CLAIMS

1. A method of targeting cell membrane phosphatidylserine (PtdS) comprising:

(a) providing an isolated polypeptide comprising a gamma-carboxyglutamic-acid (Gla) domain and lacking a protease or hormone-binding domain; and

(b) contacting said peptide with a cell surface,

wherein said polypeptide binds to PtdS on said cell membrane.

2. The method of claim 1, wherein said cell membrane is a cardiac cell membrane, a neuronal cell membrane, an endothelial cell membrane, a virus-infected cell membrane, an apoptotic cell membrane, a platelet membrane or a cancer cell membrane.

3. The method of claim 1, wherein said polypeptide further comprises an EGF binding domain.

4. The method of claim 1, wherein said polypeptide further comprises a Kringle domain.

5. The method of claim 1, wherein said polypeptide further comprises an aromatic amino acid stack domain.

6. The method of claim 1, wherein said Gla domain is a Gla domain from Factor II, Factor VII, Factor IX, Factor X, protein S or protein C.

7. The method of claim 1, wherein said polypeptide further comprises a detectable label.

8. The method of claim 7, wherein said detectable label is a fluorescent label, a chemilluminescent label, a radiolabel, an enzyme, a dye or a ligand.

9. The method of claim 1, wherein said polypeptide further comprises a therapeutic agent.

10. The method of claim 9, wherein said therapeutic agent is an anti-cancer agent.

11. The method of claim 10, wherein said anti-cancer agent is a chemotherapeutic, a radiotherapeutic, a cytokine, a hormone, an antibody or antibody fragment or a toxin.

12. The method of claim 9, wherein said therapeutic agent is an anti-viral agent.

13. The method of claim 9, wherein the therapeutic agent is an enzyme, such as a prodrug converting enzyme.

14. The method of claim 9, wherein the theraepeutic agent is a cytokine, growth factor, clotting factor, or anti-coagulant.

15. The method of claim 1, wherein said polypeptide is 300 residues or less, 200 residues or less, or 100 residues or less.

16. The method of claim 1, wherein said polypeptide comprises 5-15 Gla residues.

17. The method of claim 1, wherein said polypeptide comprises 9-13 Gla residues.

18. The method of claim 1, wherein said polypeptide comprises more than 13 Gla residues, but less than 30% total Gla residues.

19. The method of claim 1, wherein said polypeptide is between about 4.5 and 30 kD in size.

20. The method of claim 1, wherein said polypeptide comprises at least one disulfide bond.

21. The method of claim 1, wherein said polypeptide comprises 2-5 disulfide bonds.

22. The method of claim 1, wherein said polypeptide comprises protein S Gla domain.

23. The method of claim 1, wherein said polypeptide comprises protein S Gla domain and protein S EGF domain.

24. The method of claim 1, wherein said polypeptide comprises prothrombin Gla domain.

25. The method of claim 1, wherein said polypeptide comprises prothrombin Gla domain plus prothrombin Kringle domain.

26. The method of claim 1, wherein said polypeptide comprises protein Z Gla domain.

27. The method of claim 1, wherein said polypeptide comprises protein Z Gla domain plus prothrombin Kringle domain.

28. The method of claim 1, wherein said polypeptide comprises Factor VII Gla domain.

29. The method of claim 1, wherein said polypeptide comprises Factor VII Gla domain plus prothrombin Kringle domain.

30. The method of claim 1, wherein said polypeptide further comprises an antibody Fc region.

31. The use of an isolated polypeptide comprising a gamma-carboxyglutamic-acid (Gla) domain and lacking a protease or hormone-binding domain, wherein said polypeptide is linked to a therapeutic payload, in the manufacture of a medicament for the treatment of cancer.

32. The use of claim 31, wherein said therapeutic payload is a chemotherapeutic, a radiotheraputic or a toxin.

33. The use of claim 31, where said cancer is breast cancer, brain cancer, stomach cancer, lung cancer, prostate cancer, ovarian cancer, testicular cancer, colon cancer, skin cancer, rectal cancer, cervical cancer, uterine cancer, liver cancer, pancreatic cancer, head & neck cancer or esophageal cancer.

34. The use of an isolated polypeptide comprising a gamma-carboxyglutamic-acid (Gla) domain and lacking a protease or hormone-binding domain, wherein said polypeptide is linked to an anti-viral agent, in the manufacture of a medicament for the treatment of a viral disease.

35. The use of claim 34, wherein said viral disease is influenza, human immunodeficiency virus, dengue virus, West Nile virus, smallpox virus, respiratory syncytial virus, Korean hemorrhagic fever virus, chickenpox, varicella zoster virus, herpes simplex virus 1 or 2, Epstein-Barr virus, Marburg virus, hantavirus, yellow fever virus, hepatitis A, B, C or E, Ebola virus, human papilloma virus, rhinovirus, Coxsackie virus, polio virus, measles virus, rubella virus, rabies virus, Newcastle disease virus, rotavirus, HTLV-1 and -2.

