

WHAT IS CLAIMED IS:

1. A non-human obesity animal model whose gut microbiota population comprises at least an *Enterobacter cloacae* having a 16S rRNA gene, wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1.
2. The non-human obesity animal model of Claim 1, wherein the non-human obesity animal model is a mouse, a rat, a Guinea pig, a pig, a rabbit, or a Monkey.
3. A method for establishing a non-human obesity animal model, comprising,

inoculating a germ-free animal with an *Enterobacter cloacae* having a 16S rRNA gene while feeding the germ-free animal with a diet having at least 5% of fat content for a period of time to provide a non-human obesity animal model, wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1.
4. The method of Claim 3, wherein the non-human obesity animal model manifests a metabolic syndrome.
5. The method of Claim 4, wherein the metabolic syndrome comprises obesity, insulin resistance, chronic inflammation, or a combination thereof.
6. The method of Claim 3, wherein the non-human obesity animal model is a mouse, a rat, a rabbit, a monkey, a pig, or a Guinean pig.
7. The method of Claim 3, wherein the period of time is at least 4 weeks.
8. The method of Claim 3, wherein the inoculating the germ-free animal comprises intragastric administration, topical administration, oral administration, or a combination thereof.
9. The method of Claim 3, wherein the inoculating the germ-free animal comprises inoculating the germ-free animal with at least 10^2 bacteria cells.
10. The method of Claim 3, wherein the diet has at least 20% of fat content.

11. The method of Claim 3, wherein the diet has at least 10% of fat content.
12. The method of Claim 3, wherein the diet comprises at least 4.5 kcal per gram.
13. A method for establishing a non-human obesity animal model, comprising,

inoculating a germ-free animal with an *Enterobacter cloacae* having a 16S rRNA gene while feeding the germ-free animal with a diet having at least 5% of fat content for a period of time to provide a non-human obesity animal model, wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1, and wherein the non-human obesity animal model manifests at least one metabolic syndrome.

14. The method of Claim 13, wherein the *Enterobacter cloacae* is capable of colonizing in the germ-free animal's gut.
15. A method for screening a material that has a preventive or therapeutic effect on the symptom of metabolic or immune system disorders, comprising,

using a non-human animal model exhibiting at least one symptom of metabolic or immune system disorders, wherein the gut microbiota population of the non-human animal model comprises at least an *Enterobacter cloacae* having a 16S rRNA gene, and wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1, and

administering the material to the animal model, if the animal exhibits improvement on at least one symptom of metabolic or immune system disorders, it is indicative of that the material have a preventive or therapeutic effect on the symptom of metabolic or immune system disorders.

16. The method of Claim 15, wherein the material is a food or a drug.
17. The method of Claim 15, wherein the improvement may include weight loss, decreased insulin resistance, or reduced chronic inflammation.

18. The method of Claim 15, wherein the metabolic syndrome comprises weight gain, obesity, insulin resistance, chronic inflammation, or a combination thereof.
19. A method for screening a microorganism or a combination thereof that has a preventive or therapeutic effect on the symptom of metabolic or immune system disorder, comprising,

using a non-human animal model that exhibits at least one symptom of metabolic or immune system disorders, wherein the gut microbiota population of the non-human animal model comprises at least an *Enterobacter cloacae* having a 16S rRNA gene, and wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1, and

administering a test microorganism or a combination thereof to the non-human animal model, if the animal model exhibits improvement in at least one symptom of metabolic or immune system disorders, it is indicative that the microorganism or a combination thereof has a preventive or therapeutic effect on the symptom of metabolic or immune system disorders.

20. The method of Claim 19, wherein the improvement in at least one symptom of metabolic or immune system disorders includes amelioration of symptom of obesity, insulin resistance, or chronic inflammation.
21. The method of Claim 19, wherein the improvement in at least one symptom of metabolic or immune system disorders includes one or more of weight loss, reduced fat, decreased blood lipids, improved insulin resistance, reduced level of serum lipopolysaccharide binding protein, decreased leptin resistance, decreased serum level of inflammation, or decreased inflammatory factor expression levels.
22. The method of Claim 19, wherein the metabolic syndrome comprises weight gain, obesity, insulin resistance, chronic inflammation, or a combination thereof.
23. A method for screening an obesity causing bacterium, comprising,

inoculating a germ-free animal with an *Enterobacter cloacae* having a 16S rRNA gene while feeding the germ-free animal with a high-fat diet for a period of time to provide a non-human obesity animal model, wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1 and the *Enterobacter cloacae* is capable of colonizing the gut of a germ-free animal, and the non-human obesity animal model exhibits at least one type of metabolic or immune system disorders, and

comparing a test microorganism or combination thereof with the *Enterobacter cloacae*, if the test microorganism or a combination thereof exhibits similar effect as the *Enterobacter cloacae*, it is indicative that the test microorganism or combination thereof may cause obesity.

