

# Renal Stem Cells Transplantation in Autosomal Recessive Polycystic Kidney Disease; a Visible Science Fiction

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## Introduction

Autosomal recessive polycystic kidney disease (ARPKD) is a developmental disease that affects 1 in 10000- 40000 live births worldwide. It manifests in the form of disturbed cellular proliferation/apoptosis that affects the epithelium of the renal collecting ducts and the biliary ducts. Disturbed cellular polarity plays a major role in the disease development, rendering the cyst epithelium secretory rather than absorptive [1]. The main molecular changes of ARPKD are loss-of function mutations of Fibrocystin, defective Focal Adhesion Kinase (FAK) activation, and defective  $\beta 1$  Na<sup>+</sup>/K<sup>+</sup> ATPase expression [2].

Stem cell therapy could shine as a therapeutic hope, but which and how?

There are 3 types of stem cells;

- Embryonic stem cells, which are derived from the inner cell mass of blastocyst and have the ability to differentiate into cell types of all three germ lineages, but carry high risk of teratoma [3].

- Induced pluripotent stem cells, which are similar to the embryonic stem cells in the ability to differentiate into cell types of all three germ lineages and the risk of teratoma, but are derived from the somatic cells [3].

Both cell types have high degree of proliferation, self-renewal ability and grow indefinitely.

- Somatic stem cells can be isolated from the adult tissue, are multipotent, with limited self-renewal capacity and limited life span, but with no teratoma risk [3].

In ARPKD, which is a genetic developmental disease, autotransplantation of stem cells would not help because the underlying Fibrocystin mutations are expected to be present in the stem cells. In addition, the infantile age of the patients may potentiate the teratoma risk of pluripotent stem cells. Accordingly, somatic stem cells seem to be of choice, but they can differentiate into limited cell types depending on the tissue of origin.

Renal stem cells have been successfully isolated, which are spindle-shaped, capable of self-renewal for >200 population doublings with normal karyotype and DNA analysis. They were found to express vimentin, CD90 (thy1.1), Pax -2, and Oct4 but not cytokeratin, MHC class I or II, or other markers of more differentiated cells [4]. These cells have the ability to differentiate into renal tissue and lack surface molecules essential for the stimulation of the immune system, which renders the possibility of allografting from healthy individuals applicable [4].

## Future Hope

The renal stem cells might be isolated from a single or multiple donors through guided renal biopsies, where the renal biopsy could be partially digested by collagenase to obtain cellular suspensions that could be treated and cultured as described by Gupta et al. [4]. The stem cells could be then transplanted and introduced through the renal artery, with the hope of the successful slowdown, stop and or reversal of the cystic formation. Repetition of the procedure at frequent intervals might have a more positive impact, if the intra-renal administration could be developed in a relatively less invasive and more efficient intervention.

## References

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