such as chronic tophaceous gout, or condition associated with gout has been diagnosed with such imaging, such as with DECT.

Identifying Uric Acid Degradation

[0309] A method to identify uric acid degrading polypeptides can comprise the steps of functionally expressing a candidate uric acid degrading polypeptide by operably linking it to a promoter in a cell functionally expressing one or more of the uric acid transporters of SEQ ID NO: 9-18, or polypeptide having uric acid transporter activity ~~as identified in [[CLAIM Y]]~~; identifying cells with increased urate consumption by quantifying urate uptake and biodegradation of cells from step 1. using a urate consumption assay and comparing their urate consumption to cells functionally expressing only the one or more of the uric acid transporters of SEQ ID NO: 9-18 or polypeptide having uric acid transporter activity ~~as identified in [[CLAIM Y]]~~. The cells that show increased urate consumption functionally express a uric acid degrading polypeptide, thereby confirming the candidate uric acid degrading polypeptide can functionally break down uric acid and encodes a uricase (EC 1.7.3.3).

[0310] A method to identify uric acid transporters can comprise the steps of functionally expressing a candidate uric acid transporting polypeptide by operably linking it to a promoter in a cell functionally expressing one or more of the uricases of SEQ ID NO: 1-8, or polypeptide having uricase activity ~~as identified in CLAIM X~~; identifying cells with increased urate consumption by quantifying urate uptake and biodegradation of cells from step 1. using a urate consumption assay and comparing their urate consumption to cells functionally expressing only the one or more of the uricases of SEQ ID NO:1-8 or polypeptide having uricase activity ~~as identified in CLAIM X~~. The cells that show increased urate consumption functionally express a uric acid transporter polypeptide, thereby confirming the candidate uric acid transporting

CLAIMS

~~**What is claimed is:**~~

1. An engineered microbial cell comprising:

~~a plurality of microbial cells;~~

~~the microbial cells expressing at least two exogenous polypeptides, including~~ nucleic acid encoding a first exogenous polypeptide and a second exogenous polypeptide;

wherein the first exogeneous polypeptide is a uric acid degrading polypeptide; and

wherein the second exogenous polypeptide is a uric acid transporter ~~that brings in~~ which transports uric acid ~~from outside of~~ into the microbial ~~cells~~ cell.

2. The engineered microbial cell of claim 1, ~~further comprising:~~

wherein the uric acid transporter ~~is at least 60% homologous to a uric acid transporter selected from a group, or a combination selected from the group, consisting of: *Aspergillus nidulans* UapA [SEQ ID NO: 9], *Aspergillus nidulans* UapC [SEQ ID NO: 10], *Aspergillus fumigatus* UapC [SEQ ID NO: 11], *Candida albicans* Xut1 [SEQ ID NO: 12], *Schizosaccharomyces pombe* Q9HE12 [SEQ ID NO: 13], *Bacillus subtilis* PucK [SEQ ID NO: 14], *Bacillus subtilis* PucJ [SEQ ID NO: 15], *Escherichia coli* YgfU [SEQ ID NO: 16], *Zygosaccharomyces parabailii* AQZ18664 [SEQ ID NO: 17], or *Spirosoma sp.* KCTC 42546 WP_142773020 [SEQ ID NO: 18]~~ comprises at least 95% identity with the full length of any one of SEQ ID NOs: 9-18.

3. The engineered microbial cell of claim ~~2~~ 1, ~~further comprising:~~

wherein the microbial ~~cells are~~ cell is a fungal ~~cells~~ cell.

4. The engineered microbial cell of claim ~~3~~ 1, ~~further comprising:~~

wherein the uric acid degrading polypeptide is a uricase.

5. The engineered microbial cell of claim 4, ~~further comprising:~~

wherein the uricase is a fungal uricase.

6. The engineered microbial cell of claim ~~5~~ 4, ~~further comprising:~~

wherein the ~~fungal~~ uricase ~~is selected from a group, or a combination selected from the group, consisting of: *Candida utilis* [SEQ ID NO: 1], *Aspergillus flavus* [SEQ ID NO: 2], *Schizosaccharomyces pombe* [SEQ ID NO: 5], or *Zygosaccharomyces parabailii* [SEQ ID NO: 7]~~ comprises at least 95% identity to the full length of one of SEQ ID NOs: 1-8.

7. The engineered microbial cell of claim 4, ~~further comprising:~~

wherein the uricase is a bacterial uricase.

~~8. The engineered microbial cell of claim 7, further comprising:~~

~~The bacterial uricase is selected from a group, or a combination selected from the group, consisting of: *Arthrobacter globiformis* [SEQ ID NO: 2], *Bacillus subtilis* [SEQ ID NO: 6], or *Spriosoma sp.* [SEQ ID NO: 8].~~

~~9.~~8.The engineered microbial cell of claim 4, ~~further comprising:~~

wherein the uricase is a mutant uricase, ~~including chimera~~ a chimeric uricase, and/or an overexpression ~~variants~~ variant of the uricase.

