WHAT IS CLAIMED IS:

1. A polypeptide comprising a human acid alpha-glucosidase or a catalytically-active fragment thereof having a modification at or near an N-terminal 70-kDa processing site, wherein the polypeptide exhibits more rapid lysosomal protease processing when compared to an unmodified human acid alpha-glucosidase.

2. The polypeptide of claim 1, wherein the modification is increased hydrophobicity at or near the N-terminal 70-kDa processing site.

3. The polypeptide of claim 1, wherein the modification is at one or more amino acids corresponding to positions 195-209 of SEQ ID NO: 1.

4. The polypeptide of claim 3, wherein the modification is at one or more amino acids corresponding to positions 200-204 of SEQ ID NO: 1.

5. The polypeptide of claim 4, wherein the modification is at the amino acid corresponding to position 201 of SEQ ID NO: 1.

6. The polypeptide of any one of claims 1 to 5, wherein the modification comprises

a) substitution of one or more amino acids with a more hydrophobic amino acid, or

b) insertion of one or more hydrophobic amino acids.

7. The polypeptide of claim 1, wherein the fragment is chosen from a 70-kDa, 76-kDa, 82-kDa, 95-kDa, or any other catalytically-active fragment of human acid alpha-glucosidase.

8. The polypeptide of claim 1, wherein the polypeptide has at least 80% identity to at least 500 amino acids of SEQ ID NO: 1.

9. The polypeptide of claim 1, wherein at least 50% of the polypeptide is proteolytically processed to a 70-kDa form within 20 hours of administration.

10. The polypeptide of claim 9, wherein substantially all the polypeptide is proteolytically processed to a 70-kDa form within 55 hours of administration.

11. A nucleic acid encoding a polypeptide selected from any one of claims 1-10.

12. A host cell stably transfected with the nucleic acid of claim 11.

13. A pharmaceutical composition comprising a polypeptide of any one of claims 1 to 10 for use in treating a glycogen storage disease.

14. A polypeptide of any one of claims 1-10 for use in the reduction or prevention of glycogen accumulation in a tissue.

WHAT IS CLAIMED IS:

1. A polypeptide comprising a human acid alpha-glucosidase or a catalytically-active fragment thereof having a modification at or near an N-terminal 70-kDa processing site, wherein the modification comprises

a) substitution of one or more amino acids with a more hydrophobic amino acid, or

b) insertion of one or more hydrophobic amino acids,

wherein the polypeptide exhibits more rapid lysosomal protease processing when compared to an unmodified human acid alpha-glucosidase.

2. The polypeptide of claim 1, wherein the modification is increased hydrophobicity at or near the N-terminal 70-kDa processing site.

3. The polypeptide of claim 1, wherein the modification is at one or more amino acids corresponding to positions 195-209 of SEQ ID NO: 1.

4. The polypeptide of claim 3, wherein the modification is at one or more amino acids corresponding to positions 200-204 of SEQ ID NO: 1.

5. The polypeptide of claim 4, wherein the modification is at the amino acid corresponding to position 201 of SEQ ID NO: 1.

6. The polypeptide of claim 1, wherein the fragment is chosen from a 70-kDa, 76-kDa, 82-kDa, 95-kDa, or any other catalytically-active fragment of human acid alpha-glucosidase.

7. The polypeptide of claim 1, wherein the polypeptide has at least 80% identity to at least 500 amino acids of SEQ ID NO: 1.

8. The polypeptide of claim 1, wherein at least 50% of the polypeptide is proteolytically processed to a 70-kDa form within 20 hours of administration.

9. The polypeptide of claim 8, wherein substantially all the polypeptide is proteolytically processed to a 70-kDa form within 55 hours of administration.

10. A nucleic acid encoding a polypeptide selected from any one of claims 1-9.

11. A host cell stably transfected with the nucleic acid of claim 10.

12. A pharmaceutical composition comprising a polypeptide of any one of claims 1 to 9 for use in treating a glycogen storage disease.

13. A polypeptide of any one of claims 1-9 for use in the reduction or prevention of glycogen accumulation in a tissue.