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A Mathematical Model of Thrombus Formation Under Flow

To explore how blood flow affects the growth of thrombi (blood clots) and how the growing masses, in turn, feed back and affect flow, we have developed a spatialtemporal mathematical model of platelet deposition and coagulation under flow. The model includes detailed descriptions of coagulation biochemistry, chemical activation and deposition of blood platelets, as well as the two-way interaction between the fluid dynamics and the growing platelet mass. In this talk, I will present the mathematical model and use it to explain what underlies the threshold behavior of the production of an important enzyme within the coagulation system. I will then show how the wall shear rate of flow and a near-wall enhanced platelet concentrations affect the development of growing thrombi. Since we account for the porous nature of thrombi, I am also able to demonstrate how advective and diffusive transport to and within thrombi affects their growth at different stages and spatial locations.