CLAIMS

1. A radioimmunoconjugate comprising a recombinant anti-oxMIF antibody or an antigen binding fragment thereof, comprising

(a1) a light chain variable domain comprising SEQ ID NO:32 having at least one of amino acid substitutions M30L, F49Y, A51G, P80S, W93F, or

(a2) a light chain variable domain comprising SEQ ID NO:32 with 1, 2, 3, 4, or 5 amino acid substitutions further comprising

- a conserved tyrosine at position 36, and
- at least one of amino acid substitutions M30L, F49Y, A51G, P80S, W93F;

and

(b1) a heavy chain variable domain comprising SEQ ID NO:29; or

(b2) a heavy chain variable domain comprising SEQ ID NO:29 and the amino acid substitutions L5Q and/or W97Y, or

(b3) a heavy chain variable domain comprising SEQ ID NO:29 having at least one of amino acid substitutions L5Q or W97Y, and 1, 2, 3, 4 or 5 further amino acid substitutions;

wherein amino acid positions are numbered according to Kabat,

wherein said antibody or antigen binding fragment thereof has reduced aggregation potential and reduced hydrophobicity compared to an antibody or an antigen binding fragment thereof comprising SEQ ID NO:32 and SEQ ID NO:29 lacking the amino acid substitutions.

2. The radioimmunoconjugate of claim 1, wherein the light chain variable domain comprises the amino acid substitution W93F and the heavy chain variable region comprises the amino acid substitution W97Y.

3. The radioimmunoconjugate of claim 1 or 2, wherein the radioisotope is selected from the group consisting of ^{11}C, ^{13}N, ^{15}O, ^{18}F, ^{32}P, ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{89}Zr, ^{90}Y, ^{99}mTc, ^{103}Pd, ^{105}Rh, ^{109}Pd, ^{111}Ag, ^{111}In, ^{123}I, ^{124}I, ^{125}I, ^{131}I, ^{140}La, ^{149}Tb, ^{149}Pm, ^{153}Sm, ^{159}Gd, ^{165}Dy, ^{166}Dy, ^{166}Ho, ^{169}Yb, ^{175}Yb, ^{177}Lu, ^{227}Th, ^{186}Re, ^{188}Re, ^{192}Ir, ^{193}mPt, ^{195}mPt, ^{198}Au, ^{199}Au, ^{211}At, ^{212}Pb, ^{212}Bi, ^{213}Bi, ^{225}Ac, ^{223}Ra, and ^{227}Th, specifically the radioisotope is selected from the group consisting of ^{67}Ga, ^{89}Zr, ^{111}In, ^{124}I, ^{131}I, ^{177}Lu, and ^{225}Ac.

4. The radioimmunoconjugate of any one of claims 1 to 3, comprising a Fc variant domain of a wild-type human IgG1 constant domain having SEQ ID NO: 37, comprising at least one amino acid substitution at any one of positions, L234, L235, G236, G237, N297, L328 or P329, and wherein said radioimmunoconjugate exhibits decreased binding to Fcγ-receptors compared to a radioimmunoconjugate comprising the wildtype IgG1 Fc region.

5. The radioimmunoconjugate of any one of claims 1 to 4, comprising an Fc variant domain of a human IgG1 constant domain, comprising one, two or three amino acid substitutions at any one of positions, I253, H310, H435, and wherein said radioimmunoconjugate exhibits reduced affinity to the human FcRn compared to a radioimmunoconjugate comprising the wildtype IgG1 Fc region

6. The radioimmunoconjugate of any one of claims 1 to 5, comprising an amino acid sequence selected from the group consisting of SEQ ID NOs:31, 33, 34, 35, and 36.

7. The radioimmunoconjugate of any one of claims 1 to 5, comprising SEQ ID NOs:29 and 34; SEQ ID NOs:30 and 33, SEQ ID NOs:30 and 34, SEQ ID NOs:31 and 34, SEQ ID NOs:31 and 36, or SEQ ID NOs:31 and 33, in combination with any one of SEQ ID NOs:37, 38, 39, and 40.

8. The radioimmunoconjugate of any one of claims 1 to 7, selected from the group consisting of IgG, IgG-fusion protein, Fv, scFv, scFv fusion protein, diabody, diabody fusion protein, Fab, Fab-fusion protein, scFab, scFab-fusion protein, Fab', and F(ab')2, Fab'-SH, Fcab, Fcab fusion protein, a fusion protein of two or more single chain antibodies, minibody, and small immune protein (SIP) format.

9. The radioimmunoconjugate of any one of claims 1 to 8, further comprising a chelating group, specifically selected from the group of DOTA, deferoxamine B (DFO) and DFO*.

10. The radioimmunoconjugate of any one of claims 1 to 9 for use in the preparation of a medicament.

11. A pharmaceutical composition comprising the radioimmunoconjugate of any one of claims 1 to 9, optionally together with a pharmaceutical carrier or adjuvant, specifically formulated for intravenous administration.

12. Use of ~~T~~the pharmaceutical composition of claims 10 or 11 or the radioimmunoconjugate of any one of claims 1 to 9 in the manufacture of a medicament for ~~use~~ the treatment of a patient suffering from cancer, specifically in the treatment of tumors, specifically of hematological or solid tumors, more specifically for the treatment of colorectal cancer, ovarian cancer, breast cancer, prostate cancer, pancreas cancer, and lung cancer.

13. An isolated nucleic acid encoding the recombinant anti-oxMIF antibody or antigen binding fragment thereof of the radioimmunoconjugate of any one of claims 1 to 9.

14. An expression vector comprising the nucleic acid of claim 13.

15. A host cell containing the nucleic acid of claim 13 or an expression vector of claim 14.

16. A method for producing the radioimmunoconjugate of any one of claims 1 to 9, comprising expressing a nucleic acid encoding an anti-oxMIF antibody in a host cell and further labeling said antibody with a radioisotope.

17. Use of the radioimmunoconjugate of any one of claims 1 to 9 for detection of oxMIF level in the cancer of a subject.

18. Use of the radioimmunoconjugate of any one of claims 1 to 9 for diagnosis of cancer in a subject.

19. A method for in vivo diagnosing cancer in a subject, wherein the radioimmunoconjugate of any one of claims 1 to 9 is used for detecting tumor cells.

20. A method for in vitro diagnosing cancer, wherein the radioimmunoconjugate of any one of claims 1 to 9 is used for detecting tumor cells in a sample.

21. A kit for production of the radioimmunoconjugate of any one of claims 1 to 9, comprising two or more vials, wherein one vial contains a conjugate comprising a chelator linked to an anti-oxMIF antibody and a second vial contains a radioisotope, specifically selected from ^{177}Lu and ^{89}Zr, and wherein the content of one or several of the vials is optionally lyophilized or in solution.

22. The kit of claim 21, wherein the content of one or several of the vials is lyophilized or in solution.

23. ~~Method for treating cancer using~~Use of the radioimmunoconjugate of any one of claims 1 to 9, or a pharmaceutical composition of claim 11, in the manufacture of a medicament for treating cancer.