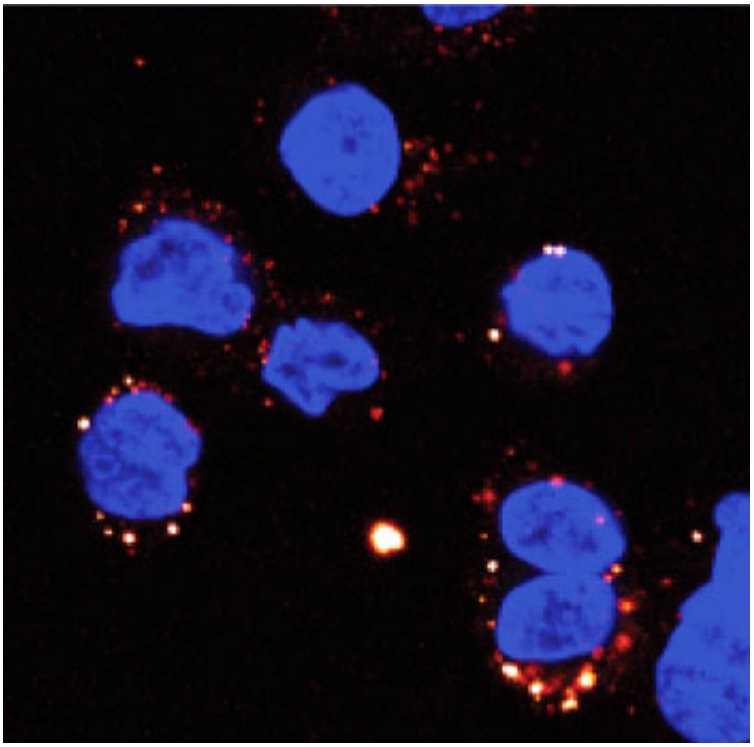
Researchers uncover new mode of cardiovascular communication

May 14 2015, by Katie Babcock



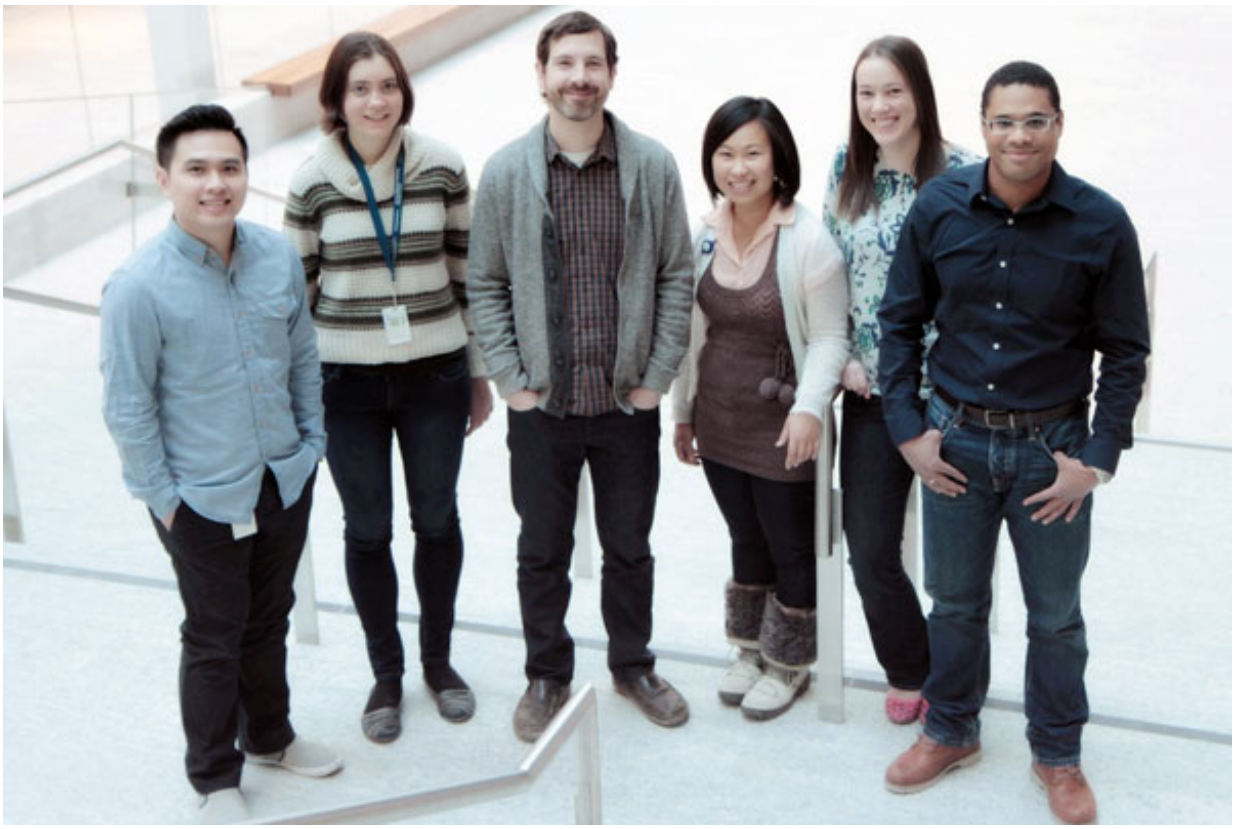
Scientists have found that blood vessel cells have a deeper level of communication than previously believed – a discovery that could lead to new diagnostics and more targeted treatment for cardiovascular disease.

