

WHAT IS CLAIMED:

1. ~~An antibody or antigen-binding fragment thereof that~~
 - (a) ~~binds to an epitope of human SIRP α recognized by an antibody comprising a light chain variable region having an amino acid sequence of SEQ ID NO:67 and a heavy chain variable region having an amino acid sequence of SEQ ID NO:80; or~~
 - (b) ~~competes for the binding to human SIRP α with an antibody comprising a light chain variable region having an amino acid sequence of SEQ ID NO:67 and a heavy chain variable region having an amino acid sequence of SEQ ID NO:80.~~
2. ~~An antibody or antigen-binding fragment thereof that binds to SIRP α , wherein the antibody or antigen-binding fragment thereof comprises:~~
 - (a) ~~a light chain variable region (VL) comprising VL complementarity determining region 1 (CDR1), VL CDR2, and VL CDR3 of any one of antibodies SIRPAB-11, SIRPAB-12, SIRPAB-1, SIRPAB-2, SIRPAB-3, SIRPAB-4, SIRPAB-5, SIRPAB-6, SIRPAB-7, SIRPAB-8, SIRPAB-9, SIRPAB-10, or SIRPAB-13 as set forth in Table 1; and/or~~
 - (b) ~~a heavy chain variable region (VH) comprising VH complementarity determining region 1 (CDR1), VH CDR2, and VH CDR3 of any one of antibodies SIRPAB-11, SIRPAB-12, SIRPAB-1, SIRPAB-2, SIRPAB-3, SIRPAB-4, SIRPAB-5, SIRPAB-6, SIRPAB-7, SIRPAB-8, SIRPAB-9, SIRPAB-10, or SIRPAB-13 as set forth in Table 2;.~~
3. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises:~~
 - (a) ~~a light chain variable region (VL) further comprising VL framework 1 (FR1), VL FR2, VL FR3, and VL FR4 of any one of antibodies SIRPAB-11, SIRPAB-12, SIRPAB-1, SIRPAB-2, SIRPAB-3, SIRPAB-4, SIRPAB-5, SIRPAB-6, SIRPAB-7, SIRPAB-8, SIRPAB-9, SIRPAB-10, or SIRPAB-13 as set forth in Table 3; and/or~~

- (b) ~~a heavy chain variable region (VH) further comprising VH framework 1 (FR1), VH FR2, VH FR3, and VH FR4 of any one of antibodies SIRPAB-11, SIRPAB-12, SIRPAB-1, SIRPAB-2, SIRPAB-3, SIRPAB-4, SIRPAB-5, SIRPAB-6, SIRPAB-7, SIRPAB-8, SIRPAB-9, SIRPAB-10, or SIRPAB-13 as set forth in Table 4.~~
4. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the VL CDR1, VL CDR2, and VL CDR3 comprise amino acid sequences of SEQ ID NOS:62, 63, and 65, respectively, and the VH CDR1, VH CDR2, and VH CDR3 comprise amino acid sequences of SEQ ID NOS:78, 69, and 57, respectively.~~
5. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the VL CDR1, VL CDR2, and VL CDR3 comprise amino acid sequences of SEQ ID NOS:62, 63, and 65, respectively, and the VH CDR1, VH CDR2, and VH CDR3 comprise amino acid sequences of SEQ ID NOS:82, 83, and 57, respectively.~~
6. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence of SEQ ID NO:18.~~
7. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence of SEQ ID NO:46.~~
8. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence of SEQ ID NO:67.~~
9. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:9.~~
10. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:22.~~

11. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:27.~~
12. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:32.~~
13. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:36.~~
14. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:42.~~
15. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:50.~~
16. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:60.~~
17. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:71.~~
18. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:76.~~
19. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:80.~~

20. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:85.~~
21. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-3 and 6-8, wherein the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO:90.~~
22. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) a VL comprising an amino acid sequence of SEQ ID NO:18; and~~
 - ~~(b) a VH comprising an amino acid sequence of SEQ ID NO:9.~~
23. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) a VL comprising an amino acid sequence of SEQ ID NO:18; and~~
 - ~~(b) a VH comprising an amino acid sequence of SEQ ID NO:22.~~
24. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) a VL comprising an amino acid sequence of SEQ ID NO:18; and~~
 - ~~(b) a VH comprising an amino acid sequence of SEQ ID NO:27.~~
25. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) a VL comprising an amino acid sequence of SEQ ID NO:18; and~~
 - ~~(b) a VH comprising an amino acid sequence of SEQ ID NO:32.~~
26. ~~The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) a VL comprising an amino acid sequence of SEQ ID NO:18; and~~