24. The method of Claim 23, wherein the metabolic syndrome comprises weight gain, obesity, insulin resistance, chronic inflammation, or a combination thereof.

WHAT IS CLAIMED IS:

1. A non-human obesity animal model whose gut microbiota population comprises at least an *Enterobacter cloacae* bacterium having a 16S rRNA gene, wherein the sequence of the 16S rRNA gene is at least 7595% similar to SEQ ID NO.1.
- ~~2. The non-human obesity animal model of Claim 1, wherein the bacterium is an endotoxin-producing bacterium.~~
- ~~3. The non-human obesity animal model of Claim 1, wherein the bacterium is *Enterobacter*.~~
- ~~4. The non-human obesity animal model of Claim 1, wherein the bacterium is *Enterobacter cloacae*.~~
- ~~5. The non-human obesity animal model of Claim 1, wherein the 16S rRNA gene is at least 95% similar to SEQ ID NO.1.~~
- ~~6. The non-human obesity animal model of Claim 1, wherein the 16S rRNA gene is at least 85% similar to SEQ ID NO.1.~~
- ~~72.~~ The non-human obesity animal model of Claim 1, wherein the non-human obesity animal model is a mouse, a rat, a Guinea pig, a pig, a rabbit, or a Monkey.
- ~~83.~~ A method for establishing an non-human obesity animal model, comprising,

inoculating a germ-free animal with an *Enterobacter cloacae* bacterium having a 16S rRNA gene while feeding the germ-free animal with a diet having at least 5% of fat content for a period of time to provide a non-human obesity animal model~~to provide an inoculated animal~~, wherein the sequence of the 16S rRNA gene is at least 7595% similar to SEQ ID NO.1;~~;~~ and

~~feeding the inoculated animal with a diet having at least 5% of fat content for a period of time to provide an obesity animal model.~~

- ~~9.~~ The method of Claim 8, wherein the obesity animal model has a gut microbiota population comprising at least one bacterium having a 16S rRNA gene, wherein the sequence of the 16S rRNA gene is at least 75% similar to SEQ ID NO.1.
- ~~104.~~ The method of Claim 83, wherein the non-human obesity animal model manifests a metabolic syndrome.
- ~~115.~~ The method of Claim ~~104~~, wherein the metabolic syndrome comprises obesity, insulin resistance, chronic inflammation, or a combination thereof.
- ~~12.~~ The method of Claim 8, wherein the bacterium is an endotoxin-producing bacterium.
- ~~13.~~ The method of Claim 8, wherein the bacterium is *Enterobacter*.
- ~~14.~~ The method of Claim 8, wherein the bacterium is *Enterobacter cloacae*.
- ~~15.~~ The method of Claim 8, wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1.
- ~~166.~~ The method of Claim 83, wherein the non-human obesity animal model is a mouse, a rat, a rabbit, a monkey, a pig, or a Guinean pig.
- ~~177.~~ The method of Claim 83, wherein the period of time is at least 4 weeks.
- ~~188.~~ The method of Claim 83, wherein the inoculating the germ-free animal comprises intragastric administration, topical administration, oral administration, or a combination thereof.
- ~~199.~~ The method of Claim 83, wherein the inoculating the germ-free animal comprises inoculating the germ-free animal with at least 10^2 bacteria cells.
- ~~2010.~~ The method of Claim 83, wherein the diet has at least 20% of fat content.
- ~~2111.~~ The method of Claim 83, wherein the diet has at least 10% of fat content.

~~22~~12. The method of Claim ~~8~~3, wherein the diet comprises at least 4.5 kcal per gram.

