Using magnets to help prevent heart attacks

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If a person's blood becomes too thick it can damage blood vessels and increase the risk of heart attacks. But a Temple University physicist has discovered that he can thin the human blood by subjecting it to a magnetic field.

Rongjia Tao, professor and chair of physics at Temple University, has pioneered the use of electric or magnetic fields to decrease the viscosity of oil in engines and pipelines. Now, he is using the same magnetic fields to thin human blood in the circulation system.

Because red blood cells contain iron, Tao has been able to reduce a person's blood viscosity by 20-30 percent by subjecting it to a magnetic field of 1.3 Telsa (about the same as an MRI) for about one minute.

Tao and his collaborator tested numerous blood samples in a Temple lab and found that the magnetic field polarizes the red blood cells causing them to link together in short chains, streamlining the movement of the blood. Because these chains are larger than the single blood cells, they flow down the center, reducing the friction against the walls of the blood vessels. The combined effects reduce the viscosity of the blood, helping it to flow more freely.

When the magnetic field was taken away, the blood's original viscosity state slowly returned, but over a period of several hours.

"By selecting a suitable magnetic field strength and pulse duration, we will be able to control the size of the aggregated red-cell chains, hence to

control the blood's viscosity," said Tao. "This method of magneto-rheology provides an effective way to control the blood viscosity within a selected range."

Currently, the only method for thinning blood is through drugs such as aspirin; however, these drugs often produce unwanted side effects. Tao said that the magnetic field method is not only safer, it is repeatable. The magnetic fields may be reapplied and the viscosity reduced again. He also added that the viscosity reduction does not affect the red blood cells' normal function.

Tao said that further studies are needed and that he hopes to ultimately develop this technology into an acceptable therapy to prevent heart disease.

Tao and his former graduate student, Ke "Colin" Huang, now a medical physics resident in the Department of Radiation Oncology at the University of Michigan, are publishing their findings in the journal, *Physical Review E.*

Provided by Temple University