- (b) — a VH comprising an amino acid sequence of SEQ ID NO:36.
27. — The antibody or antigen binding fragment thereof of claim 2, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a VL comprising an amino acid sequence of SEQ ID NO:46; and
- (b) — a VH comprising an amino acid sequence of SEQ ID NO:42.
28. — The antibody or antigen binding fragment thereof of claim 2, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a VL comprising an amino acid sequence of SEQ ID NO:46; and
- (b) — a VH comprising an amino acid sequence of SEQ ID NO:50.
29. — The antibody or antigen binding fragment thereof of claim 2, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a VL comprising an amino acid sequence of SEQ ID NO:67; and
- (b) — a VH comprising an amino acid sequence of SEQ ID NO:60.
30. — The antibody or antigen binding fragment thereof of claim 2, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a VL comprising an amino acid sequence of SEQ ID NO:67; and
- (b) — a VH comprising an amino acid sequence of SEQ ID NO:71.
31. — The antibody or antigen binding fragment thereof of claim 2, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a VL comprising an amino acid sequence of SEQ ID NO:67; and
- (b) — a VH comprising an amino acid sequence of SEQ ID NO:76.
32. — The antibody or antigen binding fragment thereof of claim 2, wherein the antibody or antigen binding fragment thereof comprises:

- (a) — a VL comprising an amino acid sequence of SEQ ID NO:67; and
- (b) — a VH comprising an amino acid sequence of SEQ ID NO:80.
33. — The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises:
- (a) — a VL comprising an amino acid sequence of SEQ ID NO:67; and
- (b) — a VH comprising an amino acid sequence of SEQ ID NO:85.
34. — The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises:
- (a) — a VL comprising an amino acid sequence of SEQ ID NO:67; and
- (b) — a VH comprising an amino acid sequence of SEQ ID NO:90.
35. — The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises:
- (a) — a VL comprising an amino acid sequence selected from the group consisting of SEQ ID NOS:18, 46, and 67; and
- (b) — a VH comprising an amino acid sequence selected from the group consisting of SEQ ID NOS:9, 22, 27, 32, 36, 42, 50, 60, 71, 76, 80, 85, and 90.
36. — The antibody or antigen-binding fragment thereof of any one of claims 1-35, wherein the antibody or antigen-binding fragment thereof comprises a human IgG1 Fc region or a mutant thereof.
37. — The antibody or antigen-binding fragment thereof of any one of claims 1-36, wherein the antibody or antigen-binding fragment thereof comprises a human IgG1-K322A Fc region.
38. — The antibody or antigen-binding fragment thereof of any one of claims 1-35, wherein the antibody or antigen-binding fragment thereof comprises a human IgG1-AAS Fc region.

39. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-35, wherein the antibody or antigen-binding fragment thereof comprises a human IgG4 Fc region or a mutant thereof.~~
40. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-35 and 39, wherein the antibody or antigen-binding fragment thereof comprises a human IgG4P Fc region.~~
41. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-35 and 39, wherein the antibody or antigen-binding fragment thereof comprises a human IgG4PE Fc region.~~
42. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-35, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain Fc region comprising an amino acid sequence selected from the group consisting of SEQ ID NOS:144 and 155-159.~~
43. ~~The antibody or antigen-binding fragment thereof of claim 1-42, wherein the antibody or antigen-binding fragment thereof further comprises a light chain constant region comprising an amino acid sequence of SEQ ID NO:211.~~
44. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-35, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) a light chain constant region comprising an amino acid sequence of SEQ ID NO:211; and~~
- ~~(b) a heavy chain Fc region comprising an amino acid sequence selected from the group consisting of SEQ ID NOS:144 and 155-159.~~
45. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-4, 8, 29-34, and 35, wherein the antibody or antigen-binding fragment thereof comprises a light chain comprising an amino acid sequence of SEQ ID NO:143.~~
46. ~~The antibody or antigen-binding fragment thereof of claim any one of claims 1-4, 19, 32, and 35, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:142.~~

47. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-4, 8, 19, 32, and 35, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:142.~~
48. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a light chain comprising an amino acid sequence of SEQ ID NO:200.~~
49. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a light chain comprising an amino acid sequence of SEQ ID NO:202.~~
50. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a light chain comprising an amino acid sequence of SEQ ID NO:143.~~
51. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a light chain comprising an amino acid sequence of SEQ ID NO:208.~~
52. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a light chain comprising an amino acid sequence of SEQ ID NO:209.~~
53. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a light chain comprising an amino acid sequence of SEQ ID NO:210.~~
54. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:142.~~
55. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:119.~~

56. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:204.~~
57. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:205.~~
58. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:98.~~
59. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:120.~~
60. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:112.~~
61. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:106.~~
62. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:118.~~
63. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:111.~~
64. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:212.~~

65. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:213.~~
66. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:214.~~
67. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:215.~~
68. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:216.~~
69. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:217.~~
70. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:218.~~
71. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:219.~~
72. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:220.~~
73. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:221.~~

74. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:222.~~
75. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:223.~~
76. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:207.~~
77. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:117.~~
78. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:110.~~
79. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence of SEQ ID NO:148.~~
80. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:200; and~~
- ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:212.~~
81. — ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:200; and~~
- ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:213.~~

82. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:200; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:214.~~
83. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:200; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:215.~~
84. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:200; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:216.~~
85. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:202; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:217.~~
86. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:202; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:218.~~
87. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and~~

- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:219.
88. — The antibody or antigen binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:220.
89. — The antibody or antigen binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:221.
90. — The antibody or antigen binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:142.
91. — The antibody or antigen binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:204.
92. — The antibody or antigen binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:222.
93. — The antibody or antigen binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen binding fragment thereof comprises:

- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:200; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:223.
94. — The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:200; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:207.
95. — The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:208; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:117.
96. — The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:209; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:110.
97. — The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:119.
98. — The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and
- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:98.

99. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:120.~~
100. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:112.~~
101. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:205.~~
102. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:106.~~
103. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and~~
 - ~~(b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:118.~~
104. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen-binding fragment thereof comprises:~~
- ~~(a) — a light chain comprising an amino acid sequence of SEQ ID NO:143; and~~

- (b) — a heavy chain comprising an amino acid sequence of SEQ ID NO:111.
105. — The antibody or antigen binding fragment thereof of any one of claims 1-46, wherein the antibody or antigen binding fragment thereof comprises:
- (a) — a light chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOS:143, 200, 202, 208, 209, and 210; and
- (b) — a heavy chain comprising an amino acid sequence selected from the group consisting of SEQ ID NOS:212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 142, 204, 222, 223, 207, 117, 110, 148, 119, 98, 120, 112, 205, 106, 118, and 111.
106. — The antibody or antigen binding fragment thereof of any one of claims 1-105, wherein, when bound to SIRP α , the antibody or antigen binding fragment binds to at least one of residues 67-98 within an amino acid sequence of SEQ ID NO:146.
107. — The antibody or antigen binding fragment thereof of claim 106, wherein, when bound to SIRP α , the antibody or antigen binding fragment binds to at least one of residues 67-74 within an amino acid sequence of SEQ ID NO:146.
108. — The antibody or antigen binding fragment thereof of claim 106, wherein, when bound to SIRP α , the antibody or antigen binding fragment binds to at least one of residues 93-98 within an amino acid sequence of SEQ ID NO:146.
109. — The antibody or antigen binding fragment thereof of any one of claims 1-105, wherein, when bound to SIRP α , the antibody or antigen binding fragment binds to at least one of residues 30-93 within an amino acid sequence of SEQ ID NO:146.
110. — The antibody or antigen binding fragment thereof of any one of claims 1-109, wherein, when bound to SIRP α , the antibody or antigen binding fragment binds to at least one residue selected from the group consisting of L30, I36, Q52, T67, R69, F74, K93, R95, K96, and S98 within an amino acid sequence of SEQ ID NO:146.
111. — The antibody or antigen binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen binding fragment binds to L30 within an amino acid sequence of SEQ ID NO:146.

112. ~~The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to I36 within an amino acid sequence of SEQ ID NO:146.~~
113. ~~The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to Q52 within an amino acid sequence of SEQ ID NO:146.~~
114. ~~The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to T67 within an amino acid sequence of SEQ ID NO:146.~~
115. ~~The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to R69 within an amino acid sequence of SEQ ID NO:146.~~
116. ~~The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to F74 within an amino acid sequence of SEQ ID NO:146.~~
117. ~~The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to K93 within an amino acid sequence of SEQ ID NO:146.~~
118. ~~The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to R95 within an amino acid sequence of SEQ ID NO:146.~~
119. ~~The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to K96 within an amino acid sequence of SEQ ID NO:146.~~
120. ~~The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to S98 within an amino acid sequence of SEQ ID NO:146.~~

- ~~121. The antibody or antigen-binding fragment thereof of claim 110, wherein, when bound to SIRP α , the antibody or antigen-binding fragment binds to T67, R69, R95, K96, and S98 within an amino acid sequence of SEQ ID NO:146.~~
- ~~122. The antibody or antigen-binding fragment thereof of any one of claims 1-121, wherein the antibody or antigen-binding fragment thereof reduces binding between SIRP α and CD47.~~
- ~~123. The antibody or antigen-binding fragment thereof of claim 122, wherein the SIRP α comprises a haplotype in the IgV domain selected from the group consists of SEQ ID NOS:149, 150, 151, 152, 153, and 154.~~
- ~~124. The antibody or antigen-binding fragment thereof of claim 122 or 123, wherein the antibody or antigen-binding fragment thereof reduces CD47 binding to each of 6 SIRP α haplotypes,
—— wherein the 6 SIRP α haplotypes consist of SIRP α v1, SIRP α v2, SIRP α v3, SIRP α v4, SIRP α v5, and SIRP α v6, and
—— wherein SIRP α v1 comprising SEQ ID NO:149 in the IgV domain, SIRP α v2 comprising SEQ ID NO:150 in the IgV domain, SIRP α v3 comprising SEQ ID NO:151 in the IgV domain, SIRP α v4 comprising SEQ ID NO:152 in the IgV domain, SIRP α v5 comprising SEQ ID NO:153 in the IgV domain, and SIRP α v6 comprising SEQ ID NO:154 in the IgV domain.~~
- ~~125. The antibody or antigen-binding fragment thereof of any one of claims 122-124, wherein the reduction in CD47-SIRP α binding is 50%, 60%, 70%, 80%, 90%, 95%, or 99%.~~
- ~~126. The antibody or antigen-binding fragment thereof of any one of claims 122-125, wherein the EC₅₀ of the antibody or antigen-binding fragment thereof for reducing CD47-SIRP α binding is from about 1 pM to about 10 pM, from about 10 pM to about 100 pM, from about 100 pM to about 1 nM, from about 1 nM to about 10 nM, or from about 10 nM to about 100 nM.~~
- ~~127. The antibody or antigen-binding fragment thereof of any one of claims 122-126, wherein the EC₅₀ of the antibody or antigen-binding fragment thereof for reducing CD47-SIRP α binding is about 2 nM, about 2.1 nM, about 2.2 nM, about 2.3 nM,~~