~~23~~13. A method for establishing a non-human obesity animal model, comprising,

inoculating a germ-free animal with an *Enterobacter cloacae* having a 16S rRNA gene while feeding the germ-free animal with a diet having at least 5% of fat content for a period of time to provide a non-human obesity animal model, wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1, and endotoxin-producing bacterium to provide an inoculated animal; and while

feeding the inoculated animal with a diet having at least 5% of fat content for a period of time to provide an obesity animal model, wherein the non-human obesity animal model manifests at least one metabolic syndrome.

~~24.~~ The method of Claim ~~23~~, wherein the endotoxin-producing bacterium comprises a bacterium of *Enterobacter cloacae*.

~~25.~~ The method of Claim ~~23~~, wherein the endotoxin-producing bacterium comprises a bacterium of *Enterobacter*.

~~26.~~ The method of Claim ~~23~~, wherein the endotoxin-producing bacterium comprises a bacterium of *Enterobacteriaceae*.

~~27.~~ The method of Claim ~~23~~, wherein the endotoxin-producing bacterium comprises a bacterium of *γ-Proteobacteria*.

~~28.~~ The method of Claim ~~23~~, wherein the endotoxin-producing bacterium comprises a bacterium of *Proteobacteria*.

~~29.~~ The method of Claim ~~23~~, wherein the endotoxin-producing bacterium comprises a bacterium of Gram-negative bacteria.

~~30~~14. The method of Claim ~~23~~13, wherein the *Enterobacter cloacae* endotoxin-producing bacterium is capable of colonizing in the germ-free animal's gut. —

31. ~~The method of Claim 23, wherein the endotoxin-producing bacterium has a 16S rRNA gene, and wherein the sequence of the 16S rRNA gene is at least 75% similar to SEQ ID NO.1.~~
32. ~~The method of Claim 23, wherein the obesity animal model has a gut microbiota population comprising at least one bacterium having a 16S rRNA gene, wherein the sequence of the 16S rRNA gene is at least 75% similar to SEQ ID NO.1.~~
33. 15. A method for screening a compound-material that has a preventive or therapeutic effect on the symptom of metabolic or immune system disorders, comprising,
- ~~providing a test obesity animal model and a control obesity animal model, wherein both the test obesity animal model and the control obesity animal model have a gut microbiota population comprising at least one bacterium having a 16S rRNA gene, and wherein the sequence of the 16S rRNA gene is at least 75% similar to SEQ ID NO.1;~~
- ~~providing a compound to the test obesity animal model for a period of time while feeding a diet having at least 5% of fat content to both the test obesity animal model and the control obesity animal model over the period of time; and~~
- ~~measuring weight gain, serum level change of an endotoxin biomarker, or both in the test obesity animal model and in the control obesity animal model, and wherein the weight gain of the test obesity animal model being statistically significantly less than the weight gain of the control obesity animal model, or the serum level change of the endotoxin biomarker in the test obesity animal model being statistically insignificant while the serum level change of endotoxin biomarker in the control obesity animal model being statistically significant, or both is indicative that the compound is effective in preventing metabolic syndrome.~~ using a non-human animal model exhibiting at least one symptom of metabolic or immune system disorders, wherein the gut microbiota population of the non-human animal model comprises at least an *Enterobacter cloacae* having a 16S rRNA gene, and wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1, and

administering the material to the animal model, if the animal exhibits improvement on at least one symptom of metabolic or immune system disorders, it is indicative of that the material have a preventive or therapeutic effect on the symptom of metabolic or immune system disorders.

3416. The method of Claim 3315, wherein the ~~material~~compound is a food or a drug.

3517. The method of Claim 3315, wherein the improvement may include weight loss, decreased insulin resistance, or reduced chronic inflammation~~the endotoxin biomarker comprises lipopolysaccharide-binding protein (LBP), lipopolysaccharide (LPS), or a combination thereof.~~

3618. The method of Claim 3315, wherein the metabolic syndrome comprises weight gain, obesity, insulin resistance, chronic inflammation, or a combination thereof.

