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Peptide delivery: How can nanosystems help address present and future challenges

Peptides have become very attractive drugs in the last decades, due to their selectivity, their high bioactivity and low toxicity. These drugs have been successfully developed for the treatment of major diseases like type 2 diabetes and cardiovascular disorders, various types of cancer and multiple sclerosis. Due to their poor stability in extreme pH conditions, their enzymatic degradation and poor absorption across epithelial membranes, as well as their short plasma half-life, peptides remain difficult-to-administer drugs. At the present time, they are predominantly administered via injection, using sustained-release (SR) formulations mainly based on polymer matrices slowly releasing the peptide over months. These formulations have become the most successful injectable peptide formulations on the market. However, the use of alternative routes of administration, like the oral route or the transmucosal route, is likely to increase in the future, due to the pain and invasiveness of injections, as well as disposal issues associated with used needles and relatively complicated injection protocols. Low bioavailability due to limited permeability through the membranes remain a key challenge for these alternative delivery routes. In addition, new challenges have emerged recently, related to the need for intracellular delivery of peptides to new targets in cancer treatment and to the crossing of the blood-brain barrier (BBB) for peptide delivery to the brain. Then, in this context, nanodelivery systems (e.g. nanotubes, nanoparticles or nanocapsules) can provide appropriate solutions to address present and future challenges of peptide delivery, especially as regards SR formulations and delivery systems crossing cellular membranes (either intestinal epithelium or BBB) or entering cells to target intracellular receptors. This paper will present various successful nanosystems for peptide delivery that have entered the clinic or even progressed to the market, and discuss prospective approaches mainly focused on the crossing of membranes.

Biography

Richard J pursued PhD in Materials Science. He is currently Senior Vice President, Peptides Development in IPSEN (France). He is globally leading all the pharmaceutical development activities of both injectable and oral peptide and small molecule-based products, including APIs and drug products, with major franchises in Oncology, Neurology and Rare Diseases. He has more than 25 years of experience in chemistry and biopharmaceutical R&D, including several global senior positions in various biotech and pharma companies. He has published 67 peer-reviewed scientific papers, 8 book chapters and 2 review editorials in various fields (colloids and interfaces, drug delivery, supercritical fluids, protein formulations, nanoparticles, sustained-release formulations). He is the author of more than 120 international communications and 53 patent families.

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