PO101 - 24916 - INCORPORATION OF CURCUMIN-LOADED LACTOFERRIN NANOHYDROGELS INTO A MODEL GELATINE: RELEASE KINETICS AND CHARACTERIZATION

João Araújo[1]; Ana Isabel Bourbon[2]; Lívia S. Simões[2]; António Vicente[1]; Paulo Coutinho[3]; Óscar Ramos[4]

1 - Universidade do Minho - Centro de Engenharia Biológica; 2 - International Iberian Nanotechnology Laboratory; 3 - Universidade do Minho - Escola de Ciências; 4 - Universidade Católica Portuguesa - Centro de Biotecnologia e Química Fina

E-mail: joaomiguelfernandesaraujo@gmail.com

Keywords: Whey protein, Nanohydrogels, Nutraceuticals, Release kinetics, Gelatine

Abstract

The design and development of whey protein nanostructures as encapsulating agents for nutraceutical's controlled release has been intensively studied towards the production of functional foods. However, the interactions of these structures with food matrices are not well understood at the nanoscale and therefore they must be addressed. In this study, a curcumin-loaded lactoferrin (LF) nanohydrogel was developed aiming at its behaviour evaluation when incorporated into a model food matrix (gelatine). The release kinetics of curcumin from LF nanohydrogels added to food simulants (hydrophilic medium: ethanol 10%; and lipophilic medium: ethanol 50%) were performed at 25 °C (according to the Commission regulation EU No 10/2011). The resulting experimental data were fitted by the linear superimposition model (LSM) aiming at the evaluation of the release mechanisms of curcumin through LF nanohydrogels. This system was then incorporated into an unflavoured commercial gelatine and further characterized. For this purpose, the protein nanohydrogel isolated and loaded with curcumin was dehydrated by freeze-drying, resulting in a homogeneous LF-curcumin powder. Freeze-dried nanohydrogels were characterized by dynamic light scattering (DLS), circular dichroism (CD) and fluorometry. LF nanohydrogel showed higher release of curcumin in a lipophilic food simulant (ca. 16 µg) in comparison with a hydrophilic one (ca. 1.6 µg). Curcumin release kinetics through LF nanohydrogels have shown to be mainly driven by Case II transport, rather than Fickian diffusion, in both simulants. The behaviour of this system and curcumin release kinetics in food stimulants showed that LF nanohydrogel has a huge potential for the controlled release of lipophilic nutraceuticals in refrigerated food products of hydrophilic character. Finally, LF nanohydrogels were successfully incorporated in a gelatine matrix and showed no degradation in this process.

Acknowledgements

This work was supported by the Portuguese Foundation for Science and Technology (FCT) under the scope of the strategic funding of UID/BIO/04469/2013 unit and COMPETE 2020 (POCI-01-0145-FEDER-006684) and BioTecNorte operation (NORTE-01-0145-FEDER-000004) funded by European Regional Development Fund under the scope of Norte2020, Programa Operacional Regional do Norte. Óscar L. Ramos gratefully acknowledges FCT for his financial grant with reference SFRH/BPD/80766/2011.

João F. Araújo acknowledges the Escola de Ciências and Centro de Engenharia Biológica from Universidade do Minho (Braga, Portugal) for their support, under the scope of the Biophysics and Bionanosystems Master program.