Researchers succeed in multiplying blood cells in the lab

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A team from the Institute for Research in Immunology and Cancer (IRIC) at Université de Montréal has succeeded in producing a large quantity of laboratory stem cells from a small number of blood stem cells obtained from bone marrow. The multidisciplinary team, directed by Dr. Guy Sauvageau, thus took a giant step towards the development of a revolutionary treatment based on these stem cells. This worldwide first will advance stem cell research and could have major implications in several fields for which no treatment currently exists.

Every year in North America, nearly 4,000 people wait in vain for a bone marrow transplant due to the lack of compatible donors. It is known that a bone marrow stem cell transplant can reconstitute the recipient's bone marrow. The main difficulty is to obtain a sufficient number of compatible stem cells. Thanks to Dr. Sauvageau and his team, these patients will be able to obtain new bone marrow within the next few years. "It could be possible to envision transplants for all adults from existing umbilical cord blood banks. The stem cell content of these blood banks is currently too limited for large-scale use in adults," Dr. Sauvageau affirmed.

Organ transplants without side effects: the medicine of the future?

Currently, transplant recipients are condemned to take medications against rejection of the transplanted organ and suffer the side effects for

the rest of their lives. However, "mouse studies exist, showing that bone marrow stem cells can prevent the rejection typically directed against solid organs," Dr. Sauvageau said.

Rejection occurs because the immune system cells manufactured by bone marrow attack the transplanted organ as if it were an invader. By extrapolation from laboratory studies, it is very likely that transplanting hematopoietic stem cells collected from the organ donor and developed in the laboratory could avoid rejection of this organ. This is why it is important to have large quantities of hematopoietic stem cells, so that compatible stem cells can be matched with the organ to be transplanted.

Using proteins to multiply stem cells

To produce large quantities of hematopoietic stem cells in the laboratory, Dr. Sauvageau's team identified 10 proteins out of 700 candidates. These 10 proteins are naturally present in hematopoietic stem cells and researchers can use each of them to force these cells to multiply in the laboratory. "The next step is to verify whether this also works in humans. Everything is already in place," Guy Sauvageau pointed out. These tests will be conducted at Montreal's Maisonneuve-Rosemont Hospital, one of the leading centres in Canada where stem cell transplants are performed. "If only one of the ten proteins allows hematopoietic stem cells to be multiplied in humans, we will be able to obtain the quantities of cells necessary to perform transplants. It will then be possible to say "mission accomplished"."

Researchers around the world are currently trying to harness the regenerative power of other types of stem cells to treat diseases such as Alzheimer's or diabetes. IRIC's research could also help them achieve their goal.

The work of Dr. Sauvageau's team has been funded by the Canadian

Institutes of Health Research and the findings are being published today in the prestigious scientific journal *Cell*.

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