3719. A method for screening a microorganism or a combination thereof that has a preventive or therapeutic effect on the symptom of metabolic or immune system disorder~~an obesity preventing bacterium, comprising,~~

using a non-human animal model that exhibits at least one symptom of metabolic or immune system disorders, wherein the gut microbiota population of the non-human animal model comprises at least an *Enterobacter cloacae* having a 16S rRNA gene, and wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1, and

administering a test microorganism or a combination thereof to the non-human animal model, if the animal model exhibits improvement in at least one symptom of metabolic or immune system disorders, it is indicative that the microorganism or a combination thereof has a preventive or therapeutic effect on the symptom of metabolic or immune system disorders.

~~providing a test obesity animal model and a control obesity animal model, wherein both the test obesity animal model and the control obesity animal model have a~~

gut microbiota population comprising at least one bacterium having a 16S rRNA gene, and wherein the sequence of the 16S rRNA gene is at least 75% similar to SEQ ID NO.1;

inoculating the test obesity animal model with a test bacterium to provide an inoculated test obesity animal model;

feeding a diet having at least 5% of fat content to both the inoculated test obesity animal model and the control obesity animal model for a period of time; and

measuring weight gain, serum level change of an endotoxin biomarker, or both in the inoculated test obesity animal model and in the control obesity animal model, wherein the weight gain of the inoculated test obesity animal model being statistically significantly less than the weight gain of the control obesity animal model, or the serum level change of the endotoxin biomarker in the inoculated test obesity animal model being statistically insignificant while the serum level change of endotoxin biomarker in the control non-human obesity animal model being statistically significant, or both is indicative that the test bacterium is effective in preventing metabolic syndrome.

3820. The method of Claim 3719, wherein the improvement in at least one symptom of metabolic or immune system disorders includes amelioration of symptom of obesity, insulin resistance, or chronic inflammation.~~the endotoxin biomarker comprises lipopolysaccharide-binding protein (LBP), lipopolysaccharide (LPS), or a combination thereof.~~

3921. The method of Claim 3719, wherein the improvement in at least one symptom of metabolic or immune system disorders includes one or more of weight loss, reduced fat, decreased blood lipids, improved insulin resistance, reduced level of serum lipopolysaccharide binding protein, decreased leptin resistance, decreased serum level of inflammation, or decreased inflammatory factor expression levels~~the bacterium comprises an isolate of gut bacterium of a subject.~~

40. ~~The method of Claim 37, wherein the subject is a human.~~

4122. The method of Claim 3719, wherein the metabolic syndrome comprises weight gain, obesity, insulin resistance, chronic inflammation, or a combination thereof.

4223. A method for screening an obesity causing bacterium, comprising,

inoculating a germ-free animal with an *Enterobacter cloacae* having a 16S rRNA gene while feeding the germ-free animal with a high-fat diet for a period of time to provide a non-human obesity animal model, wherein the sequence of the 16S rRNA gene is at least 95% similar to SEQ ID NO.1 and the *Enterobacter cloacae* is capable of colonizing the gut of a germ-free animal, and the non-human obesity animal model exhibits at least one type of metabolic or immune system disorders, and

comparing a test microorganism or combination thereof with the *Enterobacter cloacae*, if the test microorganism or a combination thereof exhibits similar effect as the *Enterobacter cloacae*, it is indicative that the test microorganism or combination thereof may cause obesity.

~~inoculating a germ-free animal with a test bacterium to provide a test animal;~~

~~feeding a diet having at least 5% of fat content to both the test animal and a control obesity animal model for a period of time, wherein the control obesity animal model has a gut microbiota population comprising at least one bacterium having a 16S rRNA gene, and wherein the sequence of the 16S rRNA gene is at least 75% similar to SEQ ID NO.1; and~~

~~measuring weight gain, serum level change of an endotoxin biomarker, or both in the test animal and in the control obesity animal model, wherein the weight gain of the test animal model being at least statistically similar to the weight gain of the control obesity animal model, or the serum level change of the endotoxin biomarker in the test animal being at least statistically similar to the serum level change of the endotoxin biomarker in the control obesity animal model, or both is indicative that the test bacterium increases the incidence of metabolic syndrome.~~

43. ~~The method of Claim 42, wherein the endotoxin biomarker comprises lipopolysaccharide-binding protein (LBP), lipopolysaccharide (LPS), or a combination thereof.~~

44~~24~~. The method of Claim 42~~23~~, wherein the metabolic syndrome comprises weight gain, obesity, insulin resistance, chronic inflammation, or a combination thereof.