CLAIMS

1. A drug conjugate comprising
   (i) a biosynthetic random coil polypeptide or polypeptide segment comprising an amino acid sequence consisting solely of proline and alanine amino acid residues, wherein said amino acid sequence consists of at least 50 proline (Pro) and alanine (Ala) amino acid residues, and
   (ii) a pharmaceutical drug selected from the group consisting of (a) a biologically active protein or a polypeptide that comprises or that is an amino acid sequence that has or mediates a biological activity and (b) a small molecule drug.

2. The drug conjugate according to claim 1, wherein said random coil polypeptide or polypeptide segment comprises an amino acid sequence consisting of about 50 to about 3000 amino acid residues.

3. The drug conjugate according to claim 1 or 2, wherein said proline residues constitute more than about 10 % and less than about 75 % of the amino acid sequence.

4. The drug conjugate according to any one of claims 1 to 3, wherein said random coil polypeptide or polypeptide segment comprises a plurality of amino acid repeats, wherein said repeat consists of proline and alanine residues and wherein no more than 6 consecutive amino acid residues are identical.

5. The drug conjugate according to any one of claims 1 to 4, wherein said random coil polypeptide or polypeptide segment comprises an amino acid sequence selected from the group consisting of

   AAPAAPAPAAPAAPAPAAPA (SEQ ID NO: 1);
   AAPAAAPAPAAPAAPAPAAP(SEQ ID NO: 2);
   AAAPAAAPAAAPAAAPAAAP (SEQ ID NO: 3);
   AAPAAPAAPAAPAAPAAPAAPAAP (SEQ ID NO: 4);
   APAAAPAPAAAPAPAAAPAPAAAP (SEQ ID NO: 5);

AAAPAAPAAPPAAAAPAAPAAPPA (SEQ ID NO: 6); and
APAPAPAPAPAPAPAPAPAP (SEQ ID NO: 51)

or circular permuted versions or (a) multimer(s) of these sequences as a whole or parts of these sequences.

6. The drug conjugate according to any one of claims 1 to 5, wherein said polypeptide with biological activity, said biologically active protein or said a polypeptide that comprises or that is an amino acid sequence that has or that mediates a biological activity is selected from the group consisting of binding proteins, antibody fragments, cytokines, growth factors, hormones or enzymes.

7. The drug conjugate of claim 6, wherein said polypeptide with biological activity is a binding protein and wherein said binding molecule is selected from the group consisting of antibodies, Fab fragments, $F(ab')_2$ fragments, CDR-derived peptidomimetics, single chain variable fragments (scFv), domain antibodies, lectins, immunoglobulin domains, fibronectin domains, protein A domains, SH3 domains, ankyrin repeat domains, and lipocalins.

8. The drug conjugate of anyone of claims 1 to 7, wherein said biologically active protein is selected from the group consisting of granulocyte colony stimulating factor, human growth hormone, alpha-interferon, beta-interferon, gamma-interferon, tumor necrosis factor, erythropoietin, coagulation factor VIII, gp120/gp160, soluble tumor necrosis factor I and II receptor, reteplase, exendin-4, anakinra, interleukin-2, neutrophil gelatinase-associated lipocalin, follicle-stimulating hormone, glucocerebrosidase, thymosin alpha 1, glucagon, somatostatin, adenosine deaminase, interleukine 11, coagulation factor VIIa, coagulation factor IX, hematide, lambda-interferone, leptin, interleukine-22 receptor subunit alpha (IL-22ra), interleukine-22, hyaluronidase, fibroblast growth factor 18, fibroblast growth factor 21, glucagon-like peptide 1, osteoprotegerin, IL-18 binding protein, growth hormone releasing factor, soluble TACI receptor, thrombospondin-1, soluble VEGF receptor Flt-1, and IL-4 mutein.

9. The drug conjugate according to any one of claims 1 to 8, whereby said biosynthetic random coil polypeptide or polypeptide mediates an increased in vivo and/or in vitro stability of said drug conjugate.

