WHAT IS CLAIMED IS:

1. A method of differentiating an induced pluripotent stem cell (iPSC) into a renal proximal tubular cell (PTC)-like cell, the method comprising:

culturing an undifferentiated iPSC in a renal epithelial cell culture medium in the presence of one or more extracellular matrix (ECM) molecules comprising growth factor reduced Matrigel matrix, bone morphogenic protein 2 (BMP2) and bone morphogenic protein 7 (BMP7), for a period of from about 8 to about 10 days, under conditions sufficient to induce differentiation of the iPSC into a PTC-like cell.

2. The method of claim 1, wherein the iPSC is a human iPSC.

3. The method of claim 1 or 2, wherein the renal epithelial cell culture medium comprises renal epithelial cell growth medium.

4. The method of any one of claims 1 to 3, wherein the iPSC is initially seeded at a density of about 5 000 to about 10 000 viable cells/cm^2 preferably the iPSC is initially seeded at a density of about 8 000 viable cells/cm^2.

5. The method of any one of claims 1 to 4, wherein the iPSC is initially seeded in the presence of ROCK inhibitor and in the absence of BMP2 and BMP7, prior to said culturing.

6. The method of any one of claims 1 to 5, wherein the BMP2 is present during said culturing in a concentration from about 1 ng/ml to about 25 ng/ml.

7. The method of any one of claims 1 to 6, wherein the BMP7 is present during said culturing in a concentration from about 0.25 ng/ml to about 10 ng/ml.

8. The method of any one of claims 1 to 7, wherein the BMP2 and the BMP7 are added to the renal epithelial cell culture medium about 12 to about 24 hours after initial seeding of the iPSC.

9. The method of claim 1, wherein the method comprises:

seeding the undifferentiated iPSC at a density of about 8 000 viable cells/cm^2, in renal epithelial cell growth medium that is free from BMP2 and BMP7 and which comprises about 5 μM to about 15 μM ROCK inhibitor, for about 12 hours to about 24 hours in order to allow the undifferentiated iPSC to attach to a culture support coated with growth factor reduced Matrigel matrix;

exchanging the renal epithelial cell growth medium for fresh renal epithelial cell growth medium that is free from ROCK inhibitor and which comprises from about 2.5 ng/ml to about 15 ng/ml BMP2 and from about 1 ng/ml to about 5 ng/ml BMP7;

culturing the iPSC in the renal epithelial cell growth medium comprising BMP2 and BMP7 for a period of from about 8 to about 10 days, at a temperature of about 37°C and under about 5% CO_2, under conditions sufficient to induce differentiation of the iPSC into a PTC-like cell;

wherein the iPSC is a human iPSC.

10. A population of PTC-like cells differentiated from a population of induced pluripotent stem cells (iPSCs) seeded at a density of about 5 000 to about 10 000 viable cells/cm^2, in renal epithelial cell culture medium in the presence of one or more extracellular matrix molecule (ECM) comprising growth factor reduced Matrigel matrix, bone morphogenic protein 2, and bone morphogenic protein 7, for a period of from about 7 to about 10 days.

11. The population of cells of claim 10, when prepared by a method of any one of claims 1 to 9.

12. The population of cells of claim 10 or 11, wherein about 90% or greater of the cells express AQP1, PEPT1, OAT3 and GLUT1.

13. The population of cells of any one of claims 10 to 12, when contained in a hollow fibre bioreactor of a bioartificial kidney device.

14. The population of cells of any one of claims 10 to 12, when contained in a hydrogel.

15. The population of cells any one of claims 10 to 12, when contained in a bioengineered tissue.

16. A bioengineered tissue graft comprising a matrix seeded with the population of cells of any one of claims 10 to 12, wherein optionally the matrix is a decellularized matrix or, wherein the matrix is a bioengineered 3D renal matrix.

17. An *in vitro* method for screening nephrotoxicity of a compound, the method comprising:

contacting a test compound with a test population of cells of any one of claims 11 to 13; and

determining the effect of the test compound in comparison to a control population of cells that has not been contacted with the test compound.

18. The method of claim 17, wherein the test population is assessed for the effect of the test compound on cell viability, cell number, expression of a marker gene, cell morphology, arrangement of a cytoskeletal component, translocation of a cellular factor, ATP depletion, mitochondrial damage, glutathione (GSH) depletion, membrane damage, generation of reactive oxygen species or DNA damage.

19. The method of claim 17 or 18, wherein the test population of cells is prepared according to the method of any one of claims 1 to 9, and said contacting is performed on the test population after about 8 to about 10 days of differentiating without harvesting prior to said contacting.

20. A method of preparing a bioartificial kidney device, the method comprising seeding the device with a population of cells of any one of claims 10 to 12.