

Vascular Nanomedicine: Synthetic Hemostat to Targeted Drug Delivery

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Need

Vascular diseases, including hemorrhage, thrombosis, inflammation and atherosclerosis remain the principal causes of morbidities and mortalities in the US and globally. Current clinical strategies to treat these vascular diseases involve systemic pharmacotherapies such as anti-inflammatory, anti-coagulant and anti-platelet agents, combined with endovascular or surgical procedures. However, these therapies are limited by plasma-induced deactivation, rapid drug washout, as well as, harmful side effects.

To address such limitations, Dr. Anirban Sen Gupta of Case Western Reserve University has developed **nanotechnology-based drug delivery systems that can act selectively at vascular disease sites.**

These targeted therapies are **administered minimally invasively** and can **enhance efficacy** while **reducing harmful side-effects.**

Technology

Platelets are a component of blood whose function is to stop bleeding by clumping and clotting blood vessel injuries. Platelets anchor onto vascular disease sites via molecular interactions to modulate disease progression. These mechanisms have provided the basis for Dr. Sen Gupta's "platelet-inspired nanotechnologies" described below for the treatment and modulation of vascular disease scenarios.

Synthetic Platelets

- to promote hemostasis in the treatment of bleeding (e.g. trauma, surgery, hem/onc).

Platelet-Mimetic Systems

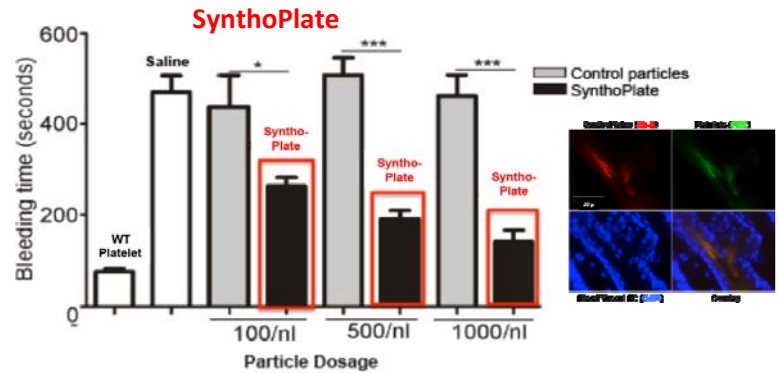
- interact with atherosclerotic and thrombotic sites to deliver anti-inflammatory and clot-busting drugs
- enhance local drug action while minimizing side effects

Bio-Inspired Coating Technologies

- to reduce clotting on blood-contacting devices

Data

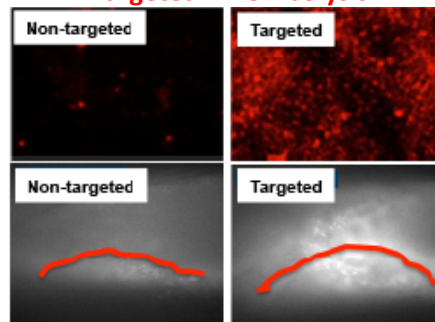
Synthetic Platelets:



Synthetic Platelet (SynthoPlate) particles reduce bleeding in animal models by ~70%, acting similar to natural platelets.

Platelet-Mimetic Systems:

Targeted Thrombolysis



Platelet-inspired targeted drug delivery systems bind to vascular thrombosis sites at significantly high levels. This can be used to deliver drugs and imaging agents site-selectively

Applications

- Synthetic Intravenous Hemostat to Treat Bleeding
- Drug Delivery Systems for Targeted Thrombolysis
- Targeted Molecular Imaging of Vascular Diseases
- Non-thrombogenic Device Coatings

Intellectual Property

- Issued patents US 9,107,963 and US 9,107,845
- Pending U.S. Utility Application 14/826,387

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