

We claim

1. An antibody or antigen-binding fragment thereof that binds specifically to a BAG2 polypeptide ~~or fragment thereof~~, wherein the antibody or antigen-binding fragment thereof comprises

a heavy chain variable region comprising a complementarity determining region (VH-CDR)1 consisting of the amino acid sequence of SEQ ID NO: 33, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 39, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 45; and a light chain variable region comprising a complementarity determining region (VL-CDR)1 consisting of the amino acid sequence of SEQ ID NO: 51, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 57, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 63,

a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 34, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 40, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 46; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 52, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 58, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 64,

a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 35, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 41, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 47; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 53, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 59, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 65,

a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 36, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 42, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 48; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 54, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 60, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 66,

a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 37, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 43, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 49; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 55, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 61, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 67, or

a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 38, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 44, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 50; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 56, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 62, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 68.

~~2. The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody or antigen-binding fragment thereof comprises~~

~~a heavy chain variable region comprising a complementarity determining region (VH-CDR)1 consisting of the amino acid sequence of SEQ ID NO: 33, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 39, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 45; and a light chain variable region comprising a complementarity determining region (VL-CDR)1 consisting of the amino acid sequence of SEQ ID NO: 51, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 57, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 63,~~

~~a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 34, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 40, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 46; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 52, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 58, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 64,~~

~~a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 35, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 41, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 47; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 53, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 59, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 65,~~

~~a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 36, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 42, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 48; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 54, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 60, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 66,~~

~~a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 37, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 43, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 49; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 55, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 61, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 67, and~~

~~a heavy chain variable region comprising a VH-CDR1 consisting of the amino acid sequence of SEQ ID NO: 38, VH-CDR2 consisting of the amino acid sequence of SEQ ID NO: 44, and VH-CDR3 consisting of the amino acid sequence of SEQ ID NO: 50; and a light chain variable region comprising a VL-CDR1 consisting of the amino acid sequence of SEQ ID NO: 56, VL-CDR2 consisting of the amino acid sequence of SEQ ID NO: 62, and VL-CDR3 consisting of the amino acid sequence of SEQ ID NO: 68.~~

32. The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody or antigen-binding fragment thereof comprises

a heavy chain variable region comprising any one amino acid sequence selected from SEQ ID NOS: 21 to 26; and

a light chain variable region comprising any one amino acid sequence selected from

SEQ ID NOS: 27 to 32.

~~43.~~ The antibody or antigen-binding fragment thereof of claim 1, being
a heavy chain variable region of SEQ ID NO: 21 and a light chain variable region of
SEQ ID NO: 27; a heavy chain variable region of SEQ ID NO: 22 and a light chain variable
region of SEQ ID NO: 28; a heavy chain variable region of SEQ ID NO: 23 and
a light chain variable region of SEQ ID NO: 29; a heavy chain variable region of
SEQ ID NO: 24 and a light chain variable region of SEQ ID NO: 30; a heavy chain variable
region of SEQ ID NO: 25 and a light chain variable region of SEQ ID NO: 31; or a heavy
chain variable region of SEQ ID NO: 26 and a light chain variable region of SEQ ID NO:
32, or a combination thereof.

~~54.~~ The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody
or antigen-binding fragment thereof is a monoclonal antibody.

~~65.~~ The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody
or antigen-binding fragment thereof is marked with a detectable label or a label capable of
emitting a detectable signal.

~~76.~~ The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody is
humanized.

~~8. — The antibody or antigen-binding fragment of claim 1, wherein a hotspot is engineered
out in a CDR of the antibody.~~

~~97.~~ The antibody or antigen-binding fragment thereof of claim 1, wherein the monoclonal
antibody is monovalent, an Fab, or a single chain variable fragment antibody (scFv).

~~108.~~ The antibody or antigen-binding fragment thereof of claim 1, wherein the monoclonal
antibody is bi-valent, bi-specific, or tri-specific.

~~14~~9. The antibody or antigen-binding fragment thereof of claim 1, wherein the monoclonal antibody is fused to a chemical or a protein.

~~12~~10. The antibody or antigen-binding fragment thereof of claim 11, wherein the monoclonal antibody is fused to a toxin, or a cytokine.

