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Arteries from distinct regions of the body have unique immune functions

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Human arteries play distinct roles in the immune system depending on their anatomical location, researchers at Emory University School of Medicine have discovered.

Their findings explain why vascular diseases affect different parts of the arterial network and could help doctors fine-tune the treatment of such diseases as atherosclerosis and vasculitis. Atherosclerosis causes heart attacks and strokes because it occurs preferentially in arteries supplying the heart and the brain.

The results were published online this week by the journal *Circulation*.

Arteries can play an active role in sensing foreign invasion and bodily injury, because cells embedded in the arterial walls called dendritic cells act like smoke-sensing fire alarms for the immune system, says senior author Cornelia Weyand, MD. PhD, co-director of the Kathleen B. and Mason I. Lowance Center for Human Immunology at Emory University.

"All of our major arteries have this alarm system," she says. "To our surprise, we found that the arteries of the neck, the arms, the abdomen and the legs are triggered by different infectious organisms. Thus, each artery functions in a specialized way."

Some vascular diseases attack arteries only in the abdomen or in the neck and upper extremities, and this selectivity has puzzled doctors for years, Weyand says.

To probe the differences among arteries, Weyand and her co-workers examined the activity of genes that encode Toll-like receptors in blood vessels from human donors.

Toll-like receptors are a cornerstone of the "innate" immune system, which can be activated by common features of infection-causing invaders. The capture of bacterial or viral fragments through Toll-like receptors alerts the immune system early during an infectious attack. Toll-like receptors can respond to whip-like antennas on bacteria called flagellae, parts of bacterial cell walls, or DNA and RNA that leaks from viruses or bacteria.

Each type of artery had a different set of Toll-like receptor genes turned on, the authors found. In contrast to arteries, veins could not be stimulated through Toll-like receptors.

For example, cells in the iliac arteries, located in the vicinity of the gut, respond avidly to flagellae but cells from the subclavian arteries, which transport blood to the upper body, do not.

A possible explanation is that dendritic cells from iliac arteries are better able to sense flagellae because of the abundant bacterial flora that inhabits the gut, Weyand says.

Weyand hypothesizes that the dendritic cells in arteries are mainly performing a protective, calming function. Arteries are in constant contact with blood borne infectious agents, with potentially dangerous consequences of damaging the vessel wall.

"It's when that protective function breaks down that we see inflammation and various vascular diseases," she says.

She says her team is now investigating how the dendritic cells in arteries

move and change as they receive various signals.

Source: Emory University