We claim:

1. A cell comprising

a first nucleic acid encoding an iduronate-2-sulfatase (I2S) protein comprising an amino acid sequence at least 70% identical to SEQ ID NO:1; and

a second nucleic acid encoding a formylglycine generating enzyme (FGE) protein comprising an amino acid sequence at least 70% identical to SEQ ID NO:5,

wherein the first and/or the second nucleic acid are exogenous and wherein the cell, once cultivated under a cell culture condition, produces I2S protein comprising at least about 70% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly).

2. A cell comprising

a first nucleic acid encoding an iduronate-2-sulfatase (I2S) protein comprising an amino acid sequence at least 70% identical to SEQ ID NO:1; and

a second nucleic acid encoding a formylglycine generating enzyme (FGE) protein comprising an amino acid sequence at least 70% identical to SEQ ID NO:5,

wherein the first and/or the second nucleic acid are exogenous and wherein the cell, once cultivated under a cell culture condition, produces I2S protein comprising at least about 60% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly) and at a specific productivity rate of great than about 30 picogram/cell/day.

3. The cell of claim 1 or 2, wherein the cell, once cultivated under a cell culture condition, produces the I2S protein comprising at least about 80% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly).

4. The cell of any one of the preceding claims, wherein the cell, once cultivated under a cell culture condition, produces the I2S protein comprising at least about 90% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly).

5. The cell of any one of the preceding claims, wherein the cell, once cultivated under a cell culture condition, produces the I2S protein comprising at least about 95% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly).

6. The cell of any one of the preceding claims, wherein the cell, once cultivated under a cell culture condition, produces the I2S protein comprising at least about 97% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly).

7. The cell of any one of the preceding claims, wherein the first and/or the second nucleic acid is operably linked to a hCMV promoter.

8. The cell of any one of the preceding claims, wherein the first nucleic acid encodes an I2S protein having an amino acid sequence identical to SEQ ID NO:1.

9. The cell of any one of the preceding claims, wherein the second nucleic acid encodes an FGE protein having an amino acid sequence identical to SEQ ID NO:5.

10. The cell of any one of the preceding claims, wherein the first nucleic acid comprises a sequence at least 70% identical to SEQ ID NO:7

11. The cell of any one of the preceding claims, wherein the first nucleic acid comprises a sequence of SEQ ID NO:7.

12. The cell of any one of the preceding claims, wherein the second nucleic acid comprises a sequence at least 70% identical to SEQ ID NO:8

13. The cell of any one of the preceding claims, wherein the second nucleic acid comprises a sequence identical to SEQ ID NO:8.

14. The cell of any one of the preceding claims, wherein both of the first and second nucleic acids are exogenous.

15. The cell of any one of the preceding claims, wherein the first and/or second nucleic acids are integrated in the genome of the cell.

16. The cell of any one of the preceding claims, wherein the first and/or second nucleic acids are present in one or more extra-chromosomal constructs.

17. The cell of any one of the preceding claims, wherein the cell is a mammalian cell.

18. The cell of claim 17, wherein the mammalian cell is a human cell.

19. The cell of claim 17, wherein the mammalian cell is a CHO cell.

20. The cell of any one of the preceding claims, wherein the cell is adaptable to suspension culture.

21. A method of producing recombinant iduronate-2-sulfatase (I2S) protein comprising cultivating a cell of any one of the preceding claims under conditions such that the recombinant I2S and FGE proteins are co-expressed in the cell.

22. The method of claim 21, wherein the cell is cultivated at a large scale.

23. The method of claim 22, wherein the large scale is a bioreactor process.

24. The method of claim 23, wherein the bioreactor process is a perfusion process.

25. The method of claim 23 or 24, wherein the bioreactor is at a scale selected from 10L, 200L, 500L, 1000L, 1500L, or 2000L.

26. The method of claim 22, wherein the large scale is a roller bottle process.

27. The method of any one of claims 21-26, wherein the cell is cultivated in a serum-free medium.

28. The method of any one of claims 21-26, wherein the cell is cultivated in a serum-containing medium.

29. The method of any one of claims 21-26, wherein the cell is cultivated in suspension.

30. The method of any one of claims 21-26, wherein the cell is cultivated adherent.

31. The method of any one of claims 21-30, wherein the method further comprises a step of purifying the recombinant I2S protein.

