CLAIMS

1. A recombinant opsonin comprising:

a carbohydrate recognition domain of an opsonin, in which the carbohydrate recognition domain permits binding to at least one carbohydrate that is present on a surface of a microbe;

and

a peptide domain that links to the carbohydrate recognition domain, in which the recombinant opsonin excludes a functional domain of the opsonin that binds to a mannan-binding lectin associated serine protease (MASP);

in which the N-terminus of the recombinant opsonin permits attachment of the recombinant opsonin to a surface of a solid substrate in an orientation that points away from the surface of the solid substrate.

2. A recombinant opsonin according to Claim 1, in which the carbohydrate recognition domain comprises a carbohydrate recognition domain of a collectin or ficolin.

3. A recombinant opsonin according to Claim 1, in which the carbohydrate recognition domain comprises a carbohydrate recognition domain of a lectin.

4. A recombinant opsonin according to Claim 3, in which the lectin is mannose-binding lectin (MBL).

5. A recombinant opsonin according to Claim 4, in which the carbohydrate recognition domain consists of amino acid residues 81 (proline) to 228 (isoleucine) of MBL (SEQ ID NO:2).

6. A recombinant opsonin according to any preceding claim, in which the N-terminus of the recombinant opsonin comprises at least one cysteine residue that allows chemical cross-linking to the surface of the solid substrate.

7. A recombinant opsonin according to any preceding claim, in which the peptide domain comprises a Glycine+Serine segment or a Proline+Alanine+Serine segment.

8. A recombinant opsonin according to any preceding claim, where the peptide domain comprises an immunoglobulin Fc.

9. A recombinant opsonin according to any preceding claim, in which the peptide domain comprises a portion of an immunoglobulin Fc including a hinge or a CH2-CH3 interface.

10. A recombinant opsonin according to any preceding claim, in which the solid substrate is a magnetic microbead, a paramagnetic microbead, a microporous membrane, a hollow-fiber reactor, or any other fluid filtration membrane or flow device.

11. A recombinant opsonin according to any preceding claim, in which the solid substrate is a living cell or extracellular matrix of a biological tissue or organ.

12. A recombinant opsonin according to Claim 11, in which the solid substrate is a phagocyte.

13. A recombinant opsonin according to Claim 1, in which the recombinant opsonin comprises a lectin having amino acid residues 81 (proline) to 228 (isoleucine) of MBL, fused to a Fc portion of human IgG (Fcγ) (SEQ ID NO: 3).

14. A recombinant opsonin according to Claim 4, in which the N-terminus of the carbohydrate recognition domain starts from amino acid residue 111 (glycine) of the human MBL.

15. A recombinant opsonin according to Claim 8, in which the peptide domain comprises an amino acid sequence of SEQ ID NO: 1.

16. A recombinant opsonin according to Claim 15, in which the amino acid sequence of the peptide domain is modified to exclude N-linked glycosylation.

17. A recombinant opsonin according to Claim 16, in which the amino acid residue 82 in the SEQ ID NO: 1 is changed from asparagine (N) to aspartic acid (D).

18. A recombinant opsonin according to Claim 1, in which the N-terminus of the recombinant opsonin essentially consists of an amino acid sequence of alanine-lysine-threonine (AKT).

19. A recombinant opsonin according to Claim 1, in which the N-terminus of the recombinant opsonin is further attached to the solid substrate.

20. A recombinant opsonin according to Claim 19, in which the solid substrate is a magnetic microbead.

21. A method of collecting an opsonin-binding microorganism from a fluid comprising

contacting the fluid with a recombinant opsonin conjugated to a solid surface; in which the recombinant opsonin comprises a carbohydrate recognition domain of an opsonin, in which the carbohydrate recognition domain permits binding to at least one carbohydrate that is present on a surface of a microbe, and a peptide domain that links to the carbohydrate recognition domain; and in which the recombinant opsonin excludes a functional domain of the opsonin that binds to a mannan-binding lectin associated serine protease (MASP), and in which the N-terminus of the recombinant opsonin permits attachment of the recombinant opsonin to the solid surface in an orientation that points away from the solid surface;

allowing the opsonin-binding microorganism to bind to the recombinant opsonin-solid surface conjugate; and

separating the fluid from the microorganism-bound recombinant opsonin-solid surface conjugate.

22. A method according to Claim 21, in which the solid surface is a magnetic particle, and the separating is achieved by applying magnetic force to the fluid after the opsonin-binding microorganism has bound to the recombinant opsonin-solid surface conjugate.

23. A method according to Claim 21, further comprising the step of identifying the microorganism.

24. A method according to Claim 21, in which the fluid is a biological fluid.

25. A method according to Claim 24, in which the biological fluid is selected from the group consisting of blood, cerebrospinal fluid, joint fluid, urine, semen, saliva, tears, and fluids collected by needle, biopsy, or aspiration procedures.

26. A method according to Claim 25, in which the biological fluid is blood.

27. A method according to Claim 21, in which the fluid is derived from a water or a food sample.

28. Use of a recombinant opsonin according to any of Claims 1 to 20 in the identification of a pathogen.

29. Use of a recombinant opsonin according to any of Claims 1 to 20 in the identification of water or food contamination.

