

WHAT IS CLAIMED IS:

1. An *in vitro* method for ~~predicting screening~~ renal proximal tubular cell-specific toxicity of a compound in humans *in vivo*, the method comprising:

contacting a test compound, ~~that is to be screened~~ for which renal proximal tubular cell-specific toxicity in humans *in vivo* is to be predicted, with an *in vitro* test population of renal proximal tubular cells, the test population being a confluent monolayer, a subconfluent monolayer, a confluent epithelium or a confluent 2D culture;

determining the expression level of an interleukin in the test population, the interleukin being interleukin-6 (IL-6); and

~~predicting~~ identifying the test compound ~~as is specifically toxic for renal proximal tubular cells in humans *in vivo*~~, based on expression levels of IL-6 in the test population being greater than expression levels in an *in vitro* control population of renal proximal tubular cells not contacted with the test compound.
2. An *in vitro* method for ~~predicting screening~~ renal proximal tubular cell-specific toxicity of a compound in humans *in vivo*, the method comprising:

contacting a test compound, ~~that is to be screened~~ for which renal proximal tubular cell-specific toxicity in humans *in vivo* is to be predicted, with an *in vitro* test population of renal proximal tubular cells;

determining the expression level of an interleukin in the test population, the interleukin being interleukin-8 (IL-8); and

~~predicting~~ identifying the test compound ~~as is specifically toxic for renal proximal tubular cells in humans *in vivo*~~, based on expression levels of IL-8 in the test population being greater than expression levels in an *in vitro* control population of renal proximal tubular cells not contacted with the test compound.
3. The method of claim 32, further comprising determining the expression level of interleukin-6 (IL-6), wherein said predicting the test compound is specifically toxic for renal proximal tubular cells in humans *in vivo* ~~identifying~~ is further based on expression levels of IL-6 in the *in vitro* test population being greater than expression levels in an *in vitro* control population of renal proximal tubular cells not contacted with the test compound.
4. The method of claim 2 or 3, wherein the *in vitro* test population of renal proximal tubular cells is a confluent monolayer, a subconfluent monolayer, a confluent epithelium, an organoid culture, a confluent 2D culture, an *in vitro* tubule, a 3D organoid culture or a 3D culture cultivated under static or microfluidic conditions.

5. The method of any one of claims 1 to 4, wherein said determining of said expression level of the interleukin comprises determining the levels of mRNA encoding the interleukin.
6. The method of claim 5, wherein said determining comprises one or more of quantitative PCR techniques, northern blot techniques, microarray techniques, TRAC techniques, fluorescent label techniques and phosphorimaging techniques.
7. The method of any one of claims 1 to 4, wherein said determining of said expression level of the interleukin comprises determining the level of secreted interleukin protein.
8. The method of claim 7, wherein said determining comprises one or more of ELISA techniques, biosensor techniques, electrochemical detection techniques, immunoblotting techniques, cytometric bead array techniques, fluorescent label techniques, and receptor binding techniques.
9. The method of any one of claims 1 to 4, wherein said determining of said expression level of the interleukin comprises detecting levels of a reporter gene expressed under control of IL-6 or IL-8 regulation.
10. The method of any one of claims 1 to 49, wherein the ratio of expression levels of the interleukin in the *in vitro* test population to expression levels of the interleukin in the *in vitro* control population being about 1.5 or greater is indicative that the test compound is specifically toxic for renal proximal tubular cells in humans in vivo.
11. The method of any one of claims 1 to 49, wherein the ratio of expression levels of the interleukin in the *in vitro* test population to expression levels of the interleukin in the *in vitro* control population being about 3.5 or greater is indicative that the test compound is specifically toxic for renal proximal tubular cells in humans in vivo.
12. The method of any one of claims 1 to 411, wherein the renal proximal tubular cells are derived from somatic cells or from stem cells.
13. The method of claim 12, wherein the renal proximal tubular cells are derived from somatic cells and are primary cells or are cells from a stable cell line.
14. The method of claim 13, wherein the renal proximal tubular cells are human primary renal proximal tubular cells, HK-2 cells, or LLC-PK1 cells.
15. The method of claim 12, wherein the renal proximal tubular cells are derived from stem cells and are differentiated from embryonic stem cells, mesenchymal stem cells, or induced pluripotent stem cells.
16. The method of any one of claims 1 to 415, wherein the proximal tubular cells are human renal proximal tubular cells.

- 17. The method of any one of claims 1 to 415, wherein the proximal tubular cells are non-human proximal tubular cells.
- 18. The method of any one of claims 1 to 417, wherein said contacting is performed over a period of time of about 8 hours or longer.
- 19. The method of any one of claims 1 to 418, wherein said contacting is repeated one or more times in a period of from about 3 to about 14 days.
- 20. The method of any one of claims 1 to 419, wherein said contacting comprises adding the test compound to the *in vitro* test population of renal proximal tubular cells at a concentration of about 0.001 to about 1000 µg/ml.

