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Polymeric nanoparticles for drug delivery.

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As the most promising drug carriers nowadays, high molecular weight nanoparticles (micelles) from water-soluble polymers are considered, because they have the appropriate size, good solubility in bio-acceptable solutions and biocompatibility.
The focus of the project is on the experimental investigation of drug carriers with the ability to release a drug in tumor cells or tissues. These are therapeutically highly potent polymer-drug conjugates based on the copolymer N-(2-hydroxypropyl) methacrylamide (HPMA) bearing the anticancer drug doxorubicin and a defined amount of hydrophobic moieties (cholesterol and it's derivatives).
We focus on the influestructures of the cholesterol-HPMA linkage and cholesterol itself, their influence on the nanoparticle formation and behavior in solution. All cholesterol-derivatives were bound to HPMA by a pH-sensitive hydrazone bond and differed in the chemical structure in the vicinity of the bond. The hydrazone bond is relatively stable at neutral pH (blood pH), but breaks under mild acidic conditions, such as in the acidic intracellular environment (endosomes in tumor cells) and releases both the drug (doxorubicin) and cholesterol (which then is eliminated from the body).
Using fluorescence correlation spectroscopy, the critical micelle concentration in very dilute solutions (blood simulation) will be determined, using dynamic light scattering, the average size of the nanoparticles and their stability in various environments will be studies, and (time-resolved) small-angle neutron scattering will provide detailed information on the micellar structures (core-shell). Modern model-free methods will be used for the data analysis of these complex systems.

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