CLAIMS

1. An antibody or an antigen-binding fragment thereof that specifically binds to a human B7-H7CR, in which the antibody or an antigen binding fragment thereof is genetically engineered and comprises:

(1) a light chain variable region comprising amino acid sequence SEQ ID NO: 17 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 23;

(2) a light chain variable region comprising amino acid sequence SEQ ID NO: 17 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 24;

(3) a light chain variable region comprising amino acid sequence SEQ ID NO: 17 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 25;

(4) a light chain variable region comprising amino acid sequence SEQ ID NO: 17 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 26;

(5) a light chain variable region comprising amino acid sequence SEQ ID NO: 17 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 27;

(6) a light chain variable region comprising amino acid sequence SEQ ID NO: 17 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 28;

(7) a light chain variable region comprising amino acid sequence SEQ ID NO: 18 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 24;

(8) a light chain variable region comprising amino acid sequence SEQ ID NO: 18 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 25;

(9) a light chain variable region comprising amino acid sequence SEQ ID NO: 18 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 27;

(10) a light chain variable region comprising amino acid sequence SEQ ID NO: 18 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 28;

(11) a light chain variable region comprising amino acid sequence SEQ ID NO: 19 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 24;

(12) a light chain variable region comprising amino acid sequence SEQ ID NO: 19 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 25;

(13) a light chain variable region comprising amino acid sequence SEQ ID NO: 19 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 27; or

(14) a light chain variable region comprising amino acid sequence SEQ ID NO: 19 and a heavy chain variable region comprising amino acid sequence SEQ ID NO: 28.

2. An antibody or an antigen binding fragment thereof that specifically binds to a human B7-H7CR according to Claim 1, in which the specifically bound H7CR is:

(A) arrayed on the surface of a live cell; or

(B) expressed at an endogenous concentration.

3. An antibody or an antigen binding fragment thereof according to Claim 2, in which the live cell is a T cell, an NK cell, or a plasmacytoid dendritic cell.

4. An antibody or an antigen binding fragment thereof according to Claim 1, in which the antibody or an antigen binding fragment thereof is substantially incapable of blocking B7-H7CR's interaction with B7-H7.

5. An antibody or an antigen binding fragment thereof according to Claim 1, in which the antibody or an antigen binding fragment thereof modulates or agonizes H7CR activity.

6. An antibody or an antigen binding fragment thereof according to Claim 1, in which the antibody or an antigen binding fragment thereof is a bispecific or multispecific antibody, or an antigen binding fragment thereof.

7. An antibody or an antigen binding fragment thereof according to any preceding claim, in which the antigen binding fragment is selected from the group consisting of single-chain Fv (scFv), Fab fragment, F(ab') fragment, $F(ab')_2$ fragment and disulfide-linked bispecific Fv (sdFv).

8. An antibody or an antigen binding fragment thereof according to any preceding claim, in which the antibody or an antigen binding fragment thereof is of an immunoglobulin class selected from IgG, IgE, IgM, IgD, IgA, or IgY.

9. An antibody or an antigen binding fragment thereof according to Claim 8, in which the IgG is an IgG1, IgG2, IgG3, or IgG4 subtype.

10. An antibody or an antigen binding fragment thereof according to Claim 1, which is detectably labeled.

11. An antibody or an antigen binding fragment thereof according to Claim 1, which comprises a conjugated toxin, drug, receptor, enzyme, or receptor ligand.

12. A pharmaceutical composition comprising a therapeutically effective amount of the antibody or an antigen binding fragment thereof according to any of Claims 1 to 9, and a physiologically acceptable carrier or excipient.

13. A pharmaceutical composition according to Claim 12 for use in a method for treating a disease in a subject exhibiting a symptom of a disease.

14. A pharmaceutical composition for use according to Claim 13, in which the disease is cancer.

15. A pharmaceutical composition for use according to Claim 14, in which the cancer is selected from the group consisting of leukemia, lymphoma, melanoma, colon cancer, lung cancer, breast cancer, prostate cancer, cervical cancer, liver cancer, testicular cancer, brain cancer, pancreatic cancer and renal cancer.

