

SUMMARY OF THE INVENTION

[007] The present ~~invention~~disclosure provides a pharmaceutical composition comprising an antibody, preferably a monoclonal antibody, which binds to human PRDX4 present on the cell surface of a cancer cell, more preferably said antibody recognizes a region from amino acids 81 to 271 in human PRDX4 shown in SEQ ID NO: 81 and optionally a pharmaceutically acceptable carrier, diluent or excipient. In one aspect, the present disclosure refers to a pharmaceutical composition comprising a monoclonal antibody which binds to human PRDX4 present on the cell surface of a cancer cell and optionally a pharmaceutically acceptable carrier, diluent or excipient, wherein said antibody recognizes a region from amino acids 81 to 271 in human PRDX4 shown in SEQ ID NO: 81.

[008] In one ~~embodiment~~example of the pharmaceutical composition of the present ~~invention~~disclosure, said antibody has cytotoxic activity.

[009] In one further ~~embodiment~~example of the pharmaceutical composition of the present ~~invention~~disclosure, said antibody has ADCC or CDC.

[0010] In one ~~embodiment~~example of the pharmaceutical composition of the present ~~invention~~disclosure, said antibody is conjugated with a cytotoxic substance.

[0011] In one further ~~embodiment~~example of the pharmaceutical composition of the present ~~invention~~disclosure, said antibody is part of a chimeric antigen receptor (CAR). For said ~~embodiment~~example, it is preferred that said CAR is comprised by a T cell, NK cell, NK-T cell or macrophage.

[0012] In one ~~embodiment~~example of the pharmaceutical composition of the present ~~invention~~disclosure, said antibody is less than 20 % cross-reactive with PRDX4-related proteins.

[0013] In one further ~~embodiment~~example of the pharmaceutical composition of the present ~~invention~~disclosure, said antibody recognizes a region from amino acids 1 to 79, preferably from amino acids 37 to 79, more preferably from amino acids 81 to 271, in human PRDX4 shown in SEQ ID NO: 81.

[0014] Additionally, in one ~~embodiment~~example of the pharmaceutical composition of the present ~~invention~~disclosure, said antibody is

- (a) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85 % identity to the amino acid sequence shown in SEQ ID NO: 1 and a light chain variable region having an amino acid sequence with at least 85 % identity to the amino acid sequence shown in SEQ ID NO: 2;
- (b) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 3 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 4;
- (c) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 5 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 6;
- (d) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID

- NO: 7 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 8;
- (e) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 9 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 10;
 - (f) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 11 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 12;
 - (g) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 13 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 14;
 - (h) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 15 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 16;
 - (i) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 17 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 18;
 - (j) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 19 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 20; or
 - (k) an antibody which binds to the same epitope as that in the human PRDX4 protein to which any one of the antibodies (a) to (j) bind.

[0015] In one ~~embodiment~~example of the pharmaceutical composition of the present ~~invention~~disclosure, said antibody is

- (a) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 21, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 22, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 23, and a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 24, light chain CDR2 having the amino acid

sequence as set forth in SEQ ID NO: 79, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 80, or

- (k) an antibody which binds to the same epitope as that in the human PRDX4 protein to which any one of the antibodies (a) to (j) bind.

[0016] In another aspect, the present disclosure refers to the pharmaceutical composition as disclosed herein for use in therapy. In a further aspectexample, the present inventiondisclosure provides the pharmaceutical composition according to the present inventiondisclosure for use in a method for the treatment of cancer in a human subject. It is preferred for said embodimentexample, that said cancer is characterized by cells, wherein human PRDX4 is present on their cell surface. It is also preferred for said embodimentexample that said cancer is breast cancer, prostate cancer, lung cancer, colorectal cancer, ovarian cancer, oral cavity squamous carcinoma, hematologic malignancy tumor, or glioma. In another aspect, the present disclosure refers to use of the pharmaceutical composition as disclosed herein in the manufacture of a medicament for treating cancer in a human subject, wherein said cancer is characterized by cells, wherein human PRDX4 is present on their cell surface.

[0017] In a further aspect, the present inventiondisclosure provides a method for determining whether a human subject may suffer from cancer, comprising determining in a sample obtained from said human subject whether PRDX4 is present on the cell surface of cancer cells comprised by said sample.

[0018] In a further aspect, the present inventiondisclosure provides an antibody which binds to human PRDX4 present on the cell surface of a target cell, wherein said antibody is

- (a) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 1 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 2;
- (b) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 3 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 4;
- (c) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 5 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 6;
- (d) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 7 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 8;
- (e) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID

- NO: 9 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 10;
- (f) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 11 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 12;
 - (g) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 13 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 14;
 - (h) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 15 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 16;
 - (i) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 17 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 18;
 - (j) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 19 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 20; or
 - (k) an antibody which binds to the same epitope as that in the human PRDX4 protein to which any one of the antibodies (a) to (j) bind.

