

Siemens Competition

Math : Science : Technology

Regional Finalist

Names: Scarlett Guo and Laura Pang

High School: Dougherty Valley High School and Texas Academy of Math and Science

Mentor: Dr. Miriam Rafailovich

Project Title: *Investigating Thrombogenic Properties of Various Polymer Surfaces through Fibrinogen Fiber Formation and Platelet Preferential Binding and Activation (Materials Science/Nanoscience)*

Late stent thrombosis (ST), clot formation after intravascular device implantation, may be lethal. Blood clots are caused by platelets activated on fibrin fiber formed at the injury site, but fibrin is in its inactive form (fibrinogen) and unable to form fibers when no injury exists. The discovery that fibrinogen fibers form on implant surfaces reveals a probable cause of ST. This research aims to create a method to determine surface thrombogenicity, capability of generating clots, and viability of resultant pure fibrinogen fiber in initiating clot formation.

Various polymer surfaces were incubated in fibrinogen and platelets and imaged under optical, atomic force, scanning electron and EVOS microscopes to determine the percentage of surface coated in fibers, fiber conformation, and binding and activation of platelets. We demonstrated that fibers formed on a variety hydrophobic surfaces regardless of the exact degree of hydrophobicity. However, fiber conformation seemed to vary with different surfaces, indicating more complex fibrinogen-polymer interactions than anticipated. The novel discovery that platelets selectively bound to and activated on fibrinogen fibers indicated the polymer surfaces' potential to form clots. Results promised the determination of thrombogenic, clot-causing, properties of polymers and the development of anti-thrombogenic materials for intravascular devices to decrease ST casualties.