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Nanocrystallization of indomethacin by wet ball-milling technique

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The purpose of this study was to improve the solubility properties of a poorly soluble NSAID, indomethacin, by decreasing the particle size of the drug material to nanometer size area. The nanosizing was performed by wet ball-milling technique in an aqueous surfactant solution. After the ball-milling, particle size, solubility and physicochemical characterization of the drug material was performed. According to this study, wet ball-milling is an efficient way to improve the solubility of poorly soluble drug material, like indomethacin. The process time is quite short and also the process set-up is simple. After the milling, indomethacin did mostly pertain the original crystal structure of the raw material, which indicated that the increase in solubility was mainly caused by the decreased particle size. The increase in solubility was at its best as high as almost 20-fold, and the smallest size fractions of the drug material were below 100 nm.

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Controlled release of peptide from thermally hydrocarbonized mesoporous silicon microparticles in vivo

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Use of therapeutic peptides is limited due to their poor bioavailability. Delivery of peptides in microparticles can improve bioavailability of the peptides, e.g. by increasing their biological half-life. Our aim was to develop a controlled drug delivery system, based on hydrocarbonized mesoporous silicon microparticles (THCPSi), for peptide delivery. Ghrelin antagonist (GhA) was used as a model peptide. GhA decreases food intake and increases blood pressure. Unloaded THCPSi, THCPSi loaded with GhA, GhA or vehicle were injected subcutaneously and food consumption in mice and blood pressure in rats was registered during 24 h after injections. Unloaded microparticles did affect neither food intake nor blood pressure. The results obtained with loaded microparticles indicate control release of GhA peptide. No significant differences in plasma cytokine concentrations were observed after administration of unloaded THCPSi in mice, indicating that the microparticles had no major effects on immune system.

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Drug dissolution studies on mesoporous silicon particles—A theoretical approach

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Recently, applications of mesoporous silicon oxide (PSi) materials for drug delivery have been considered. These materials, when loaded with drug molecules, are expected to enhance the bioavailability of poorly absorbed drugs. Varying the pore sizes and/or functionalizing the pore walls enables controlled drug release from the loaded PSi microparticles. PSi particles have been shown to increase the rate of release compared to pure drug particles of similar size. It has been uncertain why this would be so, since one would certainly assume diffusion to be slower in the PSi case and the measured difference in equilibrium solubility has been slight. Here, the reason and mechanism behind the dissolution behavior is studied by comparing experimental results to theoretical models based on the shrinking core model. The proposed model could successfully explain the differences between different PSi particles by taking into account the surface chemistry, loading rates and porosity of the samples.

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Controlled drug release from crosslinked poly(ester-anhydrides)

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Biodegradable crosslinked poly(ester-anhydrides) (PEAH) have been shown to exhibit surface erosion in in vitro studies and thus, Peas could enable zero-order drug release (Helminen et al., 2003). The aim of this study was to characterize the effect of the drug loading degree on the erosion of and the drug release from PEAH implants. Crosslinked Peas were synthesized by photo curing methacrylated star-shaped poly(ε-caprolactone precursors. The model compound propranolol hydrochloride (Mw 296 g/mol) (10–60%, w/w) was mixed in implants by physical mixing before the crosslinking. The mass loss and drug release behaviour were studied in 0.2 M phosphate buffer (pH 7.4, +37 °C). PEAH implants eroded within 28–48 h and the drug loading accelerated the erosion. The results show erosion-controlled drug release from PEAH implants regardless of the drug loading degree.