~~about 2.4 nM, about 2.5 nM, about 2.6 nM, about 2.7 nM, about 2.8 nM, about 2.9 nM, about 3 nM, about 3.1 nM, about 3.2 nM, about 3.3 nM, about 3.4 nM, about 3.5 nM, about 3.6 nM, about 3.7 nM, about 3.8 nM, about 3.9 nM, about 4.0 nM, about 4.1 nM, about 4.2 nM, about 4.3 nM, about 4.4 nM, about 4.5 nM, about 4.6 nM, about 4.7 nM, about 4.8 nM, about 4.9 nM, about 5.0 nM, about 5.1 nM, about 5.2 nM, about 5.3 nM, about 5.4 nM, about 5.5 nM, about 5.6 nM, about 5.7 nM, about 5.8 nM, about 5.9 nM, or about 6.0 nM.~~

- ~~128. The antibody or antigen-binding fragment thereof of any one of claims 1-121, wherein the antibody or antigen-binding fragment thereof specifically binds to one or more of 6 SIRP α haplotypes,
—— wherein the 6 SIRP α haplotypes consist of SIRP α v1, SIRP α v2, SIRP α v3, SIRP α v4, SIRP α v5, and SIRP α v6, and
—— wherein SIRP α v1 comprising SEQ ID NO:149 in the IgV domain, SIRP α v2 comprising SEQ ID NO:150 in the IgV domain, SIRP α v3 comprising SEQ ID NO:151 in the IgV domain, SIRP α v4 comprising SEQ ID NO:152 in the IgV domain, SIRP α v5 comprising SEQ ID NO:153 in the IgV domain, and SIRP α v6 comprising SEQ ID NO:154 in the IgV domain.~~
- ~~129. The antibody or antigen-binding fragment thereof of claim 128, wherein the antibody or antigen-binding fragment thereof binds to each of the 6 SIRP α haplotypes.~~
- ~~130. The antibody or antigen-binding fragment thereof of claim 129, wherein the antibody or antigen-binding fragment thereof binds to each of the 6 SIRP α haplotypes with a dissociation constant (K_D) of no more than 5nM.~~
- ~~131. The antibody or antigen-binding fragment thereof of any one of claims 128-130, wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v1 with a K_D of no more than 0.2nM.~~
- ~~132. The antibody or antigen-binding fragment thereof of any one of claims 128-131, wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v1 with a K_D of about 0.13nM.~~

133. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-132,~~
~~wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v2~~
~~with a K_D of no more than 5nM.~~
134. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-133,~~
~~wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v2~~
~~with a K_D of about 4.4nM.~~
135. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-134,~~
~~wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v3~~
~~with a K_D of no more than 0.2nM.~~
136. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-135,~~
~~wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v3~~
~~with a K_D of about 0.15nM.~~
137. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-136,~~
~~wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v4~~
~~with a K_D of no more than 2nM.~~
138. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-137,~~
~~wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v4~~
~~with a K_D of about 1.5 nM.~~
139. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-138,~~
~~wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v5~~
~~with a K_D of no more than 0.7nM.~~
140. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-139,~~
~~wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v5~~
~~with a K_D of about 0.6nM.~~
141. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-140,~~
~~wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v6~~
~~with a K_D of no more than 0.2nM.~~