[0019] In one further [embodiment aspect](#), the present [invention disclosure](#) provides an antibody which binds to human PRDX4 present on the cell surface of a target cell comprising

- (a) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 21, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 22, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 23 and
a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 24, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 25, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 26;
- (b) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 27, heavy

Claims

1. Pharmaceutical composition comprising a monoclonal antibody which binds to human PRDX4 present on the cell surface of a cancer cell and optionally a pharmaceutically acceptable carrier, diluent or excipient, wherein said antibody recognizes a region from amino acids 81 to 271 in human PRDX4 shown in SEQ ID NO: 81.
2. The pharmaceutical composition of claim 1, wherein said antibody has cytotoxic activity.
3. The pharmaceutical composition of any one of the preceding claims, wherein said antibody has ADCC or CDC.
4. The pharmaceutical composition of any one of the preceding claims, wherein said antibody is conjugated with a cytotoxic substance.
5. The pharmaceutical composition of any one of the preceding claims, wherein said antibody is part of a chimeric antigen receptor (CAR).
6. The pharmaceutical composition of claim 5, wherein said CAR is comprised by a T cell, NK cell, NK-T cell or macrophage.
7. The pharmaceutical composition of any one of the preceding claims, wherein said antibody is less than 20% cross-reactive with PRDX4-related proteins.
8. The pharmaceutical composition of any one of the preceding claims, wherein said antibody is
 - (a) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 1 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 2;
 - (b) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 3 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 4;
 - (c) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID

- NO: 5 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 6;
- (d) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 7 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 8;
 - (e) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 9 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 10;
 - (f) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 11 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 12;
 - (g) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 13 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 14;
 - (h) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 15 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 16;
 - (i) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 17 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 18;
 - (j) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 19 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 20; or
 - (k) an antibody which binds to the same epitope as that in the human PRDX4 protein to which any one of the antibodies (a) to (j) bind.
9. The pharmaceutical composition of any one of the preceding claims, wherein said antibody is
- (a) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 21, heavy

- chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 22, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 23, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 24, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 25, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 26;
- (b) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 27, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 28, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 29, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 30, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 31, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 32;
- (c) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 33, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 34, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 35, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 36, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 37, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 38;
- (d) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 39, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 40, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 41, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 42, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 43, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 44;
- (e) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 45, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 46, and

- heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 47, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 48, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 49, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 50;
- (f) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 51, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 52, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 53, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 54, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 55, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 56;
- (g) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 57, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 58, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 59, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 60, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 61, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 62,
- (h) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 63, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 64, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 65, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 66, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 67, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 68,
- (i) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 69, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 70, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 71, and

- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 72, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 73, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 74,
- (j) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 75, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 76, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 77, and
a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 78, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 79, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 80, or
- (k) an antibody which binds to the same epitope as that in the human PRDX4 protein to which any one of the antibodies (a) to (j) bind.
10. The pharmaceutical composition of any one of the preceding claims for use in ~~a method for the treatment of cancer in a human subject~~therapy.
11. ~~The pharmaceutical composition for the use of~~ the pharmaceutical composition of any one of claims 1 to 9 in the manufacture of a medicament for treating cancer in a human subject, wherein said cancer is characterized by cells, wherein human PRDX4 is present on their cell surface.
12. The ~~pharmaceutical composition for the use of claim 10 or 11~~, wherein said cancer is breast cancer, prostate cancer, lung cancer, colorectal cancer, ovarian cancer, oral cavity squamous carcinoma, hematologic malignancy tumor, or glioma.
13. A method for determining whether a human subject may suffer from cancer, comprising determining in a sample obtained from said human subject whether PRDX4 is present on the cell surface of cancer cells comprised by said sample.
14. An antibody which binds to human PRDX4 present on the cell surface of a cancer cell, wherein said antibody is
- (a) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 1 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 2;

- (b) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 3 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 4;
- (c) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 5 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 6;
- (d) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 7 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 8;
- (e) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 9 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 10;
- (f) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 11 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 12;
- (g) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 13 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 14;
- (h) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 15 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 16;
- (i) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 17 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 18;
- (j) an antibody comprising a heavy chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 19 and a light chain variable region having an amino acid sequence with at least 85% identity to the amino acid sequence shown in SEQ ID NO: 20; or

- (k) an antibody which binds to the same epitope as that in the human PRDX4 protein to which any one of the antibodies (a) to (j) bind.
15. An antibody which binds to human PRDX4 present on the cell surface of a cancer cell comprising
- (a) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 21, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 22, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 23 and
a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 24, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 25, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 26;
 - (b) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 27, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 28, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 29, and
a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 30, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 31, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 32;
 - (c) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 33, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 34, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 35, and
a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 36, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 37, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 38;
 - (d) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 39, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 40, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 41, and

- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 42, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 43, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 44;
- (e) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 45, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 46, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 47, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 48, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 49, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 50;
- (f) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 51, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 52, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 53, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 54, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 55, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 56;
- (g) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 57, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 58, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 59, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 60, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 61, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 62;
- (h) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 63, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 64, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 65, and

- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 66, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 67, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 68;
- (i) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 69, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 70, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 71, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 72, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 73, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 74;
- (j) an antibody comprising a heavy chain variable region comprising heavy chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 75, heavy chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 76, and heavy chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 77, and
- a light chain variable region comprising light chain CDR1 having the amino acid sequence as set forth in SEQ ID NO: 78, light chain CDR2 having the amino acid sequence as set forth in SEQ ID NO: 79, and light chain CDR3 having the amino acid sequence as set forth in SEQ ID NO: 80; or
- (k) an antibody which binds to the same epitope as that in the human PRDX4 protein to which any one of the antibodies (a) to (j) bind.