AMENDED CLAIMS
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1. A cell capable of fucosylating a glycoprotein, wherein the cell comprises a modified GDP-4-keto-6-deoxy-mannose-3,5-epimerase-4-reductase (FX) gene having a modification that codes for an FX protein that is at least 90% identical to SEQ ID NO:1 and that comprises a serine at position 289, and wherein no more than 10% of the glycoprotein is fucosylated when the cell is grown at a temperature of 37°C in the absence of an external fucose source.

2. The cell of claim 1, wherein the FX gene further comprises a modification that encodes an FX protein having an amino acid at a specific position selected from the group consisting of a serine at position 79, a lysine at position 90, a leucine at position 136, an arginine at position 211, and a combination thereof.

3. The cell of claim 1, wherein the FX protein is at least 95% identical to SEQ ID NO:1 and comprises a serine at position 289.

4. The cell of claim 1, wherein the cell is a Chinese hamster ovary (CHO) cell.

5. The cell of claim 1, wherein the FX protein is a hamster, mouse, rat, monkey, or human FX protein.

6. The cell of claim 1, wherein the cell expresses a glycoprotein that comprises an immunoglobulin CH2 region and an immunoglobulin CH3 region.

7. The cell of claim 6, wherein the glycoprotein is an antibody.

8. The cell of claim 6, wherein no more than 6% of the glycoprotein is fucosylated when the cell is grown at a temperature of 37°C in the absence of an external fucose source.

9. The cell of claim 8, wherein no more than 2% of the glycoprotein is fucosylated when the cell is grown at a temperature of 37°C in the absence of an external fucose source.

10. The cell of claim 1, wherein the cell fucosylates at least 70% of the glycoprotein when the cell is grown at a temperature of 34°C in the absence of an external fucose source.

11. The cell of claim 1, wherein the cell fucosylates at least 90% of the glycoprotein when the cell is grown at a temperature of 34°C in the absence of an external fucose source.

12. The cell of claim 1, wherein the cell fucosylates at least 70% of the glycoprotein when the cell is grown at a temperature of 37°C in the presence of an external fucose source.

13. The cell of claim 1, wherein the cell fucosylates at least 90% of the glycoprotein when the cell is grown at a temperature of 37°C in the presence of an external fucose source.

14. An isolated nucleotide sequence encoding an FX protein, wherein the FX protein comprises a serine at position 289, and wherein the FX protein is at least 90% identical to SEQ ID NO:1.

15. The isolated nucleotide sequence of claim 14, wherein the FX protein encoded by the nucleotide sequence further comprises a serine at position 79, or a lysine at position 90, or a leucine at position 136, or an arginine at position 211, or a combination thereof.

16. The isolated nucleotide sequence of claim 14, encoding an FX protein that is at least 95% identical with SEQ ID NO:1.

17. The cell of claim 1, further comprising a nucleotide sequence encoding an immunoglobulin gene.

18. A method for making a glycoprotein with reduced fucosylation, comprising:

culturing a mammalian cell that comprises a FX gene that codes for a FX protein with a serine at position 289 and wherein the FX protein is at least 90% identical to SEQ ID NO:1, at a temperature of 37°C and in the absence of an external fucose source, wherein the cell expresses a glycoprotein that comprises

an immunoglobulin CH2 region and an immunoglobulin CH3 region; and,

isolating the glycoprotein from the culture.

19. The method according to claim 18, wherein the FX gene codes for an FX protein having an amino acid at a specific position selected from a serine at position 79, a lysine at position 90, a leucine at position 136, an arginine at position 211, and a combination thereof.

20. The method of claim 18, wherein the glycoprotein is an antibody.

We claim:

1. A cell capable of fucosylating a glycoprotein, wherein the cell comprises a modified GDP-4-keto-6-deoxy-mannose-3,5-epimerase-4-reductase (FX) gene having a modification that codes for an FX protein that is at least 90% identical to SEQ ID NO:1 and that comprises a serine at position 289, and wherein no more than 10% of the glycoprotein is fucosylated when the cell is grown at a temperature of 37°C in the absence of an external fucose source.

2. The cell of claim 1, wherein the FX gene further comprises a modification that encodes an FX protein having an amino acid at a specific position selected from the group consisting of a serine at position 79, a lysine at position 90, a leucine at position 136, an arginine at position 211, and a combination thereof.

3. The cell of claim 1, wherein the FX protein is at least 95% identical to SEQ ID NO:1 and comprises a serine at position 289.

4. The cell of claim 1, wherein the cell is a Chinese hamster ovary (CHO) cell.

5. The cell of claim 1, wherein the FX protein is a hamster, mouse, rat, monkey, or human FX protein.

6. The cell of claim 1, wherein the cell expresses a glycoprotein that comprises an immunoglobulin CH2 region and an immunoglobulin CH3 region.

7. The cell of claim 6, wherein the glycoprotein is an antibody.

8. The cell of claim 6, wherein no more than 6% of the glycoprotein is fucosylated when the cell is grown at a temperature of 37°C in the absence of an external fucose source.

9. The cell of claim 8, wherein no more than 2% of the glycoprotein is fucosylated when the cell is grown at a temperature of 37°C in the absence of an external fucose source.

10. The cell of claim 1, wherein the cell fucosylates at least 70% of the glycoprotein when the cell is grown at a temperature of 34°C in the absence of an external fucose source.

11. The cell of claim 1, wherein the cell fucosylates at least 90% of the glycoprotein when the cell is grown at a temperature of 34°C in the absence of an external fucose source.

12. The cell of claim 1, wherein the cell fucosylates at least 70% of the glycoprotein when the cell is grown at a temperature of 37°C in the presence of an external fucose source.

13. The cell of claim 1, wherein the cell fucosylates at least 90% of the glycoprotein when the cell is grown at a temperature of 37°C in the presence of an external fucose source.

14. An isolated nucleotide molecule encoding an FX protein, wherein the FX protein comprises a serine at position 289.

15. The isolated nucleotide molecule of claim 14, wherein the FX protein encoded by the nucleotide sequence further comprises a serine at position 79, or a lysine at position 90, or a leucine at position 136, or an arginine at position 211, or a combination thereof.

16. The isolated nucleotide molecule of claim 14, encoding an FX protein that is at least 95% identical with SEQ ID NO:1.

17. The cell of claim 1, further comprising a nucleotide sequence encoding an immunoglobulin gene.

18. A method for making a glycoprotein with reduced fucosylation, comprising:
culturing a mammalian cell that comprises a FX gene that codes for a FX protein with a serine at position 289, at a temperature of about 37°C and in the absence of an external fucose source, wherein the cell expresses a glycoprotein that comprises an immunoglobulin CH2 region and an immunoglobulin CH3 region; and, isolating the glycoprotein from the culture.

19. The method according to claim 18, wherein the FX gene codes for an FX protein having an amino acid at a specific position selected from a serine at position 79, a lysine at position 90, a leucine at position 136, an arginine at position 211, and a combination thereof.

20. The method of claim 18, wherein the glycoprotein is an antibody.