CLAIMS

What is claimed is:

1. A method of treating a tissue exhibiting eosinophil-related inflammation in a subject, the method comprising administering to the subject a composition comprising:

a therapeutically effective amount of a polymer of an acidic amino acid or a pharmaceutically acceptable salt thereof, wherein the polymer has an average molecular weight of at least about 5 kDa; and

a pharmaceutically acceptable excipient,

wherein the polymer binds to one or more eosinophil granule proteins in the tissue to treat the eosinophil-related inflammation.

2. A method of reducing eosinophil-related inflammation in a tissue in a subject, the method comprising administering to the subject a composition comprising:

a therapeutically effective amount of a polymer of an acidic amino acid or a pharmaceutically acceptable salt thereof, wherein the polymer has an average molecular weight of at least about 5 kDa; and

a pharmaceutically acceptable excipient,

wherein the polymer binds to one or more eosinophil granule proteins in the tissue to reduce the eosinophil-related inflammation.

3. The method of any one of claims 1-2, wherein the acidic amino acid is selected from the group consisting of aspartate, glutamate, and combinations thereof.

4. The method of claim 3, wherein the polymer of glutamate is selected from the group consisting of α poly-L-glutamic acid, α poly-D-glutamic acid, γ polyglutamic acid, and combinations thereof.

5. The method of claim 4, wherein the average molecular weight of the polymer of α poly-L-glutamic acid is selected from the group consisting of: about 5 kDa to about 7.5 kDa, about 7.5 kDa to about 9 kDa, about 9 kDa to about 33 kDa, about 33 kDa to about 120 kDa, and greater than about 120 kDa;

the average molecular weight of the polymer of a poly-D-glutamic acid is selected from the group consisting of: about 5 kDa to about 33 kDa, and greater than about 33 kDa; and

the average molecular weight of the polymer of γ polyglutamic acid is selected from the group consisting of: about 5 kDa to about 10 kDa, about 10 kDa to about 50 kDa, about 50 kDa to about 100 kDa, about 100 kDa to about 500 kDa, about 500 kDa to about 700 kDa, and greater than about 700 kDa.

6. The method of claim 3, wherein the polymer of aspartate is α poly-L-aspartic acid.

7. The method of claim 6, wherein the average molecular weight of the polymer of α poly-L-aspartic acid is selected from the group consisting of: about 5 kDa to about 5.75 kDa, about 5.75 kDa to about 23 kDa, and greater than about 23 kDa.

8. The method of any one of claims 1-3, wherein the average molecular weight of the polymer is at least about 20 kDa.

9. The method of claim 8, wherein the average molecular weight of the polymer is at least about 100 kDa.

10. The method of claim 9, wherein the average molecular weight of the polymer is at least about 700 kDa.

11. The method of any one of claims 1-2, wherein the acidic amino acid is aspartate, wherein the average molecular weight of the polymer is at least about 20 kDa.

12. The method of any one of claims 1-2, wherein the acidic amino acid is glutamate, wherein the average molecular weight of the polymer is at least about 100 kDa.

13. The method of claim 12, wherein the average molecular weight of the polymer is at least about 700 kDa.

14. The method of any one of claims 1-13, wherein the one or more eosinophil granule proteins comprise one or more of major basic protein 1 (eMBP1), major basic protein 2 (eMBP2), eosinophil derived neurotoxin (EDN), eosinophil cationic protein (ECP), and eosinophil peroxidase (EPO).

15. The method of any one of claims 1-14, further comprising a therapeutic agent conjugated to the polymer.

16. The method of claim 15, wherein the therapeutic agent is a glucocorticoid.

17. The method of any one of claims 1-16, wherein at least 50% of chains of the polymer in the composition have a molecular weight of at least 5 kDa.

18. The method of claim 17, wherein at least 70% of chains of the polymer in the composition have a molecular weight of at least 5 kDa.

19. The method of any one of claims 1-18, wherein the composition is administered systemically.

20. A composition for use in treating a tissue exhibiting eosinophil-related inflammation in a subject, the composition comprising:

an effective amount of a polymer of an acidic amino acid or a pharmaceutically acceptable salt thereof, the polymer having an average molecular weight of at least about 5

kDa, wherein the polymer is configured to bind to one or more eosinophil granule proteins in the tissue to treat the eosinophil-related inflammation; and

a pharmaceutically acceptable excipient.