142. ~~The antibody or antigen-binding fragment thereof of any one of claims 128-141, wherein the antibody or antigen-binding fragment thereof binds to purified SIRP α v6 with a K_D of about 0.18 nM.~~
143. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-142, wherein the antibody or antigen-binding fragment thereof binds to human SIRP α expressed on a cell with an EC_{50} from about 1 pM to about 10 pM, from about 10 pM to about 100 pM, from about 100 pM to about 1 nM, from about 1 nM to about 10 nM, or from about 10 nM to about 100 nM.~~
144. ~~The antibody or antigen-binding fragment thereof of claim 143, wherein the EC_{50} is about 2 nM, about 2.1 nM, about 2.2 nM, about 2.3 nM, about 2.4 nM, about 2.5 nM, about 2.6 nM, about 2.7 nM, about 2.8 nM, about 2.9 nM, about 3 nM, about 3.1 nM, about 3.2 nM, about 3.3 nM, about 3.4 nM, about 3.5 nM, about 3.6 nM, about 3.7 nM, about 3.8 nM, about 3.9 nM, about 4.0 nM, about 4.1 nM, about 4.2 nM, about 4.3 nM, about 4.4 nM, about 4.5 nM, about 4.6 nM, about 4.7 nM, about 4.8 nM, about 4.9 nM, about 5.0 nM, about 5.1 nM, about 5.2 nM, about 5.3 nM, about 5.4 nM, about 5.5 nM, about 5.6 nM, about 5.7 nM, about 5.8 nM, about 5.9 nM, or about 6.0 nM.~~
145. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-144, wherein the antibody or antigen-binding fragment thereof specifically binds to human SIRP α and/or monkey SIRP α , but not rodent SIRP α .~~
146. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-145, wherein the antibody or antigen-binding fragment thereof binds to cynomolgus SIRP α expressed on a cell with an EC_{50} from about 1 pM to about 10 pM, from about 10 pM to about 100 pM, from about 100 pM to about 1 nM, from about 1 nM to about 10 nM, or from about 10 nM to about 100 nM.~~
147. ~~The antibody or antigen-binding fragment thereof of claim 146, wherein the EC_{50} is about 2 nM, about 2.1 nM, about 2.2 nM, about 2.3 nM, about 2.4 nM, about 2.5 nM, about 2.6 nM, about 2.7 nM, about 2.8 nM, about 2.9 nM, about 3 nM, about 3.1 nM, about 3.2 nM, about 3.3 nM, about 3.4 nM, about 3.5 nM, about 3.6 nM, about 3.7 nM, about 3.8 nM, about 3.9 nM, about 4.0 nM, about 4.1 nM, about 4.2 nM, about~~

~~4.3 nM, about 4.4 nM, about 4.5 nM, about 4.6 nM, about 4.7 nM, about 4.8 nM, about 4.9 nM, about 5.0 nM, about 5.1 nM, about 5.2 nM, about 5.3 nM, about 5.4 nM, about 5.5 nM, about 5.6 nM, about 5.7 nM, about 5.8 nM, about 5.9 nM, or about 6.0 nM.~~

- ~~148. The antibody or antigen-binding fragment thereof of any one of claims 1-147, wherein the antibody or antigen-binding fragment thereof increases phagocytosis of cancer cells by co-cultured macrophages.~~
- ~~149. The antibody or antigen-binding fragment thereof of claim 148, wherein the antibody or antigen-binding fragment thereof is used as a single therapeutic agent.~~
- ~~150. The antibody or antigen-binding fragment thereof of claim 148, wherein the antibody or antigen-binding fragment thereof is used in combination with a second therapeutic agent.~~
- ~~151. The antibody or antigen-binding fragment thereof of claim 150, wherein the second therapeutic agent is selected from the group consisting of cetuximab and rituximab.~~
- ~~152. The antibody or antigen-binding fragment thereof of any one of claims 148-151, wherein SIRP α is expressed on the macrophage, the cancer cells, or both the macrophage and the cancer cells.~~
- ~~153. The antibody or antigen-binding fragment thereof of claim 152, wherein SIRP α is one or more of 6 SIRP α haplotypes,
—— wherein the 6 SIRP α haplotypes consist of SIRP α v1, SIRP α v2, SIRP α v3, SIRP α v4, SIRP α v5, and SIRP α v6, and
—— wherein SIRP α v1 comprising SEQ ID NO:149 in the IgV domain, SIRP α v2 comprising SEQ ID NO:150 in the IgV domain, SIRP α v3 comprising SEQ ID NO:151 in the IgV domain, SIRP α v4 comprising SEQ ID NO:152 in the IgV domain, SIRP α v5 comprising SEQ ID NO:153 in the IgV domain, and SIRP α v6 comprising SEQ ID NO:154 in the IgV domain.~~
- ~~154. The antibody or antigen-binding fragment thereof of any one of claims 148-153, wherein the antibody or antigen-binding fragment thereof increases a minimal percentage of phagocytotic macrophages in a population of macrophages to about~~

