Canadian first: Creating patient-specific nerve cells from blood

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Canadian scientists say they have figured out a way to turn regular human blood cells into nerve cells, an achievement that could lead to new advances for those suffering chronic pain or nerve diseases.

Stem cell researchers from McMaster University in Hamilton, Ont. say they have learned how to convert cells from blood into both central nervous system neural cells -- which are the neurons in the brain and spinal cord -- as well as cells from the peripheral nervous system, which are the nerves in the rest of the body that are responsible for sensing pain, heat and itches.

The research was led by Mick Bhatia, director of McMaster's Stem Cell and Cancer Research Institute, who says, at first, his team couldn't believe that their method had worked.

"Neural cells have a very distinct shape, but we thought we had done something wrong to the cells. They were behaving differently to make them elongate, moving from a round shape to a very long stretched-out shape," he told CTV News.

But after repeating the procedure several times over several months, they realized that they had achieved a first.

The idea of using stem cells to convert one kind of a cell into another isn't new, as other research teams have already been able to turn skin cells into blood cells, for example. But no one has ever been able to create central nervous system neural cells and peripheral nervous system neural cells, "which are very, very complex," Bhatia says.

"No one has ever done this with adult blood to make this repertoire of neural cells," Bhatia said.

The hope is that one day, doctors would be able to take a blood sample from a patient and quickly produce a million sensory and central nervous system cells, Bhaita says, noting that it doesn't take a lot of blood to produce a lot of neural cells.

Researchers could then study those cells to better understand why certain people feel pain or why others, such as diabetics, experience numbness.

It could also pave the way for the discovery of new pain medications that would specifically target neural cells, rather than just block the perception of pain.

"Pain is really poorly understood right now, and the drugs available are not well characterized," Bhatia said. "Most are narcotics and opioids that are addictive and they're not very specific to the cells you're trying to target."

The ideal drug that could come out of this discovery would target peripheral nervous system neurons and have no effect on the central nervous system. That could help avoid many of side effects of current pain medications, such as drowsiness and "brain fog."

Bhatia says they decided to try to create neural cells because they are currently so difficult to obtain.

Skin cells, blood cells or tissue samples can be easily harvested and grown into larger samples in a lab, but it's not as easy to take a piece of someone's neural system because it runs like complex wiring throughout the body.

“This gives you access to cells you couldn’t otherwise obtain. You can’t take cells from a brain and spinal cord or the peripheral nervous system and then expand them in a dish and transplant them back in," he said.

What's great about blood, Bhatia says, is that it is easily accessible, it regenerates on its own, and the resulting cells would be personalized.

"And so with this technology, blood could become a building block for neural cells," he said.

Bhatia says while they have been working quietly on their discovery for some time, they are now showing it to the world in a paper published online and featured on the cover of the journal Cell Reports.

"We know this is something that people want -- scientists, people in industry want to be able to large amount of patient-specific cells. There just hasn't been the technology,” he said.

Now, he's excited about what is to come.

"We know there are many groups trying to come up with ways to generate these cells all over the world, so we are anxiously waiting their reaction when they see the paper and get detailed knowledge of what we've done," he said.