WHAT IS CLAIMED IS:

1. An *in vitro* method for predicting renal proximal tubular cell-specific toxicity of a compound in humans *in vivo*, the method comprising:

contacting a test compound, for which renal proximal tubular cell-specific toxicity in humans *in vivo* is to be predicted, with an *in vitro* test population of renal proximal tubular cells, the test population being a confluent monolayer, a subconfluent monolayer, a confluent epithelium or a confluent 2D culture;

determining the expression level of an interleukin in the test population, the interleukin being interleukin-6 (IL-6); and

predicting the test compound is specifically toxic for renal proximal tubular cells in humans *in vivo*, based on expression levels of IL-6 in the test population being greater than expression levels in an *in vitro* control population of renal proximal tubular cells not contacted with the test compound.
2. An *in vitro* method for predicting renal proximal tubular cell-specific toxicity of a compound in humans *in vivo*, the method comprising:

contacting a test compound, for which renal proximal tubular cell-specific toxicity in humans *in vivo* is to be predicted, with an *in vitro* test population of renal proximal tubular cells;

determining the expression level of an interleukin in the test population, the interleukin being interleukin-8 (IL-8); and

predicting the test compound is specifically toxic for renal proximal tubular cells in humans *in vivo*, based on expression levels of IL-8 in the test population being greater than expression levels in an *in vitro* control population of renal proximal tubular cells not contacted with the test compound.
3. The method of claim 2, further comprising determining the expression level of interleukin-6 (IL-6), wherein said predicting the test compound is specifically toxic for renal proximal tubular cells in humans *in vivo* is further based on expression levels of IL-6 in the *in vitro* test population being greater than expression levels in an *in vitro* control population of renal proximal tubular cells not contacted with the test compound.
4. The method of claim 2 or 3, wherein the *in vitro* test population of renal proximal tubular cells is a confluent monolayer, a subconfluent monolayer, a confluent epithelium, an organoid culture, a confluent 2D culture, an *in vitro* tubule, a 3D organoid culture or a 3D culture cultivated under static or microfluidic conditions.

5. The method of any one of claims 1 to 4, wherein said determining of said expression level of the interleukin comprises determining the levels of mRNA encoding the interleukin.
6. The method of claim 5, wherein said determining comprises one or more of quantitative PCR techniques, northern blot techniques, microarray techniques, TRAC techniques, fluorescent label techniques and phosphorimaging techniques.
7. The method of any one of claims 1 to 4, wherein said determining of said expression level of the interleukin comprises determining the level of secreted interleukin protein.
8. The method of claim 7, wherein said determining comprises one or more of ELISA techniques, biosensor techniques, electrochemical detection techniques, immunoblotting techniques, cytometric bead array techniques, fluorescent label techniques, and receptor binding techniques.
9. The method of any one of claims 1 to 4, wherein said determining of said expression level of the interleukin comprises detecting levels of a reporter gene expressed under control of IL-6 or IL-8 regulation.
10. The method of any one of claims 1 to 9, wherein the ratio of expression levels of the interleukin in the *in vitro* test population to expression levels of the interleukin in the *in vitro* control population being about 1.5 or greater is indicative that the test compound is specifically toxic for renal proximal tubular cells in humans *in vivo*.
11. The method of any one of claims 1 to 9, wherein the ratio of expression levels of the interleukin in the *in vitro* test population to expression levels of the interleukin in the *in vitro* control population being about 3.5 or greater is indicative that the test compound is specifically toxic for renal proximal tubular cells in humans *in vivo*.
12. The method of any one of claims 1 to 11, wherein the renal proximal tubular cells are derived from somatic cells or from stem cells.
13. The method of claim 12, wherein the renal proximal tubular cells are derived from somatic cells and are primary cells or are cells from a stable cell line.
14. The method of claim 13, wherein the renal proximal tubular cells are human primary renal proximal tubular cells, HK-2 cells, or LLC-PK1 cells.
15. The method of claim 12, wherein the renal proximal tubular cells are derived from stem cells and are differentiated from embryonic stem cells, mesenchymal stem cells, or induced pluripotent stem cells.
16. The method of any one of claims 1 to 15, wherein the proximal tubular cells are human renal proximal tubular cells.

17. The method of any one of claims 1 to 15, wherein the proximal tubular cells are non-human proximal tubular cells.
18. The method of any one of claims 1 to 17, wherein said contacting is performed over a period of time of about 8 hours or longer.
19. The method of any one of claims 1 to 18, wherein said contacting is repeated one or more times in a period of from about 3 to about 14 days.
20. The method of any one of claims 1 to 19, wherein said contacting comprises adding the test compound to the *in vitro* test population of renal proximal tubular cells at a concentration of about 0.001 to about 1000 µg/ml.