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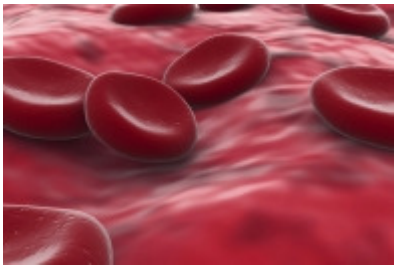
When Blood Flows Faster

Cells in blood vessels cling as blood flow speeds



When blood is flowing rapidly, scientists have found that cells cling together tightly, reducing vascular leaks. The discovery could become a consideration in heart surgery or influence drugs to treat high cholesterol.

Researchers already knew that arteries carrying slow-flowing blood are more prone to leaking and build up, but they previously suspected that the reason behind it was biochemical-based.

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Nathan Sniadecki, lead author and a University of Washington assistant professor of mechanical engineering, said the findings indicate that the cells can sense the speed of flow they are in and structurally change how they hold themselves together.

He said the discovery highlights the role of cellular force in the progression of heart disease.

Sniadecki explained that the mechanical force leads to a biochemical change that allows a greater number of proteins at the membrane to glue together. He said they are still working to understand how the mechanical tugging leads the proteins to huddle and glue together.

During the study investigators grew a patch of human endothelial cells, the thin layer of cells that line the inner walls of arteries and veins and act as a nonstick coating for the vessels' walls.

The tiny patch was grown in an area about the width of a human hair with rows of flexible silicon posts.

Researchers then observed how much the posts were bent by the cells under various flow conditions, which allowed them to calculate the strength of the tug. They found that when the flow was fast, the force between the cells increased, while the gaps between cells was reduced.

Investigators have suggested the finding could be useful in cardiology, particularly in pre-planning and guiding cardiovascular operations.

"People could do simulations so a surgeon goes, 'Ah, I should cut here versus over here, because that reconstruction will be a smoother vessel and will lead to fewer complications down the line, or as I put this stent in, put it here and make it more aerodynamic in design,'" Sniadecki said.

The research will be published in an upcoming issue of the American Journal of Physiology's *Heart and Circulatory Physiology*.

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