

WHAT IS CLAIMED IS:

1. A method of treating small cell lung cancer (SCLC) in a subject, the method comprising:

- (a) administering a chemotherapy regimen to the subject;
- (b) administering an immunotherapy regimen to the subject;
- (c) administering an antibody or antigen-binding fragment thereof to the subject;
- (d) performing surgical resection of the SCLC in the subject; and/or
- (e) contacting the subject with radiotherapy targeting the SCLC,

wherein the subject has autoantibodies that specifically bind one or more epitopes of one or more antigens selected from the group consisting of CDH5, CD133, SPINK1, CDH23, NLRP7, TFRC, SPINT2, NADSYN1, HIF1A, GRAP2, MAPRE1, INHA, PTEN, CTSB, B3GNT6, PLD3, TIMP2, NUDT2, ANAPC2, GPLD1, PTPRU and CA9, and wherein the one or more epitopes of the antigen comprises a post-translational modification (PTM).

2. The method of claim 1, wherein the one or more antigens is selected from the group consisting of SPINK1, TFRC, GRAP2, TIMP2 and PLD3.

3. The method of claim 1 or 2, wherein the PTM comprises citrullination, isoaspartylation and/or glycosylation.

4. The method of any one of claims 1-3, wherein the one or more epitopes is selected from the group consisting of SEQ ID NOs: 22-46.

5. The method of any one of claims 1-4, wherein treating the SCLC in the subject comprises administering an antibody or antigen binding fragment thereof that specifically binds at least one of the one or more antigens to the subject.

6. The method of claim 5, wherein the antibody or antigen-binding fragment comprises HCDR1-HCDR2-HCDR3-LCDR1-LCDR2-LCDR3 domains comprising the amino acid sequences, respectively, selected from the group consisting of SEQ ID NOs: 48-49-50-52-53-54, 56-57-58-60-61-62, 64-65-66-68-69-70, 72-73-74-76-77-78, and 80-81-82-84-85-86.

7. The method of claim 6, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable region (HCVR) and a light chain variable region (LCVR),

wherein the amino acid sequences of the HCVR/LCVR, respectively, are selected from the group consisting of SEQ ID NOs: 47/51, 55/59, 63/67, 71/75, and 79/83.

8. A biomarker detection panel for small cell lung cancer (SCLC), comprising one or more peptides comprising an epitope of from 7 to 50 amino acids in length from one or more antigens selected from the group consisting of CDH5, CD133, SPINK1, CDH23, NLRP7, TFRC, SPINT2, NADSYN1, HIF1A, GRAP2, MAPRE1, INHA, PTEN, CTSB, B3GNT6, PLD3, TIMP2, NUDT2, ANAPC2, GPLD1, PTPRU and CA9, wherein the epitope comprises a post-translational modification (PTM) bound by an autoantibody.

9. The biomarker detection panel of claim 8, wherein the one or more antigens is selected from the group consisting of SPINK1, TFRC, GRAP2, TIMP2 and PLD3.

10. The biomarker detection panel of claim 8 or 9, wherein the PTM comprises citrullination, isoaspartylation and/or glycosylation.

11. The biomarker detection panel of any one of claims 8-10, wherein the one or more epitopes is selected from the group consisting of SEQ ID NOs: 22-46.

12. An isolated antibody or antigen binding fragment thereof that binds to an epitope of TFRC-4 comprising a PTM, wherein the PTM comprises citrullination.

13. The antibody or antigen-binding fragment of claim 12, wherein the epitope comprises the amino acid sequence of SEQ ID NO: 39.

14. The antibody or antigen-binding fragment of claim 12 or 13, wherein the antibody or antigen binding fragment comprises HCDR1-HCDR2-HCDR3-LCDR1-LCDR2-LCDR3 domains comprising the amino sequences of SEQ ID NOs: 80-81-82-84-85-86, respectively.

15. The antibody or antigen-binding fragment of claim 14, wherein the antibody or antigen-binding fragment thereof comprises a HCVR comprising the amino acid sequence of SEQ ID NO: 79, and a LCVR comprising the amino acid sequence of SEQ ID NO: 83.