Self-assembled supramolecular nanosysems for smart diagnosis and targeted therapy of intractable diseases

Engineered polymeric nanosystems with smart functions play a key role in nanomedicine as drug carriers, gene vectors, and imaging probes. This presentation focuses present status and future trends of supramolecular nanosystems self-assembled from designed block copolymers for therapy and non-invasive diagnosis of intractable diseases. Most typical example of such nanosystems is polymeric micelle (PM) with distinctive core-shell architecture. Smart functionalities, such as pH- and/or redox potential responding properties, can be integrated into the PM structure. These smart PMs loaded with various chemotherapy reagents were evidenced to have a significant utility in the treatment of intractable and metastatic cancers, including pancreatic cancer, glioblastoma, and tumors harboring recalcitrant cancer stem cells (CSCs). Eventually, five different formulations of the PMs developed in our group have already been in clinical trials world-wide, including Japan, Asia, USA and European countries. PM-based nanosysems hold promise for the treatment of intractable diseases other than cancer. Very recently, we developed PMs decorated with glucose to crossing blood-brain barrier by recognizing glucose-transporter overexpressing on brain endothelial cells, indicating a novel route to deliver versatile drugs into brain for the treatment of neurodegenerative diseases, including Alzheimer’s disease.