10. The drug conjugate according to claim 9, wherein said increased in vivo stability is a prolonged plasma half-life of said drug conjugate which comprises said biosynthetic random coil polypeptide or polypeptide segment comprising an amino acid sequence consisting solely of proline and alanine amino acid residues, wherein said amino acid sequence consists of at least 50 proline (Pro) and alanine (Ala) amino acid residues, when compared to the stability of a control polypeptide or a control conjugate lacking said random coil random coil polypeptide or polypeptide segment.

11. A composition comprising the drug conjugate according to any one of claims 1 to 10.

12. The composition according to claim 11 which is a pharmaceutical composition.

13. A nucleic acid molecule encoding a protein conjugate that comprises a biologically active protein as defined in any one of claims 6 to 8 and that comprises a biosynthetic random coil polypeptide or polypeptide segment comprising an amino acid sequence consisting solely of proline and alanine amino acid residues, wherein said amino acid sequence consists of at least 50 proline (Pro) and alanine (Ala) amino acid residues.

14. A nucleic acid molecule encoding a drug conjugate as defined in any one of claims 1 to 10, said nucleic acid molecule comprising

(i) a nucleic acid sequence encoding a translated amino acid and/or a leader sequence;

(ii) a nucleic acid sequence encoding a biosynthetic random coil polypeptide or polypeptide segment comprising an amino acid sequence consisting solely of proline and alanine amino acid residues, wherein said amino acid sequence consists of at least 50 proline (Pro) and alanine (Ala) amino acid residues;

(iii) a nucleic acid sequence encoding a biologically active protein or said a polypeptide that comprises or that is an amino acid sequence that has or that mediates a biological and/or therapeutic activity; and

(iv) a nucleic acid sequence that represents or is a translational stop codon.

15. The nucleic acid molecule of claim 14, wherein the nucleic acid molecule parts or segments as defined in (ii) and in (iii) are interchanged in their position on said nucleic acid molecule encoding a drug conjugate .

16. The nucleic acid molecule of claim 14 or 15 that optionally comprises, between parts or segments as defined in (i) and in (ii) and/or between parts or segments as defined in (ii) and (iii), a protease and/or a chemical cleavage site and/or a recognition site.

17. A vector comprising the nucleic acid of any one of claims 13 to 16.

18. A host cell comprising the nucleic acid according to any one of claims 13 to 16 or the vector according to claim 17.

19. A method for the preparation of a random coil polypeptide or a random coil polypeptide segment as comprised in the drug conjugate of any one of claims 1 to 10, for the preparation of the biologically active protein or a drug conjugate comprising said random coil polypeptide or said random coil polypeptide segment and/or for the preparation of a polypeptide that comprises or that is an amino acid sequence that has or that mediates a biological activity as defined in anyone of claims 1 to 8 and that additionally comprises said random coil polypeptide or random coil polypeptide segment,

said method comprising culturing the cell according to claim 18 and isolating said random coil polypeptide or biologically active protein and/or said biologically active protein or said polypeptide from the culture or from said cell.

20. The drug conjugate according to any one of claims 1 to 10, the composition of claim 11 or 12, the nucleic acid according to any one of claims claim 13 to 16, the vector according to claim 17, the cell according to claim 18, or the biologically active protein or polypeptide that comprises said random coil polypeptide or random coil polypeptide segment and as prepared by the method of claim 19 for use in the treatment of hormone deficiency-related disorders, auto-immune disease, proliferative disorders,cancer, anaemia, neovascular diseases, infectious/inflammatory diseases, allergic disorders, thrombosis, myocardial infarction, restinosis,diabetes, infertility, Gaucher's disease, chronic hepatitis B, hepatitis C, hypoglycaemia, acromegaly, adenosine deaminase deficiency, thrombocytopenia, haemophilia, anemia, obesity, Alzheimer's disease, lipodistrophy, psoriasis, metastatic melanoma, osteoarthritis, dyslipidemia, rheumatoid arthritis, systemic lupus erythromatosis, multiple sclerosis, asthma, osteoporosis and reperfusion injury or other kidney diseases.

21. The drug conjugate according to any one of claims 1 to 10, the composition of claim 12 or 13, the nucleic acid according to any one of claims claim 13 to 16, the vector according to claim 17 or the cell according to claim 18 for the use as a medicament which has an increased in vivo and/or in vitro stability of said random coil polypeptide or polypeptide segment, biologically active protein, or drug conjugate.