CLAIMS

1. A collagen self-assembled element, wherein the collagen self-assembled element is a hinge-region amino acid sequence of human type III collagen for promoting self-crosslinking of a recombinant type III humanized collagen to form a triple helix structure, and comprises a sequence set forth in any one of the following (i) to (iii):

(i) the amino acid sequence set forth in SEQ ID NO.1, SEQ ID NO.2, SEQ ID NO.3, or SEQ ID NO.4;

(ii) an amino acid sequence obtained by substituting one or more amino acids in the amino acid sequence set forth in (i) with one or more conservative amino acids, deleting one or more amino acids from the amino acid sequence set forth in (i), or adding one or more amino acids to the amino acid sequence set forth in (i) and retaining a function of promoting self-crosslinking of the recombinant type III humanized collagen to form the triple helix structure; and

(iii) an amino acid sequence having at least 90%, 92%, 95%, 96%, 97%, 98%, or 99% identity to the amino acid sequence set forth in (i), wherein the difference in amino acid residues from the amino acid sequence set forth in (i) consists of one or more conservative amino acid substitutions, and retaining the function of promoting the self-crosslinking of the recombinant type III humanized collagen to form the triple helix structure.

2. A use of the collagen self-assembled element according to claim 1 in promotion of the self-crosslinking of the recombinant type III humanized collagen to form the triple helix structure by being present at a terminus of an amino acid sequence of the

recombinant type III humanized collagen.

3. The use according to claim 2, wherein the terminus of the amino acid sequence of the recombinant type III humanized collagen is C-terminus.

4. A recombinant type III humanized collagen, wherein the recombinant type III humanized collagen comprises the collagen self-assembled element according to claim 1 at a terminus thereof;
wherein the terminus of the recombinant type III humanized collagen is C-terminus.

5. The recombinant type III humanized collagen according to claim 4, wherein the recombinant type III humanized collagen comprises a sequence set forth in any one of the following (a) to (c):

(a) the amino acid sequence set forth in SEQ ID NO.6, SEQ ID NO.7, SEQ ID NO.8, or SEQ ID NO.9;

(b) an amino acid sequence obtained by substituting one or more amino acids in the amino acid sequence set forth in (a) with one or more conservative amino acids, deleting one or more amino acids from the amino acid sequence set forth in (a), or adding one or more amino acids to the amino acid sequence set forth in (a) and retaining an ability to self-crosslink and form the triple helix structure; and

(c) an amino acid sequence having at least 90%, 92%, 95%, 96%, 97%, 98%, or 99% identity to the amino acid sequence set forth in (a), wherein the difference in amino acid residues from the amino acid sequence set forth in (a) consists of one or more conservative amino acid substitutions, and retaining the ability to self-crosslink and form the triple helix structure.

6. A polynucleotide, wherein the polynucleotide encodes the collagen self-assembled element according to claim 1, or encodes a recombinant type III humanized collagen according to claim 4 or 5;
the polynucleotide comprises the nucleotide sequence set forth in SEQ ID NO.11, SEQ ID NO.12, SEQ ID NO.13, or SEQ ID NO.14.

7. A recombinant expression vector, wherein the recombinant expression vector comprises the polynucleotide according to claim 6.

8. A recombinant host cell, wherein the recombinant host cell comprises the recombinant expression vector according to claim 7.

9. A preparation method for the recombinant type III humanized collagen according to claim 4 or 5, wherein the preparation method comprises the following steps:

S1: constructing a recombinant expression vector comprising a polynucleotide according to claim 6 that encodes the recombinant type III humanized collagen according to claim 4 or 5, and constructing a recombinant host cell by transformation;

S2: culturing the recombinant host cell obtained in S1 in a medium and producing a protein;

S3: harvesting and purifying the protein by a Ni column and/or anion exchange chromatography; and

S4: subjecting the protein to enzyme digestion

with a tobacco etch virus (TEV) protease.