Stimuli Responsive Lipid and Biopolymeric Biomaterials for Drug Delivery and Tissue Engineering

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Self assembled biomaterials composed of lipids, biopolymers (based on polysaccharides) and their combinations form promising platforms for stimuli responsive delivery of drugs and for in situ gelling scaffolds for tissue engineering. These biomaterials have the advantages of being natural, FDA approved, biodegradable and showing specific phase changes in response to stimuli. Smart triggered nanoparticles which are pH, temperature, enzyme or ultrasound responsive, cause preferential release of drugs in the presence of such stimuli. The response of the materials can be controlled by internal or external stimuli acting as remote controls to allow release of drugs on demand. For example, nanobubble-nanoparticle complexes act as promising agents for combined ultrasound imaging and therapy. Focussed ultrasound enhances cellular internalisation and cavitation mediated cytotoxicity. Trigger responsive lipid nanovesicles, biopolymerosomes and lipid nanocochleates are some of the advanced technologies optimised for pH dependant responses for anticancer, antibacterial therapy and for oral delivery. Nanovesicle aerosols are another promising lipid biomaterial platform that can be temperature, pH or enzyme responsive and are useful for direct delivery of drugs by inhalation to the respiratory system reaching the distant regions of the alveoli. Further, fluidizing lipid nanovesicles can interact with the packing of the skin lipid barrier transiently allowing enhanced delivery of drugs transdermally. Nanoparticles in *in situ* gelling biopolymers allow temporal and spatial control of release of growth promoting agents within scaffolds for orthopedic applications. The talk will address the scope of stimuli responsive, biodegradable nanomaterials in drug delivery and tissue engineering with emphasis on the cutting edge technologies at the frontier of this interdisciplinary field.