

# ***Colloquium***

Department of Physics, Temple University

## **Applying Magneto-Rheology to Reduce Blood Viscosity, Suppress Turbulence, Prevent Heart Attacks and Strokes**

Prof. Rongjia Tao

Dept. of Physics, Temple University, Philadelphia, PA

Heart attacks and strokes are the leading causes of death. Research indicates one common thread, high blood viscosity, linking all cardiovascular diseases. Turbulence in blood circulation makes different regions of the vasculature vulnerable to development of atherosclerotic plaque. Turbulence is also responsible for systolic ejection murmurs and places heavier workload on heart, a possible trigger of heart attacks. Presently, neither medicine nor method is available to suppress turbulence. The only method to reduce the blood viscosity is to take medicine, such as aspirin, which has strong side effect at high dose. However, using medicine to reduce the blood viscosity does not help suppressing turbulence. In fact, the turbulence gets worse as the Reynolds number goes up with the viscosity reduction by the medicine. Here we report our new discovery: application of a strong magnetic field to blood along its flow direction, red blood cells are polarized in the magnetic field and aggregated into short chains along the flow direction. The blood viscosity becomes anisotropic: Along the flow direction the viscosity is significantly reduced, but in the directions perpendicular to the flow the viscosity is considerably increased. In this way, the blood flow becomes laminar, turbulence is suppressed, the blood circulation is greatly improved, and the risk for heart attacks is reduced. While these effects are not permanent, they last for about 24 hours after one magnetic therapy treatment. In addition to the in vitro tests and animal tests, our preliminary clinical trials fully confirm that the physics of hemodynamics will lead us to a solution to prevent heart attacks and strokes.

**Monday, 3:00-4:00pm, Jan. 29, 2018. SERC, Room 116**