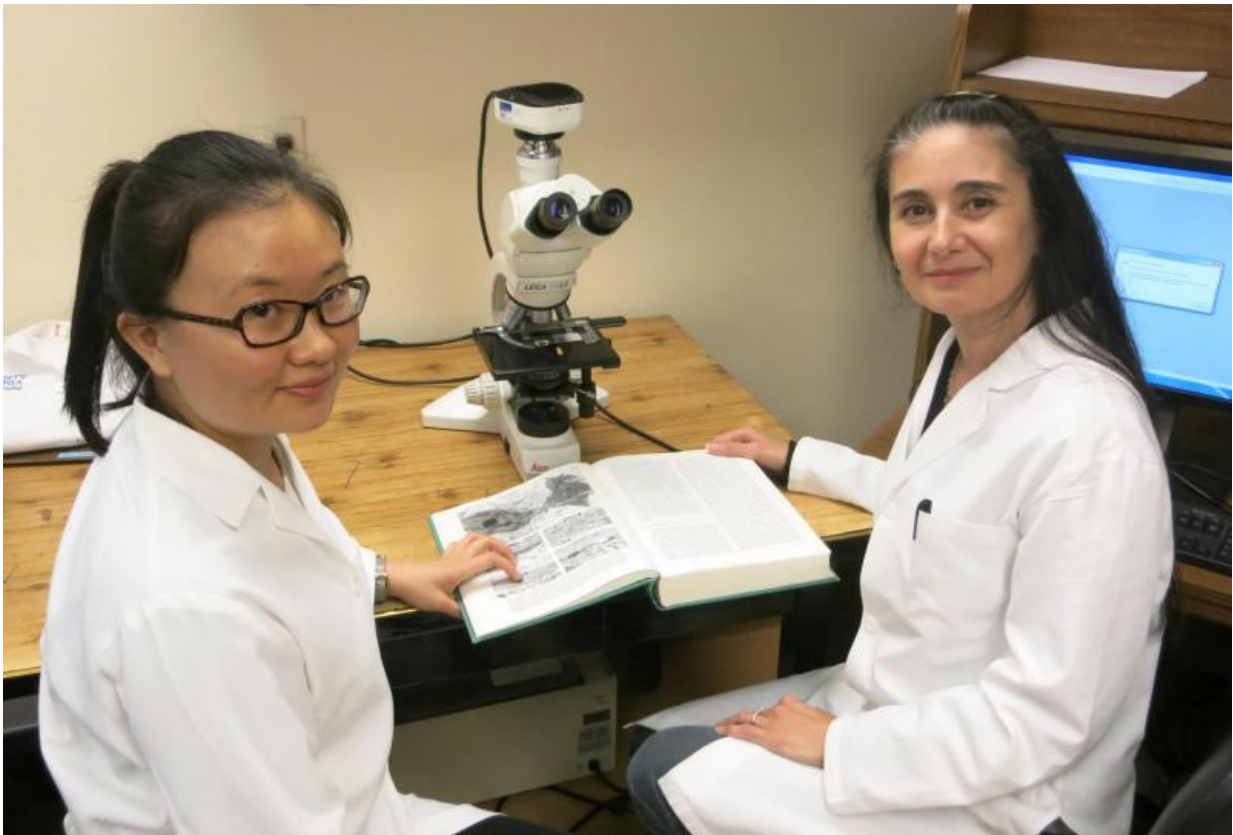


Vessel discovery a major step toward growing kidneys

December 16 2015



University of Virginia School of Medicine researchers Yan Hu (left), a graduate student, and Maria Luisa S. Sequeira-Lopez, M.D., have identified the cells that give rise to the blood vessels in the kidney -- a finding crucial to the effort to grow replacement kidneys. Credit: Josh Barney | University of Virginia Health System

In a significant step toward growing replacement kidneys, researchers at the University of Virginia School of Medicine have identified the cells that give rise to the blood vessels within the kidney. It's a discovery of critical importance, as efforts to grow kidneys have long been frustrated by the inability to create the vasculature necessary for a functional organ.

The researchers also made the surprising finding that when the vessels are created, so is the [blood](#) that fills them. Until now, scientists had not known that the kidney was a blood-generating organ. Blood generation occurs within the kidney in fish, but this is a notable discovery in mammals.

Obstacles to Growing Kidneys

Researchers have long been able to grow [kidney tissue](#) in a lab dish, successfully forming various components of the organ. But they have been unable to create the vessels that carry life-giving blood. Without that, there's no hope of creating a functional organ. But by identifying the stem cells that develop into the vessels, UVA's Maria Luisa S. Sequeira-Lopez, MD, and her team have given scientists a target to manipulate so that one day they may be able to grow complete organs. By understanding the natural development of the vessels, they can seek to reproduce and control it.

"We are very interested in knowing how the kidney vasculature develops. It's crucial. You cannot have a kidney without its vasculature," said Sequeira-Lopez, of the Department of Pediatrics and UVA's Child Health Research Center. "It's very easy to grow in culture the tubular part of the kidney but not the vessels. This will be key, will be crucial, if we are thinking of replacement therapy or making a functioning kidney in the future from cells from a patient. If we don't understand how the normal vasculature develops, we cannot reproduce or force cells to make it."

Sequeira-Lopez previously identified the cells that form the outer layer of the vessels; in her new discovery, she and her team identify the cells that form the inner layer. In addition, researcher Yan Hu noted, they identified an important molecule that regulates the development of the kidney vasculature.

"We finally found the precursor to these cells, so the next step is to determine the controllers," said Hu, a graduate student.

Blood Formation in the Kidney

As they were doing their work, Sequeira-Lopez and Hu noted something very unusual about the formation of the [vessels](#) in the kidney: As they formed, so did the blood they contained.

"A characteristic of this new precursor that we found is that it can also make [blood cells](#). It not only makes the endothelial layer, the inner layer of the vessel, but it makes blood," Sequeira-Lopez said. "So at the time you make a new blood vessel, it's not that it's empty, but it has its content in it - the blood [cells](#) are inside."

Hu noted how surprising this discovery was: "Rarely do researchers find this phenomenon in organs, and for the first time we identify this phenomenon in the developing [kidney](#)," she said.

Findings Published

The findings have been published online by the *Journal of the American Society of Nephrology*. The article was written by Hu, Minghong Li, Joachim R. Göthert, R. Ariel Gomez and Sequeira-Lopez.

Provided by University of Virginia

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