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Challenges and advances in oral drug delivery using lipid-based nanoparticles

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Oral administration is the preferred route for drug delivery and nanotechnology represents a novel strategy for protection and transport of hardly soluble, chemically unstable and poorly permeable drugs through the gastrointestinal tract, in order to improve their oral bioavailability. Here, lipid-based nanoparticles have been studied as promising tools for the transport across the intestinal barrier. All nanosystems present similar size (~180 nm) and surface charge (<30 mV). A stability study was conducted simulating the gastrointestinal tract fluids. The cellular uptake, internalization pathways and transcytosis routes were investigated using Caco-2 cells as a model of the intestinal barrier since after growth these cells form confluent and differentiated monolayers with microvilli, tight junctions and transport systems. Nanostructured lipid carriers show a higher cellular uptake and permeability across the barrier, while solid lipid nanoparticles may enter cells faster than the former. The internalization of lipid nanoparticles occurs mainly through a clathrin-mediated endocytosis mechanism, although caveolae-mediated endocytosis is also involved in the uptake. Both lipid nanoparticles are able to cross the intestinal barrier by a preferential transcellular route.

Biography

Ana Rute Neves (PhD, Pharmaceutical Sciences) is a Post-doctoral researcher at Research Unit UCIBIO/REQUIMTE, Department of Chemical Sciences, Faculty of Pharmacy, University of Porto, Portugal. She got her MSc in Biochemistry at the University of Porto in 2009. After 1 year of working in Angelini Pharmaceuticals Company she got her PhD in Pharmaceutical Sciences at Faculty of Pharmacy of the University of Porto in 2015. Currently her research focuses on the development of nanopharmaceuticals (lipid nanoparticles) as drug delivery systems to create new and more efficient therapies for a range of diseases and administration routes.

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