Breakthrough paves the way for artificial blood

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Patients could be given blood transfusions and bone marrow grafts cultivated from their own cells after scientists cracked the early stages of this difficult process.

Two teams of biologists have found a way to make the common ancestors of blood cells. The development may pave the way for doctors to brew batches of artificial blood.

Their research, published in the journal *Nature*, also raises the possibility that leukaemia patients could receive safe bone marrow transplants grown from cells in the lining of their own blood vessels.

The breakthrough revolves around a kind of self-renewing master cell that can give rise to all the basic components of the bloodstream, as well as the ground troops of the immune system.

In theory, only one haematopoietic stem cell (HSC) could be used to regenerate a person's entire blood system.

Scientists have been trying for two decades to manufacture these cells from more basic types of stem cell. A group led by George Daley, dean of Harvard University's faculty of medicine, appears finally to have overcome this considerable technical challenge.

The researchers used an array of chemical signals to turn human cells into pluripotent stem cells, which can form almost any kind of tissue in the body. These were then coaxed into becoming a mixture that included HSCs by inserting compounds known as transcription factors, which alter the work of genes but leave underlying DNA untouched.

When this soup of cells was injected into mice, it produced almost the complete set of human blood cells, which turned out to be capable of a human immune response after the mice were vaccinated.

Ryohichi Sugimura, one of Professor Daley's colleagues and lead author of the paper, said: "This step opens up an opportunity to take cells from patients with genetic blood disorders, use gene editing to correct their genetic defect and make functional blood cells.

"This also gives us the potential to have a limitless supply of blood stem cells and blood by taking cells from universal donors. This could potentially augment the bloody supply for patients who need transfusions."

Bertie Göttgens and Carolina Guibentif, of the University of Cambridge, who were not involved in the research, said in an accompanying article that the method held enormous promise for a range of new types of medicine.

They noted, however, that there were important unanswered questions, including whether the blood stem cells could become cancerous. While one team found no evidence of this happening in their cell cultures, scientists will want longer-term evidence that the method is safe to use in animals and humans.

Times 18.5.17