**Kidney Tissue Engineering in Preclinical Models of Renal Failure: A Systematic Review and Meta-analysis**

**Table S1. Characteristics of included studies**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Author year | Sex, age, weight, and species of animals | Total number of animals | Scaffold materials | Cell seeding | Follow up time after implantation | Methods used for induction of injury |
| 1 | Basu  2011 | Female Lewis rats (2–3 months old) | 13 | PCL beads, gelatin beads, PLGA beads, gelatin particles, HA/gelatin particles, HA particles, PLGA particles | 6 out of the 13 scaffolds were seeded before implantation. | 1, 4, and 8 weeks | Scaffolds were implanted on healthy animals. implantation was through microinjection via two trajectories: 1) from the midline (medullary) and 2) from poles (cortical). |
| 2 | Caldas  2011 | Female Wistar rats (250-350g) | 45 | Bovine pericardium | BMSC and Mononuclear cells | 0, 45, and 90 days | 5/6 or 2/3 renal mass reduction: Infarction of approximately one-third of the left kidney by microsurgical ligation of one branch of the left renal artery, followed by right nephrectomy. |
| 3 | Feng  2016 | 1) Wild-type FVB mice (8–10 weeks)  2) Transgenic VEGFR2-luc mice for real-time in-vivo monitoring of angiogenesis | 100 total (15 FVB mice per group and 10 transgenic mice per group) | Chitosan-based injectable hydrogel | Adipose-derived MSCs | 1, 4, 7, 10, 14, and 28 days | ischemia/reperfusion-induced AKI model: unilateral (left) 40-minute ischemia/reperfusion plus contralateral nephrectomy. |
| 4 | Geng  2016 | Male SD rats (220–250 g) | 40 | Gelatin microgels + pedicled greater omentum flaps | Murine pluripotent embryonic stem cells | All euthanized 12 weeks after inducing CKD.  On weeks 2, 4, 6, and 12, 24-hour urine and blood samples were collected. | 5/6 partial nephrectomy |
| 5 | Geng  2019 | Male SD rats (220-250 g) | 24 | Gelatin microcryogels | MSCs | 0, 4, 8 and 12 weeks | 5/6 partial nephrectomy |
| 6 | Guan  2015 | Male Wistar rats (220-400 g) | 20 | DKS | Mouse embryonic stem cells | 2 weeks | Left heminephrectomy |
| 7 | Hu  2020 | Male SDi rats (180-220 g) | 24 | DKS | Human umbilical cord MSC | 8 weeks | 5/6 partial nephrectomy |
| 8 | Huang  2017 | Male SD rats | 45 | Co-gels of decellularized vascular matrix and collagen | MSC | 3 day, 1 week, and 2 weeks | Ischemia/reperfusion |
| 9 | Huling  2019 | Male nude rats (Charles River) (250-350 g) | 23 | Collagen vascular scaffold based on PCL corrosion cast | 1. GFP-transfected *MS-1 endothelial cell line* for coating of vascular scaffold (endothelialization)  2. Heterogenous population of *human* *renal cells* from healthy donors | 2 weeks | A 6 x 4 mm rectangular defect along the lateral margin of the kidney with a depth of 2 mm |
| 10 | Kim  2018 | Female wild type C57BL/6 mice (n=40)  Female interleukin-10 knockout mice (20 g) (n=20) | 60 | PLGA | None | 1, 4, 8 and 12 weeks | partial nephrectomy (5 x 2 x 2 mm3) |
| 11 | Kim  2020 | Male ICR mice (5 weeks old, 20 g) | 80 | Fibroblast-derived-ECM-supported scaffolds + PLGA + magnesium hydroxide nanoparticle (MH-NP) | None | 3 days; and 2, 4, and 8 weeks | Partial nephrectomy (excision volume 1.5 × 2.5 × 5 mm3), then removal of opposite kidney on day 10 (except for the mice that were euthanized on day 3) |
| 12 | Ko  2021 | Male ICR mice (6 weeks old, 20 g) | 30 | PLGA, magnesium hydroxide (MH), and decellularized porcine kidney ECM functionalized with bioactive compounds, polydeoxyribonucleotide, and tumor necrosis factor-α/  interferon-γ-primed MSC-derived extracellular vesicles | None | 2 and 8 weeks | Left partial nephrectomy (5 x 2 x 2 mm3) + right total nephrectomy |
| 13 | Lee  2018 | CD1 mice (6-8 weeks) [n = 63]  Lewis rats (6 to 8 weeks old, 200 g) [n = 60]  Chimeric GFP mice [n = 5] \* | 123 | Collagen-based injectable | None | Mice: 1, 2, 3 and 4 weeks  Rats: 2 and 4 weeks | Injection and needle stick in mice and ischemia/reperfusion in rats |
| 14 | Lih  2016 | Male ICR mice (5 weeks old, 20 g) | 60 | Biomimetic porous PLGA scaffolds incorporating decellularized ECM | None | 3, 7, and 28 days | Left partial nephrectomy (excision volume 2 × 4 × 5 mm3) + right total nephrectomy |
| 15 | Lih  2019 | Male ICR mice (5 weeks old, 20 g) | 150 | Decellularized ECM + PLGA + magnesium hydroxide [Mg(OH)2] | None | 3 days and 1, 4, and 8 weeks | Left partial nephrectomy (excision volume, 5 × 2 × 2 mm3) + right total nephrectomy |
| 16 | Orlando  2012 | Female Yorkshire pigs (25 Kg) | 4 | ECM | None | 2 weeks | Scaffolds were implanted on healthy animals. |
| 17 | Peloso  2015 | Male Lewis rats (250-350 g) | 7 | ECM | None | 7 days | Unilateral nephrectomy |
| 18 | Yu  2014 | Male SD rats (2 months old, 250 g) | 80 | Rat DKS | None | 1, 2, 4, 8 weeks | Left partial (1/3) nephrectomy |
| 19 | Zhang  2015 | SD rats (2 months old, 200-250 g)  Sex not specified | 50 | Rat DKS | None | 1, 2, 4, and 8 weeks | Unilateral nephrectomy |

\*These animals did not undergo tissue engineering, but were included in the same study.

Abbreviations: DKS, Decellularized kidney scaffold; ECM, extracellular matrix; GFP, green fluorescent protein; HA, hyaluronic acid; ICR, Institute of Cancer Research; MSC, mesenchymal stem cell; PCL, polycaprolactone; PLGA, poly(lactic-co-glycolic acid); SD, Sprague-Dawley; BMSC, Bone marrow-derived stem cells; AKI, acute kidney injury; GFP, green fluorescent protein.