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BEHAVIOR OF LIPID NANOCAPSULES AFTER ORAL ADMINISTRATION

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The oral route is the most common route for drug delivery. However, some drugs present a low oral bioavailability due to low drug solubility, drug degradation along the gastrointestinal tract, or low intestinal permeability. To improve oral drug delivery, drug encapsulation into nanocarriers, such as lipid nanocapsules (LNCs), is currently one of the most promising technologies. LNCs, developed by our group, have proven to be very interesting for oral administration. These nanoparticles have a size that ranges from 20 to 130 nm and are prepared by a well-known low-energy emulsification process: the phase-inversion temperature method. They have already shown promising properties for the oral delivery of paclitaxel, Sn38, fondaparinux, decitabine, and miltefosine. However, despite the promising benefits, these studies focus only on monitoring drugs encapsulated in nanocarrier but ignore the performance of the nanocarrier itself.

Currently, the only method that can characterize the particle integrity of organic nanoparticles is by Förster resonance energy transfer (FRET). It is a subset of the fluorescence technique often dubbed the 'nano-ruler' since the technique is very sensitive to the distance change in nanoscale and is thus proved to be useful for monitoring the association or the dissociation of organic nanoparticles. In this context, FRET-LNCs were developed and the behavior of LNC after oral administration was studied. This lecture will try to explain how LNCs allow for enhancing the oral bioavailability of drugs. Special attention will be paid to the ability of those LNCs to maintain their full integrity using in vitro and in vivo models.

Brief CV

Emilie Roger received her PharmD in 2006 and his PhD in 2009 from the University of Angers, France. After a postdoctorat position at pharmaceutical department, University of Minnesota (Minneapolis, Minnesota, USA), she started an assistant professor position at the CAMB laboratory (UMR 7199 CNRS, Strasbourg, France) in 2010 and then she joined the MINT laboratory (UMR INSERM U1066 CNRS 6021, Angers, France) in 2013. Her current research is focused on oral administration and on the development of new drug delivery system, with special attention on nanotechnology, and their application to the pharmaceutical fields. She published 31 publications in international journals with reviewers, 2 patents and 3 book chapters (total citations in Scopus 1692; H-index 19),.

Major publications during last 5 years

Kaeokhamloed, N. , Legeay S. & Roger E. et al. FRET as the tool for in vivo nanomedicine tracking. *J. Control. Release* (*in press*)

Deshayes, C., Arafath, M. N., Afaire-Marchais, V. & Roger, E. Drug Delivery Systems for the Oral Administration of Antimicrobial Peptides: Promising Tools to Treat Infectious Diseases. *Front. Med. Technol.* 3, 1–13 (2022).

Bonnet, S., Elfatairi, R., Franconi, F., Roger, E. & Legeay, S. Organic nanoparticle tracking during pharmacokinetic studies. *Nanomedicine* 16, 2539–2563 (2021).

Kaeokhamloed, N. et al. New in vitro coculture model for evaluating intestinal absorption of different lipid nanocapsules. *Pharmaceutics* 13, 1–16 (2021).

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Roger, E., Gimel, J.-C., Bensley, C., Klymchenko, A. S. & Benoit, J.-P. Lipid nanocapsules maintain full integrity after crossing a human intestinal epithelium model. *J. Control. Release* 253, (2017).