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   (a) providing an isolated polypeptide comprising a gamma-carboxyglutamic-acid (Gla) domain and lacking a protease or hormone-binding domain; and

   (b) contacting said peptide with a cell surface,

   wherein said polypeptide binds to PtdS on said cell membrane, and
   wherein said polypeptide further comprises an EGF binding domain.

2. The method of claim 1, wherein said cell membrane is a cardiac cell membrane, a neuronal cell membrane, an endothelial cell membrane, a virus-infected cell membrane, an apoptotic cell membrane, a platelet membrane or a cancer cell membrane.

3. The method of claim 1, wherein said polypeptide further comprises a Kringle domain.

4. The method of claim 1, wherein said polypeptide further comprises an aromatic amino acid stack domain.

5. The method of claim 1, wherein said Gla domain is a Gla domain from Factor II, Factor VII, Factor IX, Factor X, protein S or protein C.

6. The method of claim 1, wherein said polypeptide further comprises a detectable label.

7. The method of claim 6, wherein said detectable label is a fluorescent label, a chemilluminescent label, a radiolabel, an enzyme, a dye or a ligand.

8. The method of claim 1, wherein said polypeptide further comprises a therapeutic agent.

9. The method of claim 8, wherein said therapeutic agent is an anti-cancer agent.

10. The method of claim 9, wherein said anti-cancer agent is a chemotherapeutic, a radiotherapeutic, a cytokine, a hormone, an antibody or antibody fragment or a toxin.

11. The method of claim 8, wherein said therapeutic agent is an anti-viral agent.

12. The method of claim 8, wherein the therapeutic agent is an enzyme, such as a prodrug converting enzyme.

13. The method of claim 8, wherein the theraepeutic agent is a cytokine, growth factor, clotting factor, or anti-coagulant.

14. The method of claim 1, wherein said polypeptide is 300 residues or less, 200 residues or less, or 100 residues or less.

15. The method of claim 1, wherein said polypeptide comprises 5-15 Gla residues.

16. The method of claim 1, wherein said polypeptide comprises 9-13 Gla residues.

17. The method of claim 1, wherein said polypeptide comprises more than 13 Gla residues, but less than 30% total Gla residues.

18. The method of claim 1, wherein said polypeptide is between about 4.5 and 30 kD in size.

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22. The method of claim 1, wherein said polypeptide comprises protein S Gla domain and protein S EGF domain.

23. The method of claim 1, wherein said polypeptide comprises prothrombin Gla domain.

24. The method of claim 1, wherein said polypeptide comprises prothrombin Gla domain plus prothrombin Kringle domain.

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27. The method of claim 1, wherein said polypeptide comprises Factor VII Gla domain.

28. The method of claim 1, wherein said polypeptide comprises Factor VII Gla domain plus prothrombin Kringle domain.

29. The method of claim 1, wherein said polypeptide further comprises an antibody Fc region.

30. The use of an isolated polypeptide comprising a gamma-carboxyglutamic-acid (Gla) domain and lacking a protease or hormone-binding domain, wherein said polypeptide is linked to a therapeutic payload, in the manufacture of a medicament for the treatment of cancer, wherein said polypeptide binds to PtdS on cell membrane, and wherein said polypeptide further comprises an EGF binding domain.

31. The use of claim 30, wherein said therapeutic payload is a chemotherapeutic, a radiotheraputic or a toxin.

32. The use of claim 30, where said cancer is breast cancer, brain cancer, stomach cancer, lung cancer, prostate cancer, ovarian cancer, testicular cancer, colon cancer, skin cancer, rectal cancer, cervical cancer, uterine cancer, liver cancer, pancreatic cancer, head & neck cancer or esophageal cancer.

33. The use of an isolated polypeptide comprising a gamma-carboxyglutamic-acid (Gla) domain and lacking a protease or hormone-binding domain, wherein said polypeptide is linked to an anti-viral agent, in the manufacture of a medicament for the treatment of a viral disease, wherein said polypeptide binds to PtdS on cell membrane, and wherein said polypeptide further comprises an EGF binding domain.

34. The use of claim 33, wherein said viral disease is influenza, human immunodeficiency virus, dengue virus, West Nile virus, smallpox virus, respiratory syncytial virus, Korean hemorrhagic fever virus, chickenpox, varicella zoster virus, herpes simplex virus 1 or 2, Epstein-Barr virus, Marburg virus, hantavirus, yellow fever virus, hepatitis A, B, C or E, Ebola virus, human papilloma virus, rhinovirus, Coxsackie virus, polio virus, measles virus, rubella virus, rabies virus, Newcastle disease virus, rotavirus, HTLV-1 and -2.