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RESEARCH AREA

Modern pharmaceutical technology is focused on formulations that are targeted to the exact site at the appropriate time, with maximum efficiency and with reduced side-effects. Nanoparticle engineering has been developed and reported for pharmaceutical applications. In this approach, poorly water-soluble compounds are formulated as nanometer-sized (< 1000 nm) drug particles. Nanoparticulate technology offers increased bioavailability, improved absorption, and the potential for drug targeting.

The main question of our work how we can use and apply the prepared nanosized systems (as predispersions) in drug formulation (to reach local or systemic effect) to get effective therapies in different diseases. Therefore we should find cost-effective production by new technological processes containing the most important technological and material parameters.

The aim is to reach a local and systemic effect with alternative, mainly pulmonary / nasal drug administration. There is a great need for the development of pulmonary and nasal generic formulations, as the protection of currently marketed formulations is about to expire. From a therapeutic point of view, the treatment of local asthma and Chronic Obstructive Pulmonary Disease (COPD) / remains the main indications for inhalation therapy. However, inhalation formulations for the treatment of e.g. diabetes or schizophrenia are already available as to have systemic treatment. Many new types of nasal products were developed for systemic drug delivery are already on the market. However, the development of nasal delivery systems for the treatment of central nervous system diseases that provide rapid and effective brain pharmacokinetic concentrations for drugs that utilize the nasal route could be a new area of research.

TECHNIQUES AVAILABLE IN THE LAB

We use a wide variety of technological procedures: co-milling, high-pressure homogenization, laser fragmentation, high-intensity ultrasound, solvent-antisolvent precipitation, nano-spray-drying, freeze-drying, coating, preparation of nanocapsule and nanofibers. Characterization of

micrometric and physicochemical properties (size, morphology), structure (XRPD, FTIR, DSC), compatibility, stability, in vitro, ex vivo, in silico and in vivo properties as investigation methods could be found. According to the Pharmacopoeia drug release and absorption can be studied in intestinal media (gastric juice, intestinal fluid, lung media, and nasal fluids). It can be predicted (Impactor, horizontal cells) e.g. the extent of lung deposition or diffusion through human nasal mucosa.

SELECTED PUBLICATIONS

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Ambrus, R., Benke, E., Farkas, Á., Balásházy, I., Szabó-Révész P. (2018) Novel dry powder inhaler formulation containing antibiotic using combined technology to improve aerodynamic properties **Eur J Pharm Sci** **123**: pp. 20-27.