~~10%, 20%, 30%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, or 99%.~~

- ~~155. The antibody or antigen-binding fragment thereof of any one of claims 148-154, wherein the antibody or antigen-binding fragment thereof increases phagocytosis of the macrophage by about 10%, 20%, 30%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, 100%, 125%, 150%, 175%, 200%, 250%, 300%, 400%, 500%, 600%, 700%, 800%, 900% or 1000%.~~
- ~~156. The antibody or antigen-binding fragment thereof of any one of claims 148-155, wherein the cancer cells are selected from the group consisting of colorectal cancer, head and neck squamous cell carcinoma, acute myeloid leukemia, and diffuse large B-cell lymphoma.~~
- ~~157. The antibody or antigen-binding fragment thereof of any one of claims 1-147, wherein the antibody or antigen-binding fragment thereof synergizes with a second therapeutic agent in increasing phagocytosis of cancer cells by co-cultured macrophages.~~
- ~~158. The antibody or antigen-binding fragment thereof of claim 157, wherein the second therapeutic agent is selected from the group consisting of cetuximab and rituximab.~~
- ~~159. The antibody or antigen-binding fragment thereof of any one of claims 157-158, wherein SIRP α is expressed on the macrophage, the cancer cells, or both the macrophage and the cancer cells.~~
- ~~160. The antibody or antigen-binding fragment thereof of claim 159, wherein SIRP α is one or more of 6 SIRP α haplotypes;
—— wherein the 6 SIRP α haplotypes consist of SIRP α v1, SIRP α v2, SIRP α v3, SIRP α v4, SIRP α v5, and SIRP α v6, and
—— wherein SIRP α v1 comprising SEQ ID NO:149 in the IgV domain, SIRP α v2 comprising SEQ ID NO:150 in the IgV domain, SIRP α v3 comprising SEQ ID NO:151 in the IgV domain, SIRP α v4 comprising SEQ ID NO:152 in the IgV domain, SIRP α v5 comprising SEQ ID NO:153 in the IgV domain, and SIRP α v6 comprising SEQ ID NO:154 in the IgV domain.~~

161. ~~The antibody or antigen-binding fragment thereof of any one of claims 157-160, wherein the difference between the percentage of the phagocytotic macrophages synergistically induced and the sum of the phagocytotic percentage induced by the antibody or antigen-binding fragment and the second therapeutic agent separately is about 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, or 70%.~~
162. ~~The antibody or antigen-binding fragment thereof of any one of claims 157-160, wherein the antibody or antigen-binding fragment and the second therapeutic agent synergistically increase the percentage of the phagocytotic macrophages over the sum of the phagocytotic percentage induced by the antibody or antigen-binding fragment and the second therapeutic agent separately by about 10%, 20%, 30%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, 100%, 125%, 150%, 175%, 200%, 250%, 300%, or 400%.~~
163. ~~The antibody or antigen-binding fragment thereof of any one of claims 157-162, wherein the cancer cells are selected from the group consisting of colorectal cancer, head and neck squamous cell carcinoma, acute myeloid leukemia, and diffuse large B-cell lymphoma~~
164. ~~The antibody or antigen-binding fragment thereof of any one of claims 1-163, wherein the antibody or antigen-binding fragment thereof has attenuated ADCC activity, attenuated ADCP activity, and/or attenuated CDC activity as compared to an isotype control antibody.~~
165. ~~The antibody or antigen-binding fragment thereof of claim 164, wherein the maximal ADCC activity is no more than about 5%, 10%, 20%, 30%, or 40% cytotoxicity as measured by the percentage of target cells killed.~~
166. ~~The antibody or antigen-binding fragment thereof of claim 164, wherein the maximal ADCP activity is no more than about 5%, 10%, 20%, or 30% of phagocytotic macrophages targeting autologous T cells and/or monocytes.~~
167. ~~The antibody or antigen-binding fragment thereof of claim 164, wherein the EC₅₀ of the antibody or antigen-binding fragment thereof in a CDC assay is at least 100 μ M.~~

- ~~168. The antibody or antigen-binding fragment thereof of any one of claims 1-167, wherein the antibody or antigen-binding fragment thereof does not induce cytokine release more than a level of cytokine release induced by an isotype control antibody.~~
- ~~169. The antibody or antigen-binding fragment thereof of any one of claims 1-168, wherein the antibody is a monoclonal antibody.~~
- ~~170. The antibody or antigen-binding fragment thereof of any one of claims 1-169, wherein the antibody is a humanized, human, or chimeric antibody.~~
- ~~171. The antibody or antigen-binding fragment thereof of claim 170, wherein the humanized antibody is a deimmunized antibody or a composite human antibody.~~
- ~~172. The antibody or antigen-binding fragment thereof of any one of claims 1-171, wherein the antibody or antigen-binding fragment thereof is a Fab, a Fab', a F(ab')₂, a Fv, a scFv, a dsFv, a diabody, a triabody, a tetrabody, or a multispecific antibody formed from antibody fragments.~~
- ~~173. The antibody or antigen-binding fragment thereof of any one of claims 1-172, wherein the antibody or antigen-binding fragment thereof is conjugated to an agent.~~
- ~~174. The antibody or antigen-binding fragment thereof of claim 173, wherein the agent is selected from the group consisting of a radioisotope, a metal chelator, an enzyme, a fluorescent compound, a bioluminescent compound, and a chemiluminescent compound.~~
- ~~175. A composition comprising the antibody or antigen-binding fragment thereof of any one of claims 1-174, and a pharmaceutically acceptable carrier.~~
- ~~176. A polynucleotide comprising nucleotide sequences encoding a VH, a VL, or both a VH and a VL of the antibody of any one of claims 1-175.~~
- ~~177. A polynucleotide comprising nucleotide sequences encoding a heavy chain, a light chain, or both a heavy chain and a light chain of the antibody of any one of claims 1-176.~~
- ~~178. The polynucleotide of claim 176 or 177, wherein the polynucleotide is operably linked to a promoter.~~