30. A recombinant opsonin according to any of Claims 1 to 20 for use in the treatment or prevention of a disease.

31. A recombinant opsonin according to any of Claims 1 to 20 for use in the diagnosis of a disease.

32. Use of a recombinant opsonin according to any of Claims 1 to 20 in in the preparation of a medicament for the treatment or prevention of a disease.

33. Use of a recombinant opsonin according to any of Claims 1 to 20 in the in the preparation of a medicament for the diagnosis of a disease.

34. A recombinant opsonin according to Claim 30 or 31 for a use as specified therein, or a use of a recombinant opsonin according to Claim 32 or 33, in which the disease is infection or sepsis.

35. A recombinant opsonin according to Claim 30 for a use as specified therein, or a use of a recombinant opsonin according to Claim 32, in which the treatment comprises a treatment of a blood infection in a subject by administering the recombinant opsonin to the blood of the subject, allowing the recombinant opsonin to bind to a opsonin-binding microorganism and allowing the microorganism-bound recombinant opsonin to bind with a cell, tissue or organ of the immune system, in which the microorganism is killed.

CLAIMS

1. A recombinant opsonin comprising:

a carbohydrate recognition domain of mannose-binding lectin (MBL), in which the carbohydrate recognition domain binds to at least one carbohydrate that is present on a surface of a microbe;

and

a peptide comprising a portion of an immunoglobulin Fc that links to the carbohydrate recognition domain, in which the recombinant opsonin excludes a functional domain of MBL that binds to a mannan-binding lectin associated serine protease (MASP), the functional domain being present in cysteine-rich N terminal domain of MBL or collagen segment of MBL.

2. A recombinant opsonin according to Claim 1, in which the carbohydrate recognition domain comprises the neck and lectin domains of MBL.

3. A recombinant opsonin according to Claim 1 or 2, in which the carbohydrate recognition domain consists of amino acid residues 81 (proline) to 228 (isoleucine) of MBL (SEQ ID NO:2).

4. A recombinant opsonin according to Claim 1, 2 or 3, in which N-terminus of the recombinant opsonin comprises at least one cysteine residue that allows chemical cross-linking to a surface of a solid substrate.

5. A method of collecting an opsonin-binding microorganism from a fluid comprising

contacting the fluid with a recombinant opsonin conjugated to a solid surface; in which the recombinant opsonin comprises a carbohydrate recognition domain that binds to at least one carbohydrate that is present on a surface of a microbe; and

a peptide comprising a portion of an immunoglobulin Fc that links to the carbohydrate recognition domain, in which the recombinant opsonin excludes a functional domain of MBL that binds to a mannan-binding lectin associated serine protease (MASP), the functional domain being present in cysteine-rich N terminal domain of MBL or collagen segment of MBL;

allowing the opsonin-binding microorganism to bind to the recombinant opsonin-solid surface conjugate; and

separating the fluid from the microorganism-bound recombinant opsonin-solid surface conjugate.

6. A method according to Claim 5, in which the solid surface is a magnetic particle, and the separating is achieved by applying magnetic force to the fluid after the opsonin-binding microorganism has bound to the recombinant opsonin-solid surface conjugate.

7. A method according to Claim 5, further comprising the step of identifying the microorganism.

8. A method according to Claim 5, in which the fluid is a biological fluid.

9. A method according to Claim 8, in which the biological fluid is selected from the group consisting of blood, cerebrospinal fluid, joint fluid, urine, semen, saliva, tears, and fluids collected by needle, biopsy, or aspiration procedures.

10. A method according to Claim 9, in which the biological fluid is blood.

11. A method according to Claim 5, in which the fluid is derived from a water or a food sample.

12. Use of a recombinant opsonin according to any of Claims 1 to 4 in the identification of a pathogen.

13. Use of a recombinant opsonin according to any of Claims 1 to 4 in the identification of water or food contamination.

14. A recombinant opsonin according to any of Claims 1 to 4 for use in the treatment or prevention of a disease.

15. A recombinant opsonin according to any of Claims 1 to 4 for use in the diagnosis of a disease.

16. Use of a recombinant opsonin according to any of Claims 1 to 4 in the preparation of a medicament for the treatment or prevention of a disease.

17. Use of a recombinant opsonin according to any of Claims 1 to 4 in the preparation of a medicament for the diagnosis of a disease.

18. A recombinant opsonin according to Claim 14 or 15 for a use as specified therein, or a use of a recombinant opsonin according to Claim 16 or 17, in which the disease is infection or sepsis.

19. A recombinant opsonin according to Claim 14 for a use as specified therein, or a use of a recombinant opsonin according to Claim 16, in which the treatment comprises a treatment of a blood infection in a subject by administering the recombinant opsonin to the blood of the subject, allowing the recombinant opsonin to bind to an opsonin-binding microorganism and allowing the microorganism-bound recombinant opsonin to bind with a cell, tissue or organ of the immune system, in which the microorganism is killed.