**CLAIMS**

1. An isolated nucleotide sequence having at least 85% sequence identity to SEQ ID NO: 1 that codifies for the protein SEQ ID NO: 2.

2. The isolated nucleotide sequence according to claim 1, wherein said sequence is SEQ ID NO: 1.

3. A gene construction comprising the nucleotide sequence according to any of claims 1 or 2.

4. The gene construction according to claim 3, wherein said gene construction is a vector.

5. The gene construction according to claim 4, wherein said vector is an expression vector.

6. The expression vector according to claim 5, wherein said vector is an adeno-associated vector.

7. The expression vector according to claim 6, wherein the serotype is 1, 2, 5, 7, 8 or 9.

8. The expression vector according to claim 7, wherein the serotype is 9.

9. An expression vector according to claim 6 comprising a CAG promoter operably linked to SEQ ID NO: 1.

10. The expression vector AAV9-CAG-co-hu-SFMD according to claim 9 wherein the adeno-associated vector is serotype 9.

11. The plasmid vector pAAV-CAG-co-hu-SFMD according to claim 10 with accession number DSM 24817.

12. An expression vector according to claim 5 comprising a hAAT promoter operably linked to SEQ ID NO: 1.

13. The plasmid vector pAAV-hAAT-co-hu-SFMD according to claim 12 wherein the adeno-associated vector is serotype 8 or 9.

14. The plasmid vector pAAV9-hAAT-co-hu-SFMD according to claim 13 wherein the adeno-associated vector is serotype 9.

15. A pharmaceutical composition comprising: the nucleotide sequence according to any of claims 1 or 2; the gene construction according to any of claims 3 to 5; or the expression vector according to any of claims 6 to 14.

16. The pharmaceutical composition according to claim 15 for parenteral administration, preferably for intravenous or intracisternal administration.

17. The pharmaceutical composition according to any of claims 15 or 16 comprising a therapeutically effective amount of: the nucleotide sequence according to any of claims 1 or 2; the gene construction according to any of claims 3 to 5; or the expression vector according to any of claims 6 to 14.

18. The pharmaceutical composition according to claim 15 comprising a therapeutically effective amount of the adeno-associated vector of serotype 9 according to claim 9 for intracisternal administration.

19. The nucleotide sequence according to any of claims 1 or 2; the gene construction according to any of claims 3 to 5; or the expression vector

according to any of claims 6 to 14; or the pharmaceutical composition according to any of claims 15 to 18 for use as a medicament.

20. The nucleotide sequence according to any of claims 1 or 2; the gene construction according to any of claims 3 to 5; or the expression vector according to any of claims 6 to 14; or the pharmaceutical composition according to any of claims 15 to 18 for increasing the sulfamidase activity in the body.

21. The nucleotide sequence according to any of claims 1 or 2; the gene construction according to any of claims 3 to 5; or the expression vector according to any of claims 6 to 14; or the pharmaceutical composition according to any of claims 15 to 18 for use as medicament for enzyme replacement or gene therapy, preferably for gene therapy.

22. The nucleotide sequence according to any of claims 1 or 2; the gene construction according to any of claims 3 to 5; or the expression vector according to any of claims 6 to 14; or the pharmaceutical composition according to any of claims 15 to 18 for the treatment of mucopolysaccharidoses, preferably of mucopolysaccharidosis type IIIA or Sanfilippo syndrome.

23. A method of producing the expression vectors according to claim 6 comprising the steps of:

i) providing a first vector comprising the SEQ ID NO: 1 interposed between a first AAV terminal repeat and a second AAV terminal repeat, a CAG or hAAT promoter operably linked to the SEQ ID NO: 1; a second vector comprising an AAV rep gene and a AAV cap gene; and a third vector comprising the adenovirus helper function;

ii) co-transfecting competent cells with the vectors of step i);

iii) culturing the transfected cells of step ii); and

iv) purifying the expression vectors from the culture of step iii).

24. An isolated cell transfected with: the nucleotide sequence according to any of claims 1 or 2; the gene construction according to any of claims 3 to 5; or the expression vector according to any of claims 6 to 14.

25. A method of manufacturing the pharmaceutical compositions of any of claims 15 to 18 which comprises combining the nucleotide sequence according to any of claims 1 or 2; the gene construction according to any of claims 3 to 5; or the expression vector according to any of claims 6 to 14; and a pharmaceutically acceptable vehicle or carrier.

**26.** A method for treating mucopolysaccharidosis type IIIA comprising administering to a subject having mucopolysaccharidosis type IIIA the nucleotide sequence according to any of claims 1 or 2; the gene construction according to any of claims 3 to 5; or the expression vector according to any of claims 6 to 14; or the pharmaceutical composition according to any of claims 15 to 18.

Claims:

1. An isolated nucleotide sequence wherein said sequence is SEQ ID NO: 1.

2. A gene construction comprising the nucleotide sequence according to claim 1.

3. An expression vector comprising the gene construction according to claim 2.

4. The expression vector as defined in claim 3, wherein said vector is an adeno-associated vector.

5. The expression vector according to claim 4, wherein the serotype of the adeno-associated vector is 1, 2, 5, 7, 8 or 9.

6. The expression vector according to claim 5, wherein the serotype is 9.

7. The expression vector according to claim 4, comprising a CAG promoter operably linked to SEQ ID NO: 1.

8. The expression vector according to claim 7, wherein the expression vector is AAV9-CAG-co-hu-SFMD.

9. A plasmid pAAV-CAG-co-hu-SFMD with accession number DSM 24817, containing the isolated nucleotide sequence according to claim 1.

10. The expression vector according to claim 3 comprising a hAAT promoter operably linked to SEQ ID NO: 1.

11. The expression vector according to claim 10, wherein the expression vector is an adeno-associated virus serotype 9 (AAV9) comprising the codon optimized human sulfamidase gene (co-hu-SFMD) of SEQ ID NO: 1 operably linked to a human alpha1-antitrypsin promoter (hAAT) known as AAV9-hAAT-co-hu-SFMD.

12. A plasmid pAAV-hAAT-co-hu-SFMD comprising the codon optimized human sulfamidase gene (co-hu-SFMD) of SEQ ID NO: 1 according to claim 1 operably linked to a human alpha1-antitrypsin promoter (hAAT).

13. A pharmaceutical composition comprising the nucleotide sequence according to claim 1.

14. A pharmaceutical composition comprising the gene construction according to claim 2.

15. A pharmaceutical composition comprising the expression vector according to claim 3.

16. A method for increasing the sulfamidase activity in the body comprising administering to a subject in need thereof the pharmaceutical composition according to claim 13, 14, or 15.

17. A method for the treatment of mucopolysaccharidoses comprising administering to a subject having mucopolysaccharidoses the pharmaceutical composition according to claim 13, 14, or 15.

18. A method of producing the expression vectors according to claim 4 comprising the steps of:

i) providing a first vector comprising SEQ ID NO: 1 interposed between a first AAV terminal repeat and a second AAV terminal repeat, a CAG or hAAT promoter operably linked to SEQ ID NO: 1; a second vector comprising an AAV rep gene and an AAV cap gene; and a third vector comprising an adenovirus helper function;

ii) co-transfecting competent cells with the vectors of step i);

iii) culturing the transfected cells of step ii); and

iv) purifying the expression vectors from the culture of step iii).

19. An isolated cell transfected with the nucleotide sequence according to claim 1.

20. An isolated cell transfected with the gene construction according to claim 2.

21. An isolated cell transfected with the expression vector according to claim 3.