rector.

The presently disclosed subject matter further provides a chimeric antigen receptor (CAR), comprising an extracellular antigen-binding domain that binds to Fc Receptor-like 5 (FcRL5), a transmembrane domain and an intracellular domain, wherein the extracellular antigen-binding domain comprises:

(a) a light chain variable region comprising the CDR1, CDR2 and CDR3 of the light chain variable region set forth in an amino acid sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:7, SEQ ID NO:11, SEQ ID NO:15, SEQ ID NO:19, SEQ ID NO:23, SEQ ID NO:27, SEQ ID NO:31, SEQ ID NO:35, SEQ ID NO:39, SEQ ID NO:43, SEQ ID NO:47, SEQ ID NO:51, SEQ ID NO:55, SEQ ID NO:59, SEQ ID NO:63, SEQ ID NO:67, SEQ ID NO:71, SEQ ID NO:75, SEQ ID NO:79, SEQ ID NO:83, SEQ ID NO:87, SEQ ID NO:91, SEQ ID NO:95, SEQ ID NO:99, SEQ ID NO:103, SEQ ID NO:107, SEQ ID NO:111, SEQ ID NO:115, SEQ ID NO:119, SEQ ID NO:123, SEQ ID NO:127, SEQ ID NO:131, SEQ ID NO:135, SEQ ID NO:139, SEQ ID NO:143, SEQ ID NO:147, SEQ ID NO:151, SEQ ID NO:155, SEQ ID NO:159, SEQ ID NO:163, SEQ ID NO:167, SEQ ID NO:171, SEQ ID NO:175, SEQ ID NO:179, SEQ ID NO:183, SEQ ID NO:187, SEQ ID NO:191, SEQ ID NO:195, SEQ ID NO:199, SEQ ID NO:203, SEQ ID NO:207, SEQ ID NO:211, SEQ ID NO:215, SEQ ID NO:219, SEQ ID NO:223, SEQ ID NO:227, SEQ ID NO:231, SEQ ID NO:235, SEQ ID NO:239, SEQ ID NO:243, SEQ ID NO:247, SEQ ID NO:251, SEQ ID NO:255, SEQ ID NO:259, SEQ ID NO:263, SEQ ID NO:267, SEQ ID NO:271, SEQ ID NO:275, SEQ ID NO:279, SEQ ID NO:283, SEQ ID NO:287, SEQ ID NO:291, SEQ ID NO:295, SEQ ID NO:299, SEQ ID NO:303, SEQ ID NO:917, and SEQ ID NO:921; and

(b) a heavy chain variable region comprising the CDR1, CDR2 and CDR3 of the heavy chain variable region set forth in an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:8, SEQ ID NO:12, SEQ ID NO:16, SEQ ID NO:20, SEQ ID NO:24, SEQ ID NO:28, SEQ ID NO:32, SEQ ID NO:36, SEQ ID NO:40, SEQ ID NO:44, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:56, SEQ ID NO:60, SEQ ID NO:64, SEQ ID NO:68, SEQ ID NO:72, SEQ ID NO:76, SEQ ID NO:80, SEQ ID NO:84, SEQ ID NO:88, SEQ ID NO:92, SEQ ID NO:96, SEQ ID NO:100, SEQ ID NO:104, SEQ ID NO:108, SEQ ID NO:112, SEQ ID NO:116, SEQ ID NO:120, SEQ ID NO:124, SEQ ID NO:128, SEQ ID NO:132, SEQ ID NO:136, SEQ ID NO:140, SEQ ID NO:144, SEQ ID NO:148, SEQ ID NO:152,

SEQ ID NO:156, SEQ ID NO:160, SEQ ID NO:164, SEQ ID NO:168, SEQ ID NO:172, SEQ ID NO:176, SEQ ID NO:180, SEQ ID NO:184, SEQ ID NO:188, SEQ ID NO:192, SEQ ID NO:196, SEQ ID NO:200, SEQ ID NO:204, SEQ ID NO:208, SEQ ID NO:212, SEQ ID NO:216, SEQ ID NO:220, SEQ ID NO:224, SEQ ID NO:228, SEQ ID NO:232, SEQ ID NO:236, SEQ ID NO:240, SEQ ID NO:244, SEQ ID NO:248, SEQ ID NO:252, SEQ ID NO:256, SEQ ID NO:260, SEQ ID NO:264, SEQ ID NO:268, SEQ ID NO:272, SEQ ID NO:276, SEQ ID NO:280, SEQ ID NO:284, SEQ ID NO:288, SEQ ID NO:292, SEQ ID NO:296, SEQ ID NO:300, SEQ ID NO:304, SEQ ID NO:915, and SEQ ID NO:919.

The presently disclosed subject matter further provides a chimeric antigen receptor (CAR), comprising an extracellular antigen-binding domain that binds to Fc Receptor-like 5 (FcRL5), a transmembrane domain and an intracellular domain, wherein the extracellular antigen-binding domain comprises:

(aa) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 311;

(ab) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 320, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 315, 316 and 317;

(ac) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 324, 319 and 325, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 321, 322 and 323;

(ad) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 331, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 326, 327 and 328;

(ae) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 331, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 332, 333 and 334;

(af) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 338, 330 and 339, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 335, 336 and 337;

(ag) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 343, 344 and 345, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 340, 341 and 342;

(ah) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 348, 349 and 350, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 347;

(ai) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 352, 344 and 353, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 351;

(aj) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 357, 358 and 359, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 354, 355 and 356;

(ak) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 363, 364 and 365, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 360, 361 and 362;

(al) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 369, 370 and 371, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 366, 367 and 368;

(am) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 375, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 372, 373 and 374;

(an) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 377, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 376;

(ao) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 381, 382 and 383, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 378, 379 and 380;

(ap) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 385 and 386, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 384;

(aq) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 390, 391 and 392, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 387, 388 and 389;

(ar) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 395, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 393, 355 and 394;

(as) a light chain variable region comprising the amino acid sequences set

forth in SEQ ID NOs: 397, 398 and 399, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 396;

(at) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 401, 398 and 402, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 400;

(au) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 406, 398 and 407, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 405;

(av) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 409 and 410, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 408;

(aw) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 414, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 413;

(ax) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 416, 417 and 418, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 415;

(ay) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 419, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 349;

(az) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 423, 358 and 424, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 420, 421 and 422;

(ba) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 428, 429 and 430, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 425, 426 and 427;

(bb) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 433, 434 and 435, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 372, 431 and 432;

(bc) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 423, 438 and 439, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 436, 338 and 437;

(bd) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 443, and a heavy chain variable region

comprising the amino acid sequences set forth in SEQ ID NOs: 440, 441 and 442;

(be) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 447, 448 and 449, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 444, 445 and 446;

(bf) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 452, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 450 and 451;

(bg) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 369, 454 and 455, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 453;

(bh) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 457, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 456;

(bi) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 331, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 458;

(bj) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 460, 461 and 462, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 459;

(bk) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 419, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 453;

(bl) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 423, 438 and 465, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 436, 388 and 464;

(bm) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 468, 469 and 470, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 466 and 467;

(bn) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 474, 358 and 465, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 471, 472 and 473;

(bo) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 477, 478 and 479, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 372, 475 and 476

(bp) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 483, 484 and 485, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 480, 481 and 482;

(bq) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 433, 487 and 486, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 486;

(br) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 490, 313 and 491, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 489;

(bs) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 493, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 492;

(bt) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 490, 349 and 495, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 494;

(bu) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 498, 344 and 499, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 496 and 497;

(bv) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 503, 504 and 505, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 500, 501 and 502;

(bw) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 508, 349 and 509, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 506 and 507;

(bx) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 513 and 514, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 510, 511 and 512;

(by) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 518, 319 and 519, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 515, 516 and 517;

(bz) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 348, 523 and 524, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 520, 521 and 522;

(ca) a light chain variable region comprising the amino acid sequences set

forth in SEQ ID NOs: 406, 398 and 528, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 525, 526 and 527;

(cb) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 530, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 529;

(cc) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 531, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 515, 516 and 517;

(cd) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 533, 534 and 535, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 532;

(ce) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 428, 429 and 430, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 425, 426 and 536;

(cf) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 540, 398 and 541, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 537, 538 and 539;

(cg) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 406, 398 and 542, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 537, 538 and 539;

(ch) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 544, 448 and 545, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 543;

(ci) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 547, 548 and 549, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 546;

(cj) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 550;

(ck) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 513 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 550;

(cl) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 406, 398 and 554, and a heavy chain variable region comprising the

amino acid sequences set forth in SEQ ID NOs: 551, 552 and 553;

(cm) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 556, 557 and 558, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 555;

(cn) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 562, 563 and 564, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 559, 560 and 561;

(co) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 568, 504 and 569, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 565, 566 and 567;

(cp) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 571, 572 and 573, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 372, 475 and 570;

(cq) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 343, 575 and 576, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 574;

(cr) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 577;

(cs) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 578;

(ct) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 580, 438 and 581, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 436, 388 and 579;

(cu) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 585, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 582, 583 and 584;

(cv) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 586 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 578;

(cw) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 588, 385 and 375, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 587; or

(cx) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 592, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 589, 590 and 591;

(cy) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 926, 927 and 928, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 923, 924 and 925; or

(cz) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 932, 933 and 934, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 929, 930 and 931.

The presently disclosed subject matter also provides isolated immunoresponsive cells comprising the above-described CARs. In certain embodiments, the isolated immunoresponsive cell is transduced with the CAR, for example, the CAR is constitutively expressed on the surface of the immunoresponsive cell. In certain embodiments, the isolated immunoresponsive cell is further transduced with at least one co-stimulatory ligand such that the immunoresponsive cell expresses the at least one co-stimulatory ligand. In certain embodiments, the at least one co-stimulatory ligand is selected from the group consisting of 4-1BBL, CD80, CD86, CD70, OX40L, CD48, TNFRSF14, and combinations thereof. In certain embodiments, the isolated immunoresponsive cell is further transduced with at least one cytokine such that the immunoresponsive cell secrets the at least one cytokine. In certain embodiments, the at least one cytokine is selected from the group consisting of IL-2, IL-3, IL-6, IL-7, IL-11, IL-12, IL-15, IL-17, IL-21, and combinations thereof. In certain embodiments, the isolated immunoresponsive cell is selected from the group consisting of a T cell, a Natural Killer (NK) cell, a cytotoxic T lymphocyte (CTL), a regulatory T cell, a human embryonic stem cell, a lymphoid progenitor cell, a T cell-precursor cell, and a pluripotent stem cell from which lymphoid cells may be differentiated. In certain embodiments, the immunoresponsive cell is a T cell.

The presently disclosed subject matter further provides an isolated nucleic acid molecule encoding the chimeric antigen receptor (CAR) as described herein.

The presently disclosed subject matter further provides a vector comprising the isolated nucleic acid molecule as described herein.

The presently disclosed subject matter further provides a host cell expressing

the nucleic acid molecule as described herein.

The presently disclosed subject matter further provides nucleic acid molecules encoding the presently disclosed CARs, vectors comprising the nucleic acid molecules, and host cells expressing such nucleic acid molecules. In certain embodiments, the nucleic acid molecule comprises nucleic acids having the sequence set forth in SEQ ID NO:951. In certain embodiments, the nucleic acid molecule comprises nucleic acids having the sequence set forth in SEQ ID NO:952. In certain embodiments, the vector is a γ-retroviral vector. In certain embodiments, the host cell is a T cell. Furthermore, the presently disclosed subject matter provides the use of an effective amount of the immunoresponsive cell as described herein, in the manufacture of a medicament for reducing tumor burden in a subject.

Furthermore, the presently disclosed subject matter provides use of an effective amount of the immunoresponsive cell as described herein to the subject, in the manufacture of a medicament for increasing or lengthening survival of a subject having a neoplasm.

Furthermore, the presently disclosed subject matter provides methods of using the above-described immunoresponsive cell for reducing tumor burden in a subject. For example, the presently disclosed subject matter provides methods of reducing tumor burden in a subject, where the method comprises administering an effective amount of the presently disclosed immunoresponsive cell to the subject, thereby

inducing tumor cell death in the subject. In certain embodiments, the method reduces the number of tumor cells. In another embodiment, the method reduces the tumor size. In yet another embodiment, the method eradicates the tumor in the subject. In certain embodiments, the tumor is selected from the group consisting of multiple myeloma, Non-Hodgkin Lymphoma (especially Mantle Cell), Hodgkin Lymphoma, Chronic Lymphocytic Leukemia (CLL), Acute lymphocytic leukemia (ALL), Hairy Cell Leukemia, Burketts Lymphoma, and Waldenstrom's Macroglobulinemia. In certain embodiments, the tumor is multiple myeloma. In certain embodiments, the subject is a human. In certain embodiments, the immunoresponsive cell is a T cell.

Furthermore, the presently disclosed subject matter provides methods of using the above-described immunoresponsive cell for increasing or lengthening survival of a subject having neoplasia. For example, the presently disclosed subject matter provides methods of increasing or lengthening survival of a subject having neoplasia, where the method comprises administering an effective amount of the presently disclosed immunoresponsive cell to the subject, thereby increasing or lengthening survival of the subject. In certain embodiments, the neoplasia is selected from the group consisting of multiple myeloma, Non-Hodgkin Lymphoma (especially Mantle Cell), Hodgkin Lymphoma, Chronic Lymphocytic Leukemia (CLL), Acute lymphocytic leukemia (ALL), Hairy Cell Leukemia, Burketts Lymphoma, and Waldenstrom's Macroglobulinemia. In certain embodiments, the neoplasia is multiple myeloma. In certain embodiments, the method reduces or eradicates tumor burden in the subject.

The presently disclosed subject matter also provides methods for producing an immunoresponsive cell that binds to Fc Receptor-like 5 (FcRL5), *e.g.*, domain 9 of FcRL5. In one non-limiting example, the method comprises introducing into the immunoresponsive cell a nucleic acid sequence that encodes a chimeric antigen receptor (CAR), which comprises an extracellular antigen-binding domain, a transmembrane domain and an intracellular domain, wherein the extracellular antigen-binding domain specifically binds to Fc Receptor-like 5 (FcRL5). In a specific non-limiting embodiment, the extracellular antigen-binding domain is an scFv.

The presently disclosed subject matter further provides pharmaceutical compositions comprising an effective amount of the presently disclosed immunoresponsive cells and a pharmaceutically acceptable excipient. In certain embodiments, the pharmaceutical compositions are for treating a neoplasia. In certain

embodiments, the neoplasia is selected from the group consisting of multiple myeloma, Non-Hodgkin Lymphoma (especially Mantle Cell), Hodgkin Lymphoma, Chronic Lymphocytic Leukemia (CLL), Acute lymphocytic leukemia (ALL), Hairy Cell Leukemia, Burketts Lymphoma, and Waldenstrom's Macroglobulinemia. In certain embodiments, the neoplasia is multiple myeloma.

The presently disclosed subject matter further provides kits for treating a neoplasm, comprising the immunoresponsive cell as described herein.

The presently disclosed subject matter further provides kits for treating a neoplasia, comprising the presently disclosed immunoresponsive cells. In certain embodiments, the kit further include written instructions for using the immunoresponsive cell for treating a neoplasia. In certain embodiments, the neoplasia is selected from the group consisting of multiple myeloma, Non-Hodgkin Lymphoma (especially Mantle Cell), Hodgkin Lymphoma, Chronic Lymphocytic Leukemia (CLL), Acute lymphocytic leukemia (ALL), Hairy Cell Leukemia, Burketts Lymphoma, and Waldenstrom's Macroglobulinemia. In certain embodiments, the neoplasia is multiple myeloma.

BRIEF DESCRIPTION OF THE FIGURES

The following Detailed Description, given by way of example, but not intended to limit the invention to specific embodiments described, may be understood in conjunction with the accompanying drawings.

Figure 1 depicts the FcRL5 expression in various normal tissues and human cancer cell lines.

Figure 2 depicts the screening of anti-FcRL5 scFvs using 3T3 cells expressing FcRL5 or FcRL1, 2, 3, 4 or 6.

Figure 3A-D. (A) A representation of the domains of FcRL5 and the soluble, glycosylphosphatidylinositol (GPI)-anchored and transmembrane forms of FcRL5. (B) A representation of the vector used to express a mutated form of FcRL5 that lacks domain 9 (also referred to herein as FcRL5Δdom9). (C) The nucleotide sequences of full length FcRL5 and the form of FcRL5 that lacks domain 9. (D) A representation of the differences in the nucleotide sequences of full length FcRL5 and the mutated form of FcRL5 in which domain 9 is deleted (referred to herein as "FcRL5Δdom9").

Figure 4 depicts the screening of anti-FcRL5 scFv ET200-39 on 3T3 cells expressing FcRL5Δdom9.

What is claimed is:

1. A chimeric antigen receptor (CAR), comprising an extracellular antigen-binding domain that binds to Fc Receptor-like 5 (FcRL5), a transmembrane domain and an intracellular domain, wherein the extracellular antigen-binding domain comprises:

(a) a light chain variable region comprising the CDR1, CDR2 and CDR3 of the light chain variable region set forth in an amino acid sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:7, SEQ ID NO:11, SEQ ID NO:15, SEQ ID NO:19, SEQ ID NO:23, SEQ ID NO:27, SEQ ID NO:31, SEQ ID NO:35, SEQ ID NO:39, SEQ ID NO:43, SEQ ID NO:47, SEQ ID NO:51, SEQ ID NO:55, SEQ ID NO:59, SEQ ID NO:63, SEQ ID NO:67, SEQ ID NO:71, SEQ ID NO:75, SEQ ID NO:79, SEQ ID NO:83, SEQ ID NO:87, SEQ ID NO:91, SEQ ID NO:95, SEQ ID NO:99, SEQ ID NO:103, SEQ ID NO:107, SEQ ID NO:111, SEQ ID NO:115, SEQ ID NO:119, SEQ ID NO:123, SEQ ID NO:127, SEQ ID NO:131, SEQ ID NO:135, SEQ ID NO:139, SEQ ID NO:143, SEQ ID NO:147, SEQ ID NO:151, SEQ ID NO:155, SEQ ID NO:159, SEQ ID NO:163, SEQ ID NO:167, SEQ ID NO:171, SEQ ID NO:175, SEQ ID NO:179, SEQ ID NO:183, SEQ ID NO:187, SEQ ID NO:191, SEQ ID NO:195, SEQ ID NO:199, SEQ ID NO:203, SEQ ID NO:207, SEQ ID NO:211, SEQ ID NO:215, SEQ ID NO:219, SEQ ID NO:223, SEQ ID NO:227, SEQ ID NO:231, SEQ ID NO:235, SEQ ID NO:239, SEQ ID NO:243, SEQ ID NO:247, SEQ ID NO:251, SEQ ID NO:255, SEQ ID NO:259, SEQ ID NO:263, SEQ ID NO:267, SEQ ID NO:271, SEQ ID NO:275, SEQ ID NO:279, SEQ ID NO:283, SEQ ID NO:287, SEQ ID NO:291, SEQ ID NO:295, SEQ ID NO:299, SEQ ID NO:303, SEQ ID NO:917, and SEQ ID NO:921; and

(b) a heavy chain variable region comprising the CDR1, CDR2 and CDR3 of the heavy chain variable region set forth in an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:8, SEQ ID NO:12, SEQ ID NO:16, SEQ ID NO:20, SEQ ID NO:24, SEQ ID NO:28, SEQ ID NO:32, SEQ ID NO:36, SEQ ID NO:40, SEQ ID NO:44, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:56, SEQ ID NO:60, SEQ ID NO:64, SEQ ID NO:68, SEQ ID NO:72, SEQ ID NO:76, SEQ ID NO:80, SEQ ID NO:84, SEQ ID NO:88, SEQ ID NO:92, SEQ ID NO:96, SEQ ID NO:100, SEQ ID NO:104, SEQ ID NO:108, SEQ ID NO:112, SEQ ID NO:116, SEQ ID NO:120, SEQ ID NO:124, SEQ ID NO:128, SEQ ID NO:132, SEQ ID NO:136, SEQ ID NO:140, SEQ ID NO:144, SEQ ID NO:148, SEQ ID NO:152, SEQ ID NO:156, SEQ ID NO:160, SEQ ID NO:164, SEQ ID NO:168, SEQ ID NO:172, SEQ ID NO:176, SEQ ID NO:180, SEQ ID NO:184, SEQ ID NO:188, SEQ ID NO:192, SEQ ID NO:196, SEQ ID NO:200, SEQ ID NO:204, SEQ ID NO:208, