CLAIMS

1. A genetically engineered microbial cell for the production of lactose or an oligosaccharide of interest which comprises a galactose-β1,4-glucose moiety at its reducing end, wherein said microbial cell possesses:
   - at least one glucose transporter for translocating glucose from the culture medium into the microbial cell's cytoplasm;
   - an UDP-galactose biosynthesis pathway; and
   - at least one β-1,4-galactosyltransferase being able to galactosylate free glucose to intracellularly produce lactose; and
   - wherein the glucokinase gene(s) of the microbial cell have been deleted or functionally inactivated.

2. The genetically engineered microbial cell according to claim 1, wherein the at least one glucose transporter is selected from the group consisting of glucose facilitated diffusion proteins and glucose translocating permeases.

3. The genetically engineered microbial cell according to claim 1 or 2, wherein said microbial cell expresses or overexpresses at least one gene encoding the glucose transporter, preferably at least one gene selected from the group consisting of *glf* and *galP*.

4. The genetically engineered microbial cell according to any one of claims 1 to 3, wherein said microbial cell possesses a phosphoglucomutase, a UTP-glucose-1-phosphate-uridyltransferase, and a UDP-glucose 4-epimerase.

5. The genetically engineered microbial cell according to any one of claims 1 to 4, wherein the β-1,4-galactosyltransferase is encoded by a gene selected from the group consisting of *Neisseria meningitidis lgtB*, *Aggregatibacter aphrophilus lex-1* and *Pasteurella multocida galTpm1141*.

6. The genetically engineered microbial cell according to any one of claims 1 to 5, wherein said microbial cell possesses at least one additional glycosyltransferase, preferably a glycosyltransferase selected from the group consisting of fucosyltransferases, sialyltransferases, glucosaminyltransferases and galactosyltransferases.

7. The genetically engineered microbial cell according to any one of claims 1 to 6, wherein the microbial cell comprises a glucose-translocating phosphotransferase system.

8. The genetically engineered microbial cell according to any one of claims 1 to 7, wherein said microbial cell possesses a fructose transporter.

9. The genetically engineered microbial cell according to any one of claims 1 to 8, wherein the microbial cell possesses a fructose specific phosphotransferase system, and wherein the cell further comprises 1-phosphofructokinase.

10. The genetically engineered microbial cell according to claim 8, wherein said microbial cell comprises fructokinase-6 activity and 6-phosphofructokinase-1 activity.

11. The genetically engineered microbial cell according to claim 9, wherein the microbial cell comprises a fructose-1,6-bisphosphatase.

12. The genetically engineered microbial cell according to claim 9 or 11, wherein said microbial cell comprises a deletion or functional inactivation of its glucose-6-phosphate isomerase.

13. The genetically engineered microbial cell according to any one of claims 6 to 12, wherein the additional glycosyltransferase is a fucosyltransferase, and wherein said microbial cell possesses a mannose-6-phosphate isomerase, a phosphomannomutase, a mannose-1-phosphate-guanylyltransferase, a GDP-mannose-4,6-dehydratase, a GDP-L-fucose synthase.

14. The genetically engineered microbial cell according to any one of claims 1 to 13, wherein said microbial cell comprises an exporter protein or a permease exporting the oligosaccharide of interest from the cell, preferably a sugar efflux transporter.

15. The genetically engineered microbial cell according to any one of claims 1 to 14, wherein said microbial cell is a bacterial cell selected from the group consisting of bacteria of the genera *Escherichia*, *Lactobacillus*, *Corynebac-*

terium, *Bacillus*, *Streptococcus*, *Enterococcus*, *Lactococcus* and *Clostidium*, preferably a bacterial cell that is selected from the group of bacterial species consisting of *Escherichia coli*, *Corynebacterium glutamicum, Clotridium cellulolyticum, Clostridium ljungdahlii, Clostridium autoethanogenum, Clostridium acetobutylicum, Bacillus subtilis, Bacillus megaterium, Lactobacillus casei, Lactobacillus acidophilus, Lactobacillus helveticus, Lactobacillus delbrueckii,* and *Lactococcus lactis*.

16. Use of a genetically engineered microbial cell according to any one of claims 1 to 15 for the production of lactose or an oligosaccharide of which comprises a galactose-β1,4-glucose moiety at its reducing end.

17. A method for the production of lactose or an oligosaccharide of interest which comprises a galactose-β1,4-glucose moiety at its reducing end, the method comprising the steps of:
    a) providing a genetically engineered microbial cell according to any one of claims 1 to 15;
    b) cultivating the microbial cell in a culture medium and under conditions that are permissive for the production of said lactose or oligosaccharide of interest, wherein the culture medium contains a mixture of glucose and at least one additional compound selected from the group consisting of fructose, galactose, mannose, xylose, rhamnose, glycerol, succinate, pyruvate and malate as main carbon source; and
    c) recovering the lactose or oligosaccharide of interest from the culture medium and/or the microbial cell.

18. The method according to claim 17, wherein the oligosaccharide of interest is a human milk oligosaccharide selected from the group consisting of 2'-fucosyllactose, 3-fucosyllactose, 2',3-difucosyllactose, 3'-sialyllactose, 6'-sialyllactose, 3-fucosyl-3'-sialyllactose, lacto-*N*-tetraose, lacto-*N*-*neo*tetraose, lacto-*N*-fucopentaose I, lacto-*N*-fucopentaose II, lacto-*N*-fucopentaose III, lacto-*N*-fucopentaose V, lacto-*N*-difucosylhexose I, lacto-*N*-difucosylhexaose II, lacto-*N*-sialylpentaose LSTa, LSTb, LSTc.

19. The method according to claim 17 or 18, wherein the mixture of glucose and at least one additional monosaccharide is a mixed feedstock of glucose and fructose, preferably obtained by hydrolyzation of sucrose.

20. The method according to any one of claims 17 to 19, wherein the microbial cell is cultivated without exogenous supply of lactose.