda Digital and Universidad de Extremadura - Plan Propio de Iniciación a la Investigación, Desarrollo Tecnológico e Innovación for funding this study, which was supported by the project IB20138.

JUNTA DE EXTREMADURA
Consejería de Economía, Ciencia y Agenda Digital

Unión Europea
Fondo Europeo de Desarrollo Regional "Una manera de hacer Europa"