

Method for Engineering Functional 3-Dimensional Kidney Tissue

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BACKGROUND

End stage renal disease (ESRD) affects approximately 400,000 individuals in the United States alone, and this number continues to increase rapidly. While dialysis provides life-saving treatment to patients with ESRD and/or can bridge the time between kidney failure and the receipt of a transplant, only 78% of patients are reported to survive the first year of dialysis and the 10-year survival rate is only 9%. With over 60,000 people waiting for kidney transplants, the improvement in short-term allograft survival has shifted attention to the two major remaining challenges in kidney transplantation: the shortage of organs and the lack of improvement in the rate of allograft failure after the first post-transplant year. To address the shortage of donor organs, a variety of tissue-engineering strategies are being pursued, including the extracorporeal renal tubule assist device, the transplantation of renal primordia, the injection of stem-like cells into diseased kidneys and the *in vitro* engineering of kidneys. The engineering of a kidney-like tissue from cells with appropriate 3D spatial relationships of nephrons has yet to be achieved.

TECHNOLOGY DESCRIPTION

Scientists at the University of California have developed a novel *in vitro* method that utilizes elements of kidney primordia, the Wolffian duct (WD) and metanephric mesenchyme (MM), to engineer in vitro kidney-like tissue containing functional tubular transporters and glomeruli with apparent early vascularization. This method provides a potential strategy for engineering a 3D vascularized kidney-like tissue from cells in vitro, if a tubular structure can be formed from adult, amniotic, embryonic stem cells or other cell types. Moreover, this in vitro stepwise approach provides the potential for introduction of immunomodulatory or other genes.

PUBLICATION

Nigam, S. K., *Staged in vitro reconstitution and implantation of engineered rat kidney tissue*, PNAS 2007 104: 20938-20943

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,460,929	06/04/2013	2007-300

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- [Methods of Tissue Repair, Regeneration, and Tissue Engineered Compositions](#)
- [A Method for Rapid Generation of Many Different Branched Epithelial Proto-Organs](#)

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OTHER INFORMATION

KEYWORDS

renal disease, dialysis, kidney,
Wolffian duct, metanephric
mesenchyme

CATEGORIZED AS

- [Medical](#)
 - [Disease: Kidneys and Genito-Urinary System](#)

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