Research led by Professor Jason Fish of the University of Toronto reveals that healthy cells that line blood vessel walls, called endothelial

cells, constantly send out tiny capsules into the blood that contain microRNAs. MicroRNAs are small pieces of genetic information that contain instructions on how cells should behave. These instructions are delivered to monocytes, key cells responsible for inflammation and cardiovascular disease, and dampen their inflammatory properties.

"We know that different parts of the body communicate with hormones, but our recent findings suggest that cells are transferring genetic information, affecting the way other cells behave," said Fish, a professor in U of T's department of laboratory medicine and pathobiology, and a scientist at the Toronto General Research Institute. "It seems that healthy endothelial cells saturate the blood with protective microRNAs that are taken up by monocytes to keep inflammation under control."

To see if these cells were communicating with one another through the capsules, Fish placed endothelial cells and monocytes in the same container separated by a porous membrane. He then labelled the endothelial cells with fluorescent markers and discovered that the capsules transferred these markers to the monocytes (see image at right).



Researchers from the Fish lab, from left: Henry Cheng, Nadiya Khyzha, Professor Jason Fish, Lan Dang, Emilie Boudreau and Sebastien Njock

In addition, the microRNAs in the capsule turned off an inflammatory switch in the monocytes and kept inflammation under control.

The findings were recently published in the scientific journal *Blood*.

Next the team will study microRNA communication in diseased blood vessels. Fish believes that when endothelial cells are unhealthy they may lose their ability to send out the tiny regulating capsules, allowing monocytes to become overactive, leading to chronic inflammation and cardiovascular disease.

"Now we're interested in looking at diseases associated with chronic cardiovascular inflammation and trying to figure out what's going wrong," said Fish. "We're wondering if there's something different about the way the cells are communicating—perhaps the cells are transferring different types of microRNAs or maybe the signal isn't transferred at all."

The discovery of this new level of communication could lead to better ways of delivering treatment for cardiovascular diseases.

"We could potentially use these capsules to deliver any microRNA and directly target disease-causing cells," said Fish. "For example, if we find that anti-inflammatory microRNAs are missing in chronic cardiovascular disease, we could add them back into the capsules and reprogram the cells to stop inflammation."

Beyond cardiovascular disease, the impact of this discovery extends to other diseases.

"Other researchers are studying how tumour cells communicate with endothelial cells, and we're interested in studying diabetes and atherosclerosis or hardening of the arteries. This new area of research is really exciting, and understanding how endothelial cells are talking to other cells will hopefully lead to new treatments for a broad range of diseases."

More information: "Endothelial cells suppress monocyte activation through secretion of extracellular vesicles containing anti-inflammatory microRNAs" *Blood* Jan 2015, DOI: 10.1182/blood-2014-11-611046

Provided by University of Toronto