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Different targeting possibilities using nanoparticles

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Since many centuries there have been huge challanges in medicine. For example, evolution gave birth to an extremely useful structure: The blood-brain barrier (BBB) that protects our central nervous system homeostasis by shielding off toxic substances and pathogens. But biologically valuable does not always mean pharmacologically welcome. The BBB does not distinguish between friend and foe and causes many potentially effective brain therapeutics to fail *in vivo* - not because of a lack of potency, but because they cannot pass this barrier. This dilemma especially comes into focus for the rapidly growing numbers of neurodegenerative disorders. Another example comes from tumor therapy. The main disadvantages of conventional chemotherapy are modest tumor response and dose limiting side effects because of non-specific action of drugs to all fast proliferating tissues. Both described scenarios are still unsolved problems in modern medicine. However today, we can use the elegant approach of molecular Trojan Horses: the fast-emerging field of nanotechnology offers the possibility to enlarge the pool of substances by packing promising drugs into nanoparticles (NP). NP show a high drug loading efficiency with minor drug leakage as well as the ability to circumvent multi¬drug resistance paired with good storage stability. By this, we can mask the original physicochemical properties of substances and even surface-modify the NP with ligands targeting specific receptors e.g. at the BBB or on cancer cells. The advantages are tempting: Apart from reducing peripheral doses and consequently side effects, drugs can be delivered directly to target structures.

Biography

Sylvia Wagner studied Chemistry at the University Karlsruhe. She did her PhD thesis at the Fraunhofer IBMT, where she is Group Manager of the Preclinical Nanotechnology & Nanotoxicology group since 2008 and Head of Department Bioprocessing & Bioanalytics since 2015. Her main research topics are focused on nanobiotechnology and development of *in vitro/ex vivo* models for preclinical testing of new nanoparticulate formulations and nanosafety issues. For example, formulations for the specific drug targeting (e.g., tumor targeting) as well as for crossing of biological barriers (e.g., blood-brain barrier or gastrointestinal barrier) are mainly on focus.

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