A Nanomedicine Approach for Targeted Thrombolysis

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In thrombo-occlusive vascular pathologies like myocardial infarction and stroke, rapid thrombolysis is necessary for restoring blood flow. To accomplish this, site-targeted delivery and action of thrombolytic drugs can minimize risks of systemic coagulopathy and hemorrhagic side effects. Accordingly, platelet-targeted liposomal nanovehicles that anchor onto thrombus for site-specific delivery have been previously been developed. Building on this work, the current study focused on investigating encapsulation and enzyme-triggered release of a model thrombolytic payload from such thrombus-targeted vehicles. For this, the thrombolytic drug, streptokinase (SK), was encapsulated in the platelet-targeted liposomal construct during the reverse-phase evaporation process of liposome preparation. These particles were filtered to separate unencapsulated drug from the particles and encapsulation efficiency (EE) was assessed using UV-Vis spectrophotometry. EE was found to be 38.25% ± 12.30. The drug-loaded constructs were incubated in the presence of a thrombus-relevant enzyme phospholipase A2 (PLA2) at physiological conditions with the rationale that enzymatic degradation of lipid membrane resulting in destabilization would trigger the release of the encapsulated SK. A statistically significant increase in SK release was observed from the liposomes when triggered by PLA2. These results demonstrate the potential of active platelet-targeted enzyme-triggerable vehicles as a novel nanomedicine technology for site–specific thrombolysis.