Therapeutic Nanoparticles as Drug Carriers: Mixed nanoparticles bearing material domains

**Pharmaceutical Technology**

**Fig.1:** Drug nanoparticles for parenteral administration (injection).
The drug (pharma agent, mRNA) in lipid, liposomes or polymer nanoparticles release the drug if the structure is sufficient.

- **Oral nano-drug application (tablets, capsules):** A test was with a simulator device of the gastrointestinal tract with SANS/DLS observation of nanoparticles and improved drug release. The structure-optimized drug-carriers shall improve the application of hydrophobic and difficult drugs (BCS-classes 2-4), food therapy interaction and side effects. A special development was the introduction of a cholesterol-containing FASSIC.

- **At the MLZ (KWS2) and ILL (D11), all samples were investigated by projecting DLS (backscattering NIBS at 170°) in the SANS cuvettes (1 mm Q), immediately after the neutron study.**

- **Time dependent processes in the gastrointestinal fluid system, i.e. stepwise solid drug form disintegration and dissolution** were studied by time resolved xtr-SANS (DLS) with a stopped flow mixing and static sample (MLZ KWS2 and ILL D11); and b) with a constant flow through channel cuvette (200x12x1mm) as position-time resolved xtr-SANS + DLS with a SM-drive (KWS2).

**Fig.2a:** SANS of drug-nanoparticles for oral therapy by deuteron-contrast variation

**Polymer nanoparticles as drug carriers:** PLGA w/o/w double suspension NP, 150nm resemble particles (42%).

**Fig.16:** Therapeutic nanoparticles for parenteral and oral therapy are investigated by SANS + DLS. For tissue and cell targeting the can be coated by a specific protein shell (cell recognition).

**Targeting drug excipients for nanotherapy**

- **Tissue and cell targeting:** Intestinal, cell or tumor recognition and uptake of the drug carrier can be triggered by a surface protein or ligand head (see method sub-page on targeting).

- **The surface protein coating was attached to semi-synthetic lipid (cholesterol) and by deuterium-contrast variation:** magnetic liposomes.

**Polymers for drug carriers:** PLGA w/o/w double suspension NP, 150nm resemble particles (42%).

**PLA polymer particles for oral and radiotherapy**

**DLS:** Deuterium contrast variation.

**PR:** Physical Review (2005) 626-638.

**References:**


**EP 2967702 A1:**  

**Fig.8a:** Therapeutic nanoparticle test and structure investigation by a combination of time resolved neutron scattering and dynamic light scattering (tr-SANS + DLS).

**Fig.8b:** Targeting drug excipients for nanotherapy.

**Fig.8c:** Polymeric nanoparticles as drug carriers. PLGA w/o/w double suspension NP, 150nm resemble particles (42%).