32. A recombinant iduronate-2-sulfatase (I2S) protein produced by a method of any one of claims 21-31.

33. A recombinant iduronate-2-sulfatase (I2S) protein produced by a cell of any one of claims 1-20.

CLAIMS

1. Use of a cell in the manufacture of a medicament for the treatment of Hunter Syndrome, wherein the cell comprises

a first nucleic acid encoding an iduronate-2-sulfatase (I2S) protein comprising an amino acid sequence at least 90% identical to SEQ ID NO:1; and

a second nucleic acid encoding a formylglycine generating enzyme (FGE) protein comprising an amino acid sequence at least 90% identical to SEQ ID NO:5,

wherein the first and/or the second nucleic acid are exogenous and wherein the cell, once cultivated under a cell culture condition, produces I2S protein comprising at least about 70% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly), and wherein the level of iduronate-2-sulfatase protein expressed by the cell is between 0.3-fold and 10-fold higher than the level of formylglycine generating enzyme protein expressed by the cell.

2. Use of a cell in the manufacture of a medicament for the treatment of Hunter Syndrome, wherein the cell comprises

a first nucleic acid encoding an iduronate-2-sulfatase (I2S) protein comprising an amino acid sequence at least 90% identical to SEQ ID NO:1; and

a second nucleic acid encoding a formylglycine generating enzyme (FGE) protein comprising an amino acid sequence at least 90% identical to SEQ ID NO:5,

wherein the first and/or the second nucleic acid are exogenous and wherein the cell, once cultivated under a cell culture condition, produces I2S protein comprising at least about 70% conversion of the cysteine residue

corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly) and at a specific productivity rate of greater than about 30 picogram/cell/day.

3. The use of the cell of claims 1 or 2, wherein the cell, once cultivated under a cell culture condition, produces the I2S protein comprising at least about 80% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly).

4. The use of the cell of claims 1 or 2, wherein the cell, once cultivated under a cell culture condition, produces the I2S protein comprising at least about 90% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly).

5. The use of the cell of claims 1 or 2, wherein the cell, once cultivated under a cell culture condition, produces the I2S protein comprising at least about 95% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly).

6. The use of the cell of claims 1 or 2, wherein the cell, once cultivated under a cell culture condition, produces the I2S protein comprising at least about 97% conversion of the cysteine residue corresponding to Cys59 of SEQ ID NO:1 to Cα-formylglycine (FGly).

7. The use of the cell of claims 1 or 2, wherein the first and/or the second nucleic acid is operably linked to a hCMV promoter.

8. The use of the cell of claims 1 or 2, wherein the first nucleic acid comprises a sequence at least 70% identical to SEQ ID NO:7.

9. The use of the cell of claims 1 or 2, wherein the second nucleic acid comprises a sequence at least 70% identical to SEQ ID NO:8.

10. The use of the cell of claims 1 or 2, wherein both of the first and second nucleic acids are exogenous.

11. The use of the cell of claims 1 or 2, wherein the cell is a mammalian cell.

12. The use of the cell of claim 11, wherein the mammalian cell is a CHO cell.

13. The use of the cell of claims 1 or 2, wherein the cell is used in producing recombinant iduronate-2-sulfatase (I2S) protein comprising cultivating the cell under conditions such that the recombinant I2S and FGE proteins are co-expressed in the cell.

14. The use of the cell of claim 13, wherein the cell is cultivated in a large scale bioreactor process at a scale selected from 10L, 200L, 500L, 1000L, 1500L, or 2000L.

15. The use of the cell of claim 14, wherein the bioreactor process is a perfusion process.

16. The use of the cell of claim 13, wherein the cell is cultivated in a serum-free medium.

17. The use of the cell of claim 13, wherein the cell is cultivated in suspension.

18. The use of the cell of claim 13, wherein the producing further comprises a step of purifying the recombinant I2S protein.

19. The use of the cell according to claims 1 or 2, wherein the first nucleic acid encodes an iduronate-2-sulfatase (I2S) protein comprising an amino acid sequence at least 95% identical to SEQ ID NO:1.

20. The use of the cell according to claims 1 or 2, wherein the second nucleic acid encodes a formylglycine generating enzyme (FGE) protein comprising an amino acid sequence at least 95% identical to SEQ ID NO:5.

21. The use of the cell according to claims 1 or 2, wherein the first nucleic acid encodes an iduronate-2-sulfatase (I2S) protein comprising an amino acid sequence identical to SEQ ID NO:1.

22. The use of the cell according to claims 1 or 2, wherein the second nucleic acid encodes a formylglycine generating enzyme (FGE) protein comprising an amino acid sequence identical to SEQ ID NO:5.

23. The use of the cell according to claims 1 or 2, wherein the medicament is administered via a route comprising intrathecal administration.