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Stem cell-based strategies for whole kidney regeneration

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Chronic kidney diseases affect thousands of people worldwide and the final consequence is a Renal Failure (RF) becoming an extremely important public health issue, haemodialysis alleviates the situation by filtering the patient's blood, but it does not replace other kidney functions such as hormone release or homeostasis regulation. Transplantation of donor organs is the ultimate treatment for patients suffering from end-stage renal failure. Chronic kidney disease is a state of endothelial dysfunction, accelerated progression of atherosclerosis and high cardiovascular risk. As a consequence, cardiovascular disorders are the main cause of death in End-Stage Renal Disease (ESRD). Actually, seeking for novel therapies, Kidney regeneration is a challenging but promising strategy aimed at reducing the progression to End-Stage Renal Disease (ESRD) and improving the quality of life of patients with ESRD. Adult stem cells are multipotent stem cells that reside in various tissues, such as bone marrow and adipose tissue. Nowadays, there is growing evidence indicating that, under pathophysiological conditions, Stem Cells (SCs) derived from adipose tissue are able to migrate in the injured kidney, and they seem to play a role in glomerular and tubular regeneration. Moreover, adipose derivate stem cells to promote structural and functional repair, including hematopoietic stem cells and mesenchymal stem cells can also participate in the repair process by proliferation and differentiation into renal lineages. Mesenchymal SCs have been shown to decrease inflammation and enhance renal regeneration.

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