- 179.—A vector comprising the polynucleotide of claim 176 or 177.
- 180.—A cell comprising the polynucleotide of claim 176 or 177.
- 181.—A cell comprising the vector of claim 179.
- 182.—An isolated cell producing the antibody or antigen binding fragment thereof of any one of claims 1-174.
- 183.—A kit comprising the antibody or antigen binding fragment thereof of any one of claims 1-174.
- 184.—A method of making an antibody or antigen binding fragment thereof which specifically binds to an epitope of human SIRP α , comprising culturing the cell of any one of claims 180 to 182 to express the antibody or antigen binding fragment thereof.
- 185.—A method of making an antibody or antigen binding fragment thereof which specifically binds to an epitope of human SIRP α , comprising expressing the polynucleotide of any one of claims 176 to 178.
- 186.—A method of increasing phagocytosis by a macrophage, comprising contacting the macrophage with an effective amount of an antibody or antigen binding fragment thereof of any one of claims 1 to 174.
- 187.—The method of claim 186, wherein the phagocytotic activity by the macrophage is increased by about 10%, 20%, 30%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, 100%, 125%, 150%, 175%, 200%, 250%, 300%, 400%, 500%, 600%, 700%, 800%, 900% or 1000%.
- 188.—A method of increasing a percentage of phagocytotic macrophages in a population of macrophages, comprising contacting the macrophages with an effective amount of an antibody or antigen binding fragment thereof of any one of claims 1 to 174.
- 189.—The method of claim 188, wherein the minimal percentage of phagocytotic macrophages in the population of macrophages is increased to about 10%, 20%, 30%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, or 99%.

- ~~190. A method of increasing phagocytosis of cancer cells by a population of macrophages, comprising contacting the cancer cells, the macrophages, or both the cancer cells and the macrophages with an effective amount of an antibody or antigen binding fragment thereof of any one of claims 1 to 174.~~
- ~~191. The method of claim 190, wherein a minimal percentage of phagocytotic macrophages in the population of macrophages is increased to about 10%, 20%, 30%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, or 99%.~~
- ~~192. The method of any one of claims 186-191, wherein the phagocytosis by macrophages is measured by co-culturing macrophages labeled with a first fluorescent dye and cancer cells labeled with a second fluorescent dye, wherein the first fluorescent dye and the second fluorescent dye are different.~~
- ~~193. The method of any one of claims 188-189 and 191-192, wherein the percentage of phagocytotic macrophages is measured by determining the percentage of macrophages comprising cancer cells.~~
- ~~194. A method of increasing phagocytosis of cancer cells in a subject, comprising administering an effective amount of an antibody or antigen binding fragment thereof of any one of claims 1 to 174 to the subject.~~
- ~~195. A method of increasing elimination of cancer cells by phagocytosis in a subject, comprising administering an effective amount of an antibody or antigen binding fragment thereof of any one of claims 1 to 174 to the subject.~~
- ~~196. A method of targeting cancer cells for immunodepletion in a subject, comprising administering an effective amount of an antibody or antigen binding fragment thereof of any one of claims 1 to 174 to the subject.~~
- ~~197. A method of treating cancer in a subject, comprising administering an effective amount of an antibody or antigen binding fragment thereof of any one of claims 1 to 174 to the subject.~~
- ~~198. The method of any one of claims 194-197, wherein the cancer is a cancer selected from the group consisting of colorectal cancer, head and neck squamous cell~~

carcinoma, acute myeloid leukemia, diffuse large B-cell lymphoma, follicular lymphoma, marginal zone lymphoma and mantle cell lymphoma.