~~13~~11. The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody or antigen-binding fragment thereof is produced by a hybridoma cell selected from hybridoma cells deposited with accession numbers KCTC 13737BP, KCTC 13738BP, KCTC 13739BP, KCTC 13740BP, KCTC 13741BP, KCTC 13742BP, KCTC 13743BP, KCTC 13744BP, KCTC 13745BP, and KCTC 13746BP.

~~14~~12. The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody or antigen-binding fragment thereof comprises a plurality of the antibodies or antigen-binding fragments thereof.

~~15~~13. A polynucleotide comprising: a polynucleotide encoding the antibody or antigen-binding fragment of claim 1.

~~16~~14. The polynucleotide of claim ~~15~~13, wherein the polynucleotide is a vector.

~~17~~15. The polynucleotide of claim ~~16~~14, wherein a detectable label or a label capable of emitting a detectable signal is conjugated with the polynucleotide.

~~18~~16. A host cell comprising the polynucleotide of claim ~~15~~13.

~~19~~17. A method of producing an antibody or an antigen-binding fragment thereof, the method comprising:

culturing the host cell of claim ~~18~~16; and

separating an antibody or antigen-binding fragment thereof from the obtained culture.

~~20~~18. The method of claim ~~19~~17, further comprising marking the antibody or antigen-binding fragment thereof.

~~21~~19. ~~A method for treating cancer that is primary or metastasized cancer in an individual comprising administering to the individual in need thereof~~ Use of an anti-BAG2 or antigen-binding fragment thereof of claim 1 in the manufacture of a medicament for treating cancer that is primary or metastasized cancer in an individual, wherein the cancer is breast, lung, melanoma, colon, colorectal, or pancreatic cancer.

~~22~~20. The ~~method-use~~ of claim ~~21~~19, ~~wherein the medicament is to be comprising co-administering-administered~~ or sequentially ~~administering-administered with~~ an existing therapeutic agent.

~~23~~21. ~~The-use method-~~of claim ~~22~~20, wherein the existing therapy is cancer immunotherapeutic agent.

~~24~~22. The ~~method-use~~ of claim ~~23~~21, wherein the immunotherapeutic agent is an inhibitor to immune checkpoint molecule.

~~25~~23. The ~~method-use~~ of claim ~~24~~22, wherein the immune checkpoint molecule is PD-1, PD-L1, or CTLA4.

~~26~~24. The ~~method-use~~ of claim ~~23~~21, wherein the immunotherapeutic agent is selected from the group consisting of: granulocyte-macrophage colony stimulating factor (GM-CSF), macrophage colony stimulating factor (M-CSF), granulocyte colony stimulating factor (G-CSF), interleukin 2 (IL-2), interleukin 3 (IL-3), interleukin 12 (IL-12), interleukin 15 (IL-15), B7-1 (CD80), B7-2

(CD86), 4-1BB ligand, GITRL, OX-40L, anti-CD3 antibody, anti-CD27 antibody, anti-CTLA4 antibody, anti-PD-1 antibody, anti-PD-L1 antibody, anti-GITR antibody, anti-OX-40 antibody, anti-4-1BB antibody, anti-LAG-3 antibody, and anti-TIM-3 antibody.

~~27. —The method of claim 21, wherein the cancer is cancer is selected from, for example, breast cancer, colorectal cancer, head and neck cancer, colon cancer, skin cancer, pancreatic cancer, lung cancer, gastric cancer, prostate cancer, bladder cancer, urethral cancer, liver cancer, kidney cancer, clear cell sarcoma, melanoma, cerebrospinal tumor, brain cancer, thymus, mesothelioma, esophageal cancer, bile duct cancer, testicular cancer, germ cell tumor, thyroid cancer, parathyroid cancer, cervical cancer, ovarian cancer, endometrial cancer, lymphoma, myelodysplastic syndromes (MDS), myelofibrosis, acute leukemia, chronic leukemia, multiple myeloma, Hodgkin's disease, endocrine cancer, and sarcoma.~~

~~28. —The method of claim 27, wherein the cancer is breast, lung, melanoma, colorectal, or pancreatic cancer.~~