

Claims

1. An alpha-1-microglobulin derived protein selected from the amino acid sequence consisting of formula I:

X¹-X²-X³-X⁴-X⁵-X⁶-X⁷-X⁸-X⁹-X¹⁰-X¹¹-X¹²-X¹³-X¹⁴-GPVPTPPDN IQVQENF-X¹⁵-IS
 RIYGKWYNLA IGSTCPWLKK I-X¹⁶-DRMTVSTL VLGEGATEAE ISMTST-X¹⁷-WRK
 GVCEETSGAY EKTDTDGKFL YHKS KW-X¹⁸-ITM ESYVVHTNYD EYAIFLTKKF
 SRHHGPTITA KLYGRAPQLR ETLLQDFRVV AQGVGIPEDS IFTMADRGE C
 VPGEQEPEPI LIPR (SEQ ID NO: 10)

and formula II:

X¹-X²-X³-X⁴-X⁵-X⁶-X⁷-X⁸-X⁹-X¹⁰-X¹¹-X¹²-X¹³-X¹⁴-GPVPTPPDN IQVQENF-X¹⁵-IS
 RIYGKWYNLA IGSTCPWLKK I-X¹⁶-DRMTVSTL VLGEGATEAE ISMTST-X¹⁷-WRK
 GVCEETSGAY EKTDTDGKFL YHKS KW-X¹⁸-ITM ESYVVHTNYD EYAIFLTKKF
 SRHHGPTITA KLYGRAPQLR ETLLQDFRVV AQGVGIPEDS IFTMADRGE C
 VPGEQEPEPI (SEQ ID NO: 17),

wherein at least one X is present;

X¹ is absent or represents Met or N-formyl Met;

X² is absent or represents His;

X³ is absent or represents His;

X⁴ is absent or represents His;

X⁵ is absent or represents His;

X⁶ is absent or represents His;

X⁷ is absent or represents His;

X⁸ is absent or represents His;

X⁹ is absent or represents His;

X¹⁰ is absent or selected from Asp, Glu, Lys, or Arg;

X¹¹ is absent or selected from Asp, Glu, Lys, or Arg;

X¹² is absent or selected from Asp, Glu, Lys, or Arg;

X¹³ is absent or selected from Asp, Glu, Lys, or Arg;

X¹⁴ is absent or selected from Asp, Glu, Lys, or Arg;

X¹⁵ represents Asp;

X¹⁶ represents Met or Lys or Arg;

X¹⁷ represents Arg or His or Lys;

X¹⁸ represents Asp;

or a pharmaceutically acceptable salt thereof, wherein the alpha-1-microglobulin derived protein has improved thermostability compared to human wild-type alpha-1-microglobulin.

2. The alpha-1-microglobulin derived protein according to claim 1, wherein

X¹ is Met or N-formyl Met,

X², X³, X⁴, X⁵, X⁶, X⁷ are His,

X⁸ and X⁹ are absent,

X¹⁰, X¹¹, X¹² and X¹³ are Asp,

X¹⁴ is Lys,

and X¹⁵-X¹⁸ are as defined above.

3. The alpha-1-microglobulin derived protein according to claim 1, wherein

X¹ is Met or N-formyl Met,

X², X³, X⁴, X⁵, X⁶, X⁷, X⁸ and X⁹ are His,

X¹⁰, X¹¹, X¹² and X¹³ are Asp,

X¹⁴ is Lys,

and X¹⁵-X¹⁸ are as defined above.

4. The alpha-1-microglobulin derived protein according to claim 1, wherein

X¹ is Met,

X², X³, X⁴, X⁵, X⁶, X⁷, X⁸, X¹⁰, X¹¹, X¹², X¹³, and X¹⁴, are absent,

X¹⁵ is Asp,

X¹⁶ is Met,

X¹⁷ is His,

and X¹⁸ is Asp.

5. The alpha-1-microglobulin according to claim 4 having an amino acid sequence corresponding to SEQ ID NO: 3 or SEQ ID NO: 18.

6. The alpha-1-microglobulin derived protein according to claim 1, wherein

X¹ is Met or N-formyl Met,

X², X³, X⁴, X⁵, X⁶, X⁷ are His,

X⁸ and X⁹ are absent,

X¹⁰, X¹¹, X¹² and X¹³ are Asp,
X¹⁴ is Lys,
X¹⁵ is Asp,
X¹⁶ is Met,
X¹⁷ is His,
and X¹⁸ is Asp.

7. The alpha-1-microglobulin derived protein according to claim 6 having an amino acid sequence corresponding to SEQ ID NO: 5 or SEQ ID NO: 20.
8. The alpha-1-microglobulin derived protein according to claim 1, wherein
X¹ is Met or N-formyl Met,
X², X³, X⁴, X⁵, X⁶, X⁷, X⁸ and X⁹ are His,
X¹⁰, X¹¹, X¹² and X¹³ are Asp,
X¹⁴ is Lys,
X¹⁵ is Asp,
X¹⁶ is Met,
X¹⁷ is His,
and X¹⁸ is Asp.
9. The alpha-1-microglobulin derived protein according to claim 8 having an amino acid sequence corresponding to SEQ ID NO: 7 or SEQ ID NO: 22.
10. The alpha-1-microglobulin derived protein according to any of the preceding claims, wherein said protein is an antioxidant.
11. The alpha-1-microglobulin derived protein according to any of the preceding claims, wherein said protein binds heme.
12. A pharmaceutical composition comprising an alpha-1-microglobulin derived protein according to any one of claims 1-17 and one or more pharmaceutically acceptable excipients.
13. An alpha-1-microglobulin derived protein according to any of the claims 1-17 for use in medicine.