~~10. The engineered microbial cell of claim 9, further comprising:~~

~~the mutant uricase is a porcine-baboon chimera uricase [SEQ ID NO: 4].~~

~~11. The engineered microbial cell of claim 2, further comprising:~~

~~the microbial cells are bacterial cells.~~

~~12. The engineered microbial cell of claim 11, further comprising:~~

~~the uric acid degrading polypeptide is a uricase.~~

~~13. The engineered microbial cell of claim 12, further comprising:~~

~~the uricase is a fungal uricase.~~

~~14. The engineered microbial cell of claim 13, further comprising:~~

~~the fungal uricase is selected from a group, or a combination selected from the group, consisting of: *Candida utilis* [SEQ ID NO:1], *Aspergillus flavus* [SEQ ID NO: 2], *Arthrobacter globiformis* [SEQ ID NO: 3], Chimeric porcine baboon [SEQ ID NO: 4], *Schizosaccharomyces pombe* [SEQ ID NO: 5], or *Zygosaccharomyces parabailii* [SEQ ID NO: 7].~~

~~15. The engineered microbial cell of claim 12, further comprising:~~

~~the uricase is a bacterial uricase.~~

~~16. The engineered microbial cell of claim 15, further comprising:~~

~~The bacterial uricase is selected from a group, or a combination selected from the group, consisting of: *Arthrobacter globiformis* [SEQ ID NO: 2], *Bacillus subtilis* [SEQ ID NO: 6], or *Spirosoma sp.* [SEQ ID NO: 8].~~

~~17. The engineered microbial cell of claim 12, further comprising:~~

~~the uricase is a mutant uricase, including chimera and/or overexpression variants of the uricase.~~

~~18. The engineered microbial cell of claim 17, further comprising:~~

~~the mutant uricase is porcine-baboon chimera uricase [SEQ ID NO: 4].~~

~~19.~~9. A method of lowering uric acid in the gastrointestinal tract of a recipient, the method comprising ~~the steps of~~:

~~preparing a therapeutically effective dose of the engineered microbial cell selected from a group, or a combination selected from the group, consisting of: claims 1-18;~~

orally administering the ~~therapeutically effective dose~~ engineered microbial cell of claim 1 to the recipient~~; and~~

~~allowing time for the selected engineered microbial cell to transport and degrade uric acid~~.

~~20.~~10. ~~A~~ The method ~~for treating a patient suffering~~ according to claim 9, wherein the recipient suffers from a condition selected from ~~a group, or a combination selected from~~ the group~~,~~ consisting of: gout, rheumatoid arthritis, cerebral stroke, heart disease, arrhythmia, chronic renal disease, and chronic refractory gout.~~; the method comprising the steps of:~~

~~determining whether the patient has a serum uric acid level of ≥6.8 mg/dl prior to initiating urate lowering therapy; and~~

~~if the patient has a serum uric acid level of ≥6.8 mg/dl prior to initiating urate lowering therapy, then orally administering the engineered microbial cell selected from a group, or a combination selected from the group, consisting of: claims 1-18, in an amount of 10^6 to 10^12 microbial cells.~~

~~21.~~11. The method ~~for treating a patient of claim 20~~ according to claim 9, ~~further comprising:~~

wherein the amount of microbial cells ~~orally~~ administered is approximately 10^9 cells.

~~22.~~12. The method ~~for treating a patient of claim 20~~ according to claim 9, ~~further comprising:~~

wherein the recipient suffers from ~~the condition selected from a group, or a combination selected from the group, is~~ chronic refractory gout.

13. The method according to claim 9, wherein orally administering populates the gastrointestinal tract of the recipient with the engineered microbial cell.

14. The method according to claim 9, wherein the recipient is administered 10^6 to 10^12 of the engineered microbial cell.

15. The method according to claim 9, further comprising determining that the recipient has a serum uric acid level of ≥6.8 mg/dl prior to administration.

~~23. The method for treating a patient of claim 20, further comprising:~~

~~the engineered microbial cell selected from a group, or a combination selected from the group, is administered with a pharmaceutically acceptable carrier.~~

~~24. A method for determining uric acid degradation, comprising the steps of:~~

~~creating an assay solution including an assay buffer and a uric acid solution;~~

~~selecting a mid-log phase exponentially growing cell;~~

~~washing and suspending the cell in the assay solution;~~

~~incubating the cell in the assay solution at conditions acceptable for uric acid degradation;~~

~~sampling aliquots of the cell in the assay solution at intervals; and~~

~~measuring the aliquots in a spectrophotometer at substantially a wavelength of 293nm.~~

~~25. A method of identifying uric acid degrading polypeptides, comprising the steps of:~~

~~selecting a cell that expresses a uric acid transporter polypeptide;~~

~~operatively linking a promoter that is functional in the cell to a nucleotide sequence encoding a uric acid degrading polypeptide;~~

~~introducing the promoter to the cell;~~

~~performing the method of claim 24; and~~

~~identifying and quantifying uric acid degradation.~~

~~26. The method of identifying uric acid degrading polypeptides of claim 25, further comprising the steps of:~~

~~the uric acid transporter polypeptide of the cell is selected from a group, or a combination selected from the group, consisting of: SEQ ID NO: 9-18.~~

~~27. A method of identifying uric acid transporters, comprising the steps of:~~

~~selecting a cell that expresses a uric acid degrading polypeptide;~~

~~operatively linking a promoter that is functional in the cell to a nucleotide sequence encoding a uric acid transporter polypeptide;~~

~~introducing the promoter to the cell;~~

~~performing the method of claim 24; and~~

~~identifying and quantifying uric acid degradation.~~

28. The method of identifying uric acid transporter of claim 27, further comprising the steps of:

the uric acid degrading polypeptide of the cell is selected from a group, or a combination selected from the group, consisting of: SEQ ID NO: 1-8.

29. An engineered microbial cell, comprising:

a cell expressing the uric acid degrading polypeptide identified by the methods of either claim 25 or claim 26; and

the cell expressing the uric acid transporter polypeptide identified by the methods of either claim 27 or claim 28.