

**WHAT IS CLAIMED IS:**

1. An IL1RAP binding protein which competes for binding to IL1RAP proteins with any one of the IL1RAP antibodies having heavy and light variable regions comprising respective heavy and light variable sequences of: SEQ ID NO:2 and 7; 12 and 17; 22 and 27; 32 and 37; 42 and 47; 51 and 52; or 63 and 68.
2. An IL1RAP binding protein of claim 1 further having the ability to directly kill IL1RAP expressing tumor cells via ADCC and/or CDC, inhibit the growth promoting effect of IL-1 on cancer cells, and/or promote an enhanced tumor-directed immune response by inhibiting the MDSC-promoting effects of IL-1.
3. An IL1RAP binding protein which binds to human IL1RAP at one or both amino acids at Gln165 and Asn166 of human IL1RAP of SEQ ID NO 59 as determined by X-ray crystallography.
4. An IL1RAP binding protein having comprising one or more of: CDRH1 as set forth in SEQ ID NO:33; CDRH2 as set forth in SEQ ID NO:34; CDRH3 as set forth in SEQ ID NO:35; CDRL1 as set forth in SEQ ID NO:38; CDRL2 as set forth in SEQ ID NO:39 and/or CDRL3 as set forth in SEQ ID NO:40, or a direct equivalent of each CDR wherein a direct equivalent has no more than two amino acid substitutions in said CDR.
5. An IL1RAP binding protein which binds to human IL1RAP protein wherein said IL1RAP binding protein comprises a V<sub>H</sub> domain comprising an amino acid sequence at least 85, 90, 95, 98, or 99% identical to the amino acid sequence set forth in SEQ ID NO:51 and/or a V<sub>L</sub> domain comprising an amino acid sequence at least 85, 90, 95, 98, or 99% identical to the amino acid sequence set forth in SEQ ID NO:52.
6. A humanized monoclonal antibodies having heavy chain CDRs having the amino acid sequences set forth in SEQ ID NO:33; SEQ ID NO:34; and SEQ ID NO:35, and light chain CDRs having the amino acid sequences set forth in SEQ ID NO:38; SEQ ID NO:39; and SEQ ID NO:40.
7. A humanized monoclonal antibodies having a V<sub>H</sub> domain comprising an amino acid sequence set forth in SEQ ID NO:51; and a V<sub>L</sub> domain comprising an amino acid sequence set forth in SEQ ID NO:52.
8. A humanized monoclonal antibodies having full length heavy chain comprising an amino acid sequence set forth in SEQ ID NO:55; and full length light chain comprising an amino acid sequence set forth in SEQ ID NO:56.

9. The antibody of claim 8 or claim 7 which is expressed from POTELLIGENT $\alpha$ -1,6-fucosyltransferase (FUT8)-knockout CHO cell line.
10. A pharmaceutical composition comprising any one of IL1RAP antigen binding protein or antibodies of any one of claims 1-9.
11. A method of treating acute myeloid leukemia (AML), chronic myeloid leukemia (CML), and myelodysplastic syndrome (MDS); and solid tumor cancers selected from the group consisting of prostate, breast, lung, colon, melanoma, bladder, brain, cervical, oesophgeal, gastric, head/neck, kidney, liver, ovarian, lymphoma, pancreatic, and sarcomas in a human comprising administering a therapeutically effective amount of IL1RAP antigen binding protein or antibody of any one of claims 1-10.
12. Polynucleotides encoding IL1RAP binding proteins having one or more of: CDRH1 as set forth in SEQ ID NO:33; CDRH2 as set forth in SEQ ID NO:34; CDRH3 as set forth in SEQ ID NO:35; CDRL1 as set forth in SEQ ID NO:38; CDRL2 as set forth in SEQ ID NO:39 and/or CDRL3 as set forth in SEQ ID NO:40 or a direct equivalent of each CDR wherein a direct equivalent has no more than two amino acid substitutions in said CDR.
13. Polynucleotides encoding IL1RAP binding proteins which specifically bind to human IL1RAP protein, and wherein said IL1RAP binding protein comprises a V<sub>H</sub> domain comprising an amino acid sequence at least 85, 90, 95, 98, or 99% identical to the amino acid sequence set forth in SEQ ID NO:51 and/or a V<sub>L</sub> domain comprising an amino acid sequence at least 85, 90, 95, 98, or 99% identical to the amino acid sequence set forth in SEQ ID NO:52.
14. Polynucleotides encoding humanized monoclonal antibodies comprising heavy chain CDRs having the amino acid sequences set forth in SEQ ID NO:33; SEQ ID NO:34; and SEQ ID NO:35 and light chain CDRs having the amino acid sequences set forth in SEQ ID NO:38; SEQ ID NO:39; and SEQ ID NO:40.
15. Polynucleotides encoding humanized monoclonal antibodies comprising a V<sub>H</sub> domain having an amino acid sequence set forth in SEQ ID NO:51; and a V<sub>L</sub> domain having an amino acid sequence set forth in SEQ ID NO:52.
16. Polynucleotides encoding humanized monoclonal antibodies comprising full length heavy chain having an amino acid sequence as set forth in SEQ ID NO:55; and full length light chain having an amino acid sequence set forth in SEQ ID NO:56.

17. Polynucleotides comprising polynucleotides having identity at least 85, 90, 95, 98, or 99% to polynucleotide sequence of SEQ ID NO:53, 54, 57, 58 or 72.
18. A Polynucleotide of claim 17 comprising a polynucleotide sequence of SEQ ID NO:53, 54, 55, 56 or 72.
19. A vector and host cell containing any of the polynucleotides of claim 17 or 18.