P18

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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P19

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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P20

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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P21

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.

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P22

A simple gene delivery method for in vitro studies

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Purpose: Optimal conditions for gene delivery are usually unique for each cell type. We have examined the efficiency of gene delivery for several cell lines by using identical reverse transfection plates made in advance. Even very small changes in gene activity can be observed with this method. *Methods*: DNA/carrier complexes were prepared at various charge ratios. Complexes were pipeted on 48-well plates, snap-frozen, freeze-dried and stored until used. The role of single mutation in the tyrosinase gene promoter was measured. *Results*: Similar transfection conditions were optimal for each cell line. A single T/C mutation reproducibly decreased the tyrosinase promoter activity by 50%. *Conclusions*: In reverse transfection, identical plates can be prepared in advance for each cell line. This method was sensitive enough, enabling the study of single nucleotide polymorphism on the gene activity.

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P23

Synthesis of in vitro non-toxic 2,2-bis(methylol)propionic acid (Bis-MPA) dendrimers

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Dendrimers are monodisperse and highly branched synthetic macromolecules which are extremely interesting candidates in various biomedical applications including drug delivery, bio-imaging and tissue repair scaffolds (Lee et al., 2005). In the present study, complex 2,2-bis(methylol)propionic acid (Bis-MPA) dendrimers were synthesized by combining two highly efficient reaction mechanisms: the click reaction and the anhydride esterification reaction (Kolb et al., 2001; Malkoch et al., 2002). These aliphatic and biodegradable dendrimers are perfect structures for the modification of surfaces. For example, mannose end-groups increase water solubility and can interact with specific cell surface receptors. In addition, Bis-MPA dendrimers did not show toxicity at the concentration of 0.4 mg/ml towards cell cultures in vitro as was determined by MTT-test. As a conclusion, Bis-MPA dendrimers have great potential to be utilized in drug and gene/siRNA delivery.

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P24

Effect of chitosan coating on liposomal gene delivery system

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In recent years, liposome–DNA complexes have been the most interesting gene delivery systems. Despite of their advantages to viral vectors, liposomes possess physical stability problems. In this study, initially, liposome formulations bearing pGL2 plasmid DNA molecule were prepared and characterized by means of particle size, zeta potential, phospholipid amount, number of layers, encapsulation volume, vesicle and DNA stability and in vitro release profile of the genetic material. Then, dual coating was applied by means of encapsulation with alginate and chitosan. Alginate-enforced chitosan beads were prepared employing ionotropic gelation method. This approach enhanced the stability of liposomes and transfection efficiency of the naked DNA molecule. The encapsulation process was carried out based on ionotropic gelation and as a result, alginate-enforced chitosan beads containing liposome–DNA complex were prepared. Finally, they were tested for transfection efficiency in mice. Higher transfection efficiency was determined in comparison to naked DNA.

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P25

Biocompatibility of mesoporous silicon microparticles

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Controlled drug-delivery systems (DDSs) are promising applications for human heath care and represent an ever-evolving field for biomedical materials science. Basically, a DDS can be described as a formulation that controls the rate and period of drug delivery and targets specific areas of the body. Mesoporous silicon (PSi) microparticles can be used as DDSs due to their unique physicochemical properties (pores size, surface chemistries, etc.), their ability to improve drug dissolution/solubility, and controlled/sustained drug release. In order to make the application of these mesoporous mate-