Smooth muscle cells created from patients' skin cells

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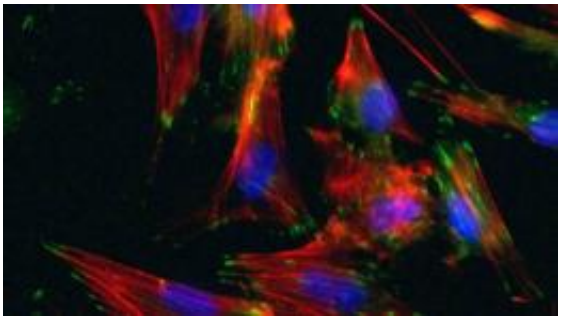

Smooth muscle cells. Credit: Dr Sanjay Sinha

(PhysOrg.com) -- Scientists have created cells which make up the walls of blood vessels; research could lead to new treatments and better screening for cardiovascular disease.

Cambridge scientists have for the first time created different types of vascular smooth muscle cells (SMCs) – the cells which make up the walls of blood vessels – using cells from patients' skin. Their research, which was partly funded by the Wellcome Trust, is published yesterday, 15 January, in the journal *Nature Biotechnology*.

In the UK, one in three of all deaths is due to cardiovascular disease. The vast majority of these are caused by atherosclerosis, a 'furring up' and blockage of blood vessels. For patients who are unsuitable for conventional stenting or bypass treatment, one option in the future may

be to grow new blood vessels to bypass their own blocked vessels.

Lead author of the research, Dr Sanjay Sinha, Wellcome Trust Intermediate Clinical Fellow at the University of Cambridge said: "This research represents an important step in being able to generate the right kind of smooth muscle cells to help construct these new blood vessels. Other patients who may benefit from new blood vessels include those with renal failure, who need vascular grafts for dialysis."

For the research, the scientists used embryonic stem cells, (or similar cells derived from a patient's skin sample) which have the potential to form any cell type in the body, known as human pluripotent stem cells (hPSCs). Using hPSCs, they discovered a method for creating high purity vascular smooth muscle. Although blood and cardiac cells from hPSCs have been created before, this is the first time that all the major types of vascular smooth muscle cells have been developed and done so in a system which would be easy to scale up for clinical-grade production.

Vascular smooth muscle cells originate from different tissues in the early embryo, and the scientists were able to reproduce three distinct types of embryonic tissue in the culture dish. Interestingly, these SMCs responded differently to vascular disease causing substances, such as growth factors, depending on which embryonic pathway they had come from. They conclude that differences in embryonic origin may play a part in determining where and when common vascular diseases such as aortic aneurysms or atherosclerosis develop.

Dr Sinha added: "Using this system, we can begin to understand how SMC origin affects development of vascular disease and why some parts of the vasculature are protected from disease.

"Additionally, there are many patients who have a genetic disorder, such

as Marfans Syndrome, that affects their vascular smooth muscle cells and leads to premature death and disability. With this research, and using hPSCs generated from patient skin samples, we will be able to generate smooth muscle cells with the genetic abnormality in a culture dish. This type of 'disease in a dish' modelling will allow us to understand the disease better and will allow us to screen for new treatments."

Provided by University of Cambridge