

Kidney disease: how could stem cells help?

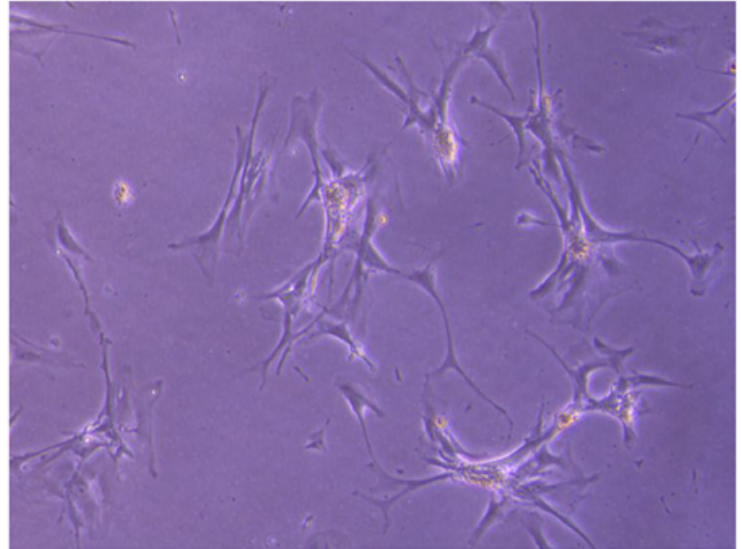
What do we know?

Our kidneys help establish the correct balance of salts and minerals in our blood. They also filter out toxins and generate several important hormones. Nephrons are the key working components of the kidney.

Kidney diseases are caused by damage to nephrons, which can be sudden and short lived (acute kidney disease) or slow and progressive (chronic kidney disease).

Chronic kidney disease can lead to kidney failure, which is fatal unless treated by blood dialysis or a kidney transplant.

Researchers are studying how stem cells might help kidneys to repair damaged nephrons and restore kidney function.



Possible kidney stem cells, growing in the lab.

Photo: Brigitte Wieles, STELLAR

What are researchers investigating?

Scientists are studying how the kidney can regenerate itself and what types of kidney cells are involved in this process.

It is still not clear which type of cells are involved in kidney regeneration. There are several groups of cells around nephrons that have 'stem cell like' characteristics. One type is called Renal Progenitor Cells (RPC), Another group has features similar to mesenchymal stem cells (MSCs), cells typically found in bone marrow.

Scientists are also using induced pluripotent stem cells (iPSCs) to produce 3D nephron-like structures that are being used to study how kidneys form in embryos as well as develop and test new drugs and therapies. Eventually it may be possible to use these cells to create new nephrons in damaged kidneys.

What are the challenges?

Studying kidney development, kidney disease and the natural repair process is very difficult because of the complex structures and large diversity of cells in a kidney.

Kidney diseases can be caused by damage to different types of cells in the kidney. Stem cell treatments will only be effective if they consider which cells are damaged and must be replaced.

Cell treatments that promote natural repair pathways could happen sooner than cell replacement therapies, but researchers still need a better understanding of how the natural repair processes works before treatments can be developed.