Life is a continuous journey of transformation?

Scientists from the United States have identified stem cells in urine that can be directed to get transformed into multiple cell types. These cells can be obtained through a simple non-invasive, low-cost approach that avoids the surgical procedures. Dr. Zhangs and his team successfully directed stem cells from urine to get transformed into bladder type cells such as smooth muscle cells and endothelial cells, the cells that line the bladder. The urine-derived cells can also form bone, cartilage, fat, skeletal muscle, nerve, and endothelial cells, which line the blood vessels. The multipotency of these cells suggests their use in various therapies. For this, the use of patient's own stem cells for therapy is considered advantageous as they do not induce immune responses or rejection.

The present study builds its basis on the platform of earlier studies confirming the multipotency of the cells, in addition to the research which found that unlike iPSC (Induced Pluripotent Stem Cells) cells or embryonic stem cells, the urine-derived stem cells do not form tumors when implanted in the body, indicating that they may be safe for use in patients. The scientists obtained urine samples from 17 healthy individuals ranging in age from 5 to 75 years. Then they evaluated the cells' ability to transform into multiple cell types. The cells differentiated into the three tissue layers (ectoderm, mesoderm, and endoderm), which are the hallmarks of true stem cells, and also differentiated into the specific cell types. The scientists then placed the cells that had differentiated into the smooth muscle cell type and endothelial cell type into scaffolds made of pig intestine. When implanted in mice for 1 month, the cells formed multilayered tissue-like structures.

The urine-derived stem cells have markers of mesenchymal cells, which are the adult stem cells from connective tissue such as bone marrow. They also have markers for pericytes, a subset of mesenchymal cells found in small blood vessels. Where do the cells come from? Researchers suspect that the cells originate from the upper urinary tract, including the kidney.

Can we anticipate that in the near future, urine sample can grow a new tooth? This is exactly what Chinese researchers are up to. Using cells generated from urine, researchers have

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found a way to isolate important stem cell subsets, implant them into the jaw line, and generate structures similar to human teeth. Stem cells from urine are on the verge of becoming the new building blocks for tooth implants, as dentists may one day be able to seed the new tooth growths in the jaws of patients who need transplants.

Teeth generated from urine involve a growth process that takes about 3 weeks. The science behind this is still in its infancy stages though, as the "tooth structures" only resemble real teeth. According to the researchers at the Guangzhou Institutes of Biomedicine and Health, human urine pluripotent stem cells (iPSCs) can be used to create different cell types that mimic tooth components such as dentin, enamel, cementum, and pulp, but the strength of these teeth is far from the strength of normal, healthy teeth.

The results of their latest research, published in the journal *Cell Regeneration*, explain how the researchers transplanted urine stem cells into mice, effectively growing teeth, similar to human teeth, in their jaws. The major setback they faced was that they were only able to generate teeth of strength about a third of regular human teeth. On top of that, they had only about a 30% success rate.

For the experiment to be more successful in human beings, they believe in using stem cells of patient's own urine. By using a patient's own stem cells, there may be a lesser chance that the patient's body would reject the implanted cells. Stem cells have offered much hope by promising to greatly extend the numbers and range of patients who could benefit from transplants and to provide cell replacement therapy to treat debilitating diseases such as diabetes, Parkinson's, and Huntington's disease. The issue of stem cell research is challenged the world over and promoting biologists to begin engaging in ethical debates and generating an unusually high level of interest in this aspect of biology in the general public. But excitement notwithstanding, there is a long way to go in basic research before new therapies will be established and

now the pressure is on for scientists and clinicians to deliver the best for the betterment of human beings.

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