21. The composition of claim 20, wherein the acidic amino acid is selected from the group consisting of aspartate, glutamate, and combinations thereof.

22. The composition of claim 21, wherein the polymer of glutamate is selected from the group consisting of α poly-L-glutamic acid, α poly-D-glutamic acid, γ polyglutamic acid, and combinations thereof.

23. The composition of claim 22, wherein the average molecular weight of the polymer of α poly-L-glutamic acid is selected from the group consisting of: about 5 kDa to about 7.5 kDa, about 7.5 kDa to about 9 kDa, about 9 kDa to about 33 kDa, about 33 kDa to about 120 kDa, and greater than about 120 kDa;

the average molecular weight of the polymer of a poly-D-glutamic acid is selected from the group consisting of: about 5 kDa to about 33 kDa, and greater than about 33 kDa; and

the average molecular weight of the polymer of γ-polyglutamic acid is selected from the group consisting of: about 5 kDa to about 10 kDa, about 10 kDa to about 50 kDa, about 50 kDa to about 100 kDa, about 100 kDa to about 500 kDa, about 500 kDa to about 700 kDa, and greater than about 700 kDa.

24. The composition of claim 21, wherein the polymer of aspartate is α poly-L-aspartic acid.

25. The composition of claim 24, wherein the average molecular weight of the polymer of α poly-L-aspartic acid is selected from the group consisting of: about 5 kDa to about 5.75 kDa, about 5.75 kDa to about 23 kDa, and greater than about 23 kDa.

26. The composition of any one of claims 20-21, wherein the average molecular weight of the polymer is at least about 20 kDa.

27. The composition of claim 26, wherein the average molecular weight of the polymer is at least about 100 kDa.

28. The composition of claim 27, wherein the average molecular weight of the polymer is at least about 700 kDa.

29. The composition of claim 20, wherein the acidic amino acid is aspartate, wherein the average molecular weight of the polymer is at least about 20 kDa.

30. The composition of claim 20, wherein the acidic amino acid is glutamate, wherein the average molecular weight of the polymer is at least about 100 kDa.

31. The composition of claim 30, wherein the average molecular weight of the polymer is at least about 700 kDa.

32. The composition of any one of claims 20-31, wherein the one or more eosinophil granule proteins comprise one or more of major basic protein 1 (eMBP1), major basic protein 2 (eMBP2), eosinophil derived neurotoxin (EDN), eosinophil cationic protein (ECP), and eosinophil peroxidase (EPO).

33. The composition of any one of claims 20-32, further comprising a therapeutic agent conjugated to the polymer.

34. The composition of claim 33, wherein the therapeutic agent is a glucocorticoid.

35. The composition of any one of claims 20-34, wherein at least 50% of chains of the polymer in the composition have a molecular weight of at least 5 kDa.

36. The composition of claim 35, wherein at least 70% of chains of the polymer in the composition have a molecular weight of at least 5 kDa.

37. The composition of any one of claims 20-36, wherein the composition is configured to be administered systemically.

38. The composition of any one of claims 20-37, further comprising a radiolabeled contrast agent conjugated to the polymer.

39. The composition of claim 38, wherein the radiolabeled contrast agent is ^{99m}Tc.

40. A method of producing a medical image of an organ in a subject, the method comprising:

administering, to the subject, a composition comprising an effective dose of a radiolabeled polymer of an acidic amino acid or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable excipient, the radiolabeled polymer having an average molecular weight of at least about 5 kDa, wherein the radiolabeled polymer is configured to bind to one or more eosinophil granule proteins to form a radiolabeled polymer/eosinophil granule protein complex, and

detecting the radiolabeled polymer/eosinophil granule protein complex in a mucosal tissue of the organ, thereby producing a medical image of the organ.

41. A method of diagnosing eosinophil-related inflammation in an organ of a subject, the method comprising:

administering, to the subject, a composition comprising an effective dose of a radiolabeled polymer of an acidic amino acid or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable excipient, the radiolabeled polymer having an average molecular weight of at least about 5 kDa, wherein the radiolabeled polymer is configured to bind to one or more eosinophil granule proteins to form a radiolabeled polymer/eosinophil granule protein complex, and

detecting the radiolabeled polymer/eosinophil granule protein complex in a mucosal tissue of the organ, thereby diagnosing the eosinophil-related inflammation in the organ.