CLAIMS

1. A recombinant fusion protein comprising a fragment of the cardioprotective protein neuregulin-1 (NRG-1) fused to a monospecific ErbB3 (HER3) monoclonal antibody (mAb).

2. The recombinant fusion protein of claim 1, wherein the NRG-1 fragment comprises an active fragment.

3. The recombinant fusion protein of claim 2, wherein the active protein fragment of NRG-1 comprises the active domain of NRG-1.

4. The recombinant fusion protein of any one of claims 1-3, wherein the NRG-1 fragment comprises the ERBB3/4 binding domain.

5. The recombinant fusion protein of any one of claims 1-4, wherein the NRG-1 fragment binds to and induces signaling through ErbB4 (HER4).

6. The recombinant fusion protein of claim 5, wherein the mAb inhibits NRG-1 signaling through ErbB3 (HER3).

7. The recombinant fusion protein of any one of claims 1-6, wherein said NRG-1 fragment comprises the NRG-1 ß2a isoform.

8. The recombinant fusion protein of any one claims 1-7, wherein the NRG-1 fragment is fused via its N-terminal amino acid to the C-terminus of the antibody heavy chain using a linker.

9. The recombinant fusion protein of claim 8, wherein said linker comprises at least one copy of a Gly-Gly-Gly-Gly-Ser-Gly-Gly-Gly-Gly-Ser linker set forth in SEQ ID NO: 5.

10. The recombinant fusion protein of claim 8, wherein the C-terminus of the antibody heavy chain comprises the Fc domain of the antibody.

11. The recombinant fusion protein of any one of claims 1-10, wherein the monoclonal antibody is glycosylated.

12. The recombinant fusion protein of claim 11, wherein the glycosylation is N-glycosylation.

13. The recombinant fusion protein of claim 11, wherein the glycosylation is O-glycosylation.

14. The recombinant fusion protein of any one of claims 1-13, wherein the NRG-1 fragment comprises the amino acid sequence of SEQ ID NO: 4.

15. The recombinant fusion protein of any one of claims 1-14, wherein the mAb comprises a heavy chain represented by the amino acid sequence of SEQ ID NO: 2.

16. The recombinant fusion protein of any one of claims 1-15, wherein the mAb comprises a light chain represented by the amino acid sequence of SEQ ID NO: 3.

17. The recombinant fusion protein of claim 15, wherein the mature mAb comprises a substitution mutation in at least one of amino acids 234, 239 and 434 of SEQ ID NO: 2.

18. The recombinant fusion protein of claim 17, wherein the at least one substitution mutation comprises a L234F mutation, a S239A mutation, a N434A mutation, or a combination thereof.

19. The recombinant fusion protein of any one of claims 1-18, wherein the recombinant fusion protein comprises the amino acid sequences of SEQ ID NO: 3 and SEQ ID NO: 14.

20. The recombinant fusion protein of any one of claims 1-19, wherein the recombinant fusion protein attenuates proliferation of tumor or cancer cells relative to recombinant NRG-1.

21. The recombinant fusion protein of any one of claims 1-20, wherein the recombinant fusion protein promotes cardiomyocyte proliferation, differentiation, and survival.

22. The recombinant fusion protein of any one of claims 1-21, wherein the recombinant fusion protein promotes proliferation, differentiation and survival of cardiac tissue.

23. The recombinant fusion protein of any one of claims 1-22, wherein the recombinant fusion protein promotes proliferation, differentiation and survival of central nervous system (CNS) cells.

24. The recombinant fusion protein of any one of claims 1-23, wherein the recombinant fusion protein has a reduced capacity to induce antibody-dependent cell cytotoxicity (ADCC).

25. The recombinant fusion protein of any one of claims 1-24, wherein the recombinant fusion protein promotes HER2/4 signaling over HER2/3 signaling relative to the signal induction potential of recombinant NRG-1.

26. A recombinant nucleic acid molecule encoding the recombinant fusion protein of any one of claims 1-25.

27. A recombinant vector comprising the nucleic acid molecule of claim 26.

28. A recombinant cell comprising the recombinant vector of claim 27.

29. A pharmaceutical composition comprising the recombinant fusion protein of anyone of claims 1-25.

30. Use of the recombinant fusion protein of any one of claims 1-25 or the pharmaceutical composition of claim 29 in the manufacture of a medicament for treating a cardiovascular disease or condition in a subject in need thereof, the treatment comprising administering a therapeutically effective amount of the recombinant fusion protein of or the pharmaceutical composition to the subject.

31. The use of claim 30, wherein the treatment alleviates a sign or a symptom of the cardiovascular disease or condition in the subject.

32. Use of the recombinant fusion protein of any one of claims 1-25 or the pharmaceutical composition of claim 29 in the manufacture of a medicament for suppressing, inhibiting or delaying the onset of a cardiovascular disease or condition in a subject, the treatment comprising administering an effective amount of the recombinant fusion protein of or the pharmaceutical composition to the subject.

33. The use of any one of claims 30-32, wherein the cardiovascular disease or condition is Chronic heart failure / Congestive heart failure (CHF), Acute heart failure / Myocardial infarction (MI), Left ventricular systolic dysfunction, Reperfusion injury associated with MI, Chemotherapy-induced cardiotoxicity (adult or pediatric), Radiation-induced cardiotoxicity, Adjunct to surgical intervention in pediatric congenital heart disease.

34. The use of claim 33, wherein the chemotherapy-induced cardiotoxicity results from a subject receiving anthracyclines, alkylating agents, antimicrotubule agents, or antimetabolite agents used as chemotherapy.

35. The use of claim any one of claims 30-32, wherein the cardiovascular condition is cardiotoxicity as a result of a subject receiving a cancer therapy.

36. The use of claim 35, wherein the cancer therapy is a HER-2 targeted therapy.

37. The use of claim 36, wherein the HER-2 targeted therapy comprises use of trastuzumab, ado-trastuzumab, emtansine, lapatinib, neratinib, and pertuzumab, any anti-HER2 antibody, any anti-HER2 agent or a combination thereof.

38. A kit, comprising an effective amount of the recombinant protein of any one of claims 1-25 or the pharmaceutical composition of claim 29.