199. — ~~The method of any one of claims 194-197, wherein the cancer is non-Hodgkin's lymphoma.~~

200. — ~~The method of any one of claims 194-197, wherein the cancer is a cancer selected from the group consisting of Grade 1 follicular lymphoma, Grade 2 follicular lymphoma, Grade 3a follicular lymphoma, Grade 3b follicular lymphoma, relapsed follicular lymphoma, refractory follicular lymphoma, relapsed DLBCL, and refractory DLBCL.~~

201. — ~~The method of any one of claims 186-200, wherein the cancer cells, the macrophages, or both the cancer cells and the macrophages expresses SIRP α .~~

202. — ~~The method of claim 201, wherein SIRP α is one or more of 6 SIRP α haplotypes,
—— wherein the 6 SIRP α haplotypes consist of SIRP α v1, SIRP α v2, SIRP α v3, SIRP α v4, SIRP α v5, and SIRP α v6, and
—— wherein SIRP α v1 comprising SEQ ID NO:149 in the IgV domain, SIRP α v2 comprising SEQ ID NO:150 in the IgV domain, SIRP α v3 comprising SEQ ID NO:151 in the IgV domain, SIRP α v4 comprising SEQ ID NO:152 in the IgV domain, SIRP α v5 comprising SEQ ID NO:153 in the IgV domain, and SIRP α v6 comprising SEQ ID NO:154 in the IgV domain.~~

203. — ~~The method of any one of claims 186 to 202, wherein the antibody or antigen-binding fragment thereof is coadministered with a second therapeutic agent.~~

204. — ~~The method of claim 203, wherein the second therapeutic agent is selected from the group consisting of cetuximab and rituximab.~~

205. — ~~The method of any one of claims 194-204, wherein the subject is selected from the group consisting of a human, a monkey, a mouse, a dog, and a rat.~~

1. An antibody or antigen-binding fragment thereof that binds to human SIRP α , wherein the antibody or the antigen-binding fragment thereof comprises:

(i) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:67; and

(ii) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:80.

2. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises:

(a) a VL comprising: a VL CDR1 comprising the amino acid sequence of SEQ ID NO:62, a VL CDR2 comprising the amino acid sequence of SEQ ID NO:63, and a VL CDR3 comprising the amino acid sequence of SEQ ID NO:65; and

(b) a VH comprising: a VH CDR1 comprising the amino acid sequence of SEQ ID NO:78, a VH CDR2 comprising the amino acid sequence of SEQ ID NO:69, and a VH CDR3 comprising the amino acid sequence of SEQ ID NO:57.

3. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a VL comprising an amino acid sequence having at least 95% identity to the amino acid sequence of SEQ ID NO:67.

4. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a VL comprising the amino acid sequence of SEQ ID NO:67.

5. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a VH comprising an amino acid sequence having at least 95% identity to the amino acid sequence of SEQ ID NO:80.

6. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a VH comprising the amino acid sequence of SEQ ID NO:80.

7. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a VL comprising an amino acid sequence having at least 95% identity to the amino acid sequence of SEQ ID NO:67; and a VH comprising an amino acid sequence having at least 95% identity to the amino acid sequence of SEQ ID NO:80.

8. An antibody or antigen-binding fragment thereof that binds to human SIRP α , wherein the antibody or the antigen-binding fragment thereof comprises a VL comprising the amino acid sequence of SEQ ID NO:67; and a VH comprising the amino acid sequence of SEQ ID NO:80.

9. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a light chain comprising an amino acid sequence having at least 95% identity to the amino acid sequence of SEQ ID NO:143.

10. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a light chain comprising the amino acid sequence of SEQ ID NO:143.

11. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a heavy chain comprising an amino acid sequence having at least 95% identity to the amino acid sequence of SEQ ID NO:119.

12. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a heavy chain comprising the amino acid sequence of SEQ ID NO:119.

13. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a light chain comprising an amino acid sequence having at least 95% identity to the amino acid sequence of SEQ ID NO:143, and a heavy chain comprising an amino acid sequence having at least 95% identity to the amino acid sequence of SEQ ID NO:119.

14. An antibody that binds to human SIRP α , wherein the antibody comprises a light chain comprising the amino acid sequence of SEQ ID NO:143, and a heavy chain comprising the amino acid sequence of SEQ ID NO:119.

15. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antigen-binding fragment is a Fab, Fab', (Fab')₂, Fv, or scFv fragment.

16. The antibody or the antigen-binding fragment of claim 8, wherein the antigen-binding fragment is a Fab, Fab', (Fab')₂, Fv, or scFv fragment.

17. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a human IgG1 Fc region or a mutant thereof.

18. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises a heavy chain Fc region comprising the amino acid sequence selected from the group consisting of SEQ ID NOS:144 and 155-159.

19. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof further comprises a light chain constant region comprising the amino acid sequence of SEQ ID NO:211.

20. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof comprises: a light chain constant region comprising the amino acid sequence of SEQ ID NO:211; and a heavy chain Fc region comprising the amino acid sequence selected from the group consisting of SEQ ID NOS:144 and 155-159.

21. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody is a monoclonal antibody.

22. The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody is a humanized, human, or chimeric antibody.

23 The antibody or the antigen-binding fragment thereof of claim 1, wherein the antibody or the antigen-binding fragment thereof is conjugated to an agent.

24. The antibody or the antigen-binding fragment thereof of claim 23, wherein the agent is selected from the group consisting of a radioisotope, a metal chelator, an enzyme, a fluorescent compound, a bioluminescent compound, and a chemiluminescent compound.