16. A pharmaceutical composition for use according to Claim 14 or 15, in which the method of treating the caner involves the use of one or more additional therapies or procedures.

17. A pharmaceutical composition for use according to Claim 16, in which the one or more additional therapies or procedures is selected from

(i) one or more anti-cancer agents, cytokines, cellular vaccines, anti-hormonal agents, and/or

(ii) surgery, chemotherapy, radiation therapy, or a combination thereof

18. A pharmaceutical composition for use according to Claim 13, in which the disease is an infectious disease.

19. A pharmaceutical composition for use according to Claim 18, in which the infectious disease is a chronic viral disease.

20. A pharmaceutical composition for use in a method for enhancing an immune response in a subject in need thereof, the method comprising administering to the subject a therapeutically effective amount of a pharmaceutical composition according to Claim 12.

21. A pharmaceutical composition for use according to Claim 20, in which the pharmaceutical composition agonizes an H7CR function.

22. A pharmaceutical composition for use according to Claim 20 or Claim 21, in which the pharmaceutical composition is administered by an oral, intradermal, intramuscular, intraperitoneal, intravenous, subcutaneous, intranasal, transdermal, implant, rectal, pulmonary, intestinal, mucosal, or epidural mode of administration.

23. A pharmaceutical composition for use in a method for prophylactically treating a disease in a subject in need of prophylactic treatment, the method comprising administering to the subject in advance of exhibiting a symptom of the disease a prophylactically effective amount of the pharmaceutical composition according to Claim 12.

24. A method for diagnosing a disease associated with the expression of B7-H7CR in a subject, the method comprising:

assaying cells or tissue obtained from a biological sample of the subject for their ability to bind to the antibody or an antigen binding fragment thereof that specifically binds to a human H7-H7CR according to Claim 1;

comparing the binding levels of the antibody or an antigen binding fragment thereof to human B7-H7CR expressed by the cells or tissue of the subject's sample; and

diagnosing disease in the subject based on an increase or a decrease in the B7-H7CR levels compared with levels of B7-H7CR in a suitable control.

25. A method according to Claim 24, in which the disease is cancer.

26. An antibody or an antigen binding fragment of an antibody that specifically binds a human B7-H7CR, in which the antibody or the antigen-binding fragment comprises a light chain CDR1 of SEQ ID NO: 29, a light chain CDR2 of SEQ ID NO: 32 and a light chain CDR3 of SEQ ID NO: 45; and a heavy chain CDR1 of SEQ ID NO: 49; a heavy chain CDR2 of SEQ ID NO: 52 and a heavy chain CDR3 of SEQ ID NO: 56

27. An antibody or an antigen binding fragment thereof according to Claim 26, in which the antibody or an antigen binding fragment thereof is a humanized antibody or a humanized monoclonal antibody or an antigen binding fragment thereof.

28. An antibody or antigen binding fragment thereof according to Claim 27, which is a bispecific or multispecific antibody.

29. An antibody or an antigen binding fragment thereof according to Claim 26, which is detectably labeled or comprises a conjugated toxin, drug, receptor, enzyme, or receptor ligand.

28. An antibody or an antigen binding fragment thereof according to Claim 1 or Claim 26, which does not block an interaction between B7-H7 and B7-H7CR.

29. An antibody or an antigen binding fragment thereof according to Claim 1 or Claim 26, which promotes antigen-specific memory T lymphocyte responses by T lymphocytes exposed to antigen and the antibody or an antigen binding fragment thereof.

30. The antibody or an antigen binding fragment thereof according to Claim 31, in which the exposure of the T lymphocytes to the antibody or an antigen binding fragment thereof elicits production of one or more of cytokines IFNγ, TNFα, GM-CSF and IL-10 by the T lymphocytes.