

First volunteers to receive blood cultured from stem cells in 2016

April 15 2014, by Stuart Forsyth

The first human volunteer will receive red blood cells cultured in the laboratory within the next three years, as part of a long-term research programme funded by the Wellcome Trust.

The £5 million Strategic Award was granted to a consortium led by the Scottish National Blood Service (SNBTS) and will follow on from previous research which proved red [blood cells](#) could be generated from [stem cells](#).

The consortium includes the Universities of Glasgow, Edinburgh and Loughborough, NHS Blood and Transplant, the Irish Blood Transfusion Service, Roslin Cells Ltd, the Cell Therapy Catapult and in collaboration with the Universities of Bristol and Cambridge.

The consortium will be using [pluripotent stem cells](#) which are able to form any other cell in the body. The team will guide these cells in the lab to multiply and become fresh red blood cells for use in humans with the hope of making the process scalable for manufacture on a commercial scale. The team hopes to start the first in-man trial by late 2016.

Dr Joanne Mountford, an experimental haematologist who is leading the basic science research at Glasgow said: "There are many hurdles to overcome in the process of turning a stem cell into a useful red blood cell, and even more challenges we face in trying to ramp-up production to an industrial scale.

"We must first make the stem cells become a mesoderm – one of the body layers that makes things like muscle, bone and blood – and then get it to turn into blood cells. Then we have to make it develop into a red blood cell specifically and finally make it eject its nuclei and mature properly.

"Every single bag of transfused blood has about two trillion red blood cells in it. It's a ludicrously high number to make in the lab. We use two million of those bags every year in the UK alone. Ensuring that any industrially produced blood can be made economically viable is quite a task."

Blood transfusions play a critical role in current clinical practice, with over 90 million [red blood cell](#) transfusions taking place each year worldwide.

Transfusions are currently made possible by blood donation programmes, but supplies are insufficient in many countries globally. Blood donations also bring a range of challenges with them including the risk of transmitting infections, the potential for incompatibility with the recipient's immune system and overloading of iron levels.

The use of cultured red blood cells in transfusions could avoid these risks and provide fresh, younger, cells which may have a clinical advantage by surviving longer and performing better.

Professor Marc Turner, Principal Investigator, said: "Producing a cellular therapy which is of the scale, quality and safety required for human clinical trials is a very significant challenge, but if we can achieve success with this first in-man clinical study it will be an important step forward to enable populations all over the world to benefit from blood transfusions. These developments will also provide information of value to other researchers working on the development of cellular therapies."

Dr Ted Bianco, Director of Technology Transfer at the Wellcome Trust, said: "Harnessing the power of stem cell biology to contribute to healthcare is one of the most exciting opportunities we can expect to see reach fruition in the coming years. But one should not underestimate the challenge of translating the science into routine procedures for the clinic. Nowhere is this more apparent than in the challenge Professor Turner and colleagues have set out to address, which is to replace the human blood donor as the source of supply for life-saving transfusions, knowing that each unit of blood contains no less than a trillion red cells".

Before clinical trials can begin the cultured cells will have to be manufactured at very high grade and be approved by UK Regulatory Authorities.

Provided by University of Glasgow

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