

# Nanotechnological Approaches for the Delivery of Biotech Products

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Nanotechnological approaches have an impact on the pharmaceutical sciences in many different ways, e.g. in miniaturization of high through-put screening approaches, of analytical equipment and diagnostic tools. An area where new nanotechnological concepts are highly welcomed and where major progress is being made, is the area of delivery of biotech products.

In order to increase their therapeutic index, potentially potent drugs need delivery devices to be delivered at the right time, right rate, right dose and right site to the patient. Up until now, these delivery systems were in essence rather simple. Examples are liposomal formulations presently marketed for a number of cytostatics and an antifungal drug. Molecular biology provides us with even more challenging delivery problems, e.g. when one considers delivery of oligonucleotides, siRNA or genes. Delivery systems need to have a time controlled release mechanism and homing devices. They may also require membrane penetrating potential to reach their target site.

In this lecture our present efforts in the dept. of Pharmaceutics (profs. Hennink and Storm) to build these sophisticated delivery systems at the nanometer level will be discussed.

## *Targeted delivery of/with proteins and peptides*

The first generation of liposomal systems missed active targeting capacity. Newer generations of liposomes are using peptides and proteins to selectively reach pre-selected areas in the body. Alternative building materials for liposomes are designed as well: Vesicle forming surface active peptides, new 'Stealth' technologies for avoiding uptake by macrophages and non-protein targeting devices via molecular imprinting.

## *Artificial viruses*

Our group embarked on an ambitious programme to build artificial viruses. Based on an analysis of the uptake of viruses into target cells, their transport through the cytoplasm and through the nuclear pores, and the transcription machinery, a nanometer-size system has been designed and is being built.

## *Conclusion*

Nanotechnological approaches are based on self-assembling systems forming a colloidal structure. Work on nanotechnological drug delivery systems started 20+ years ago, but this concept is now maturing at a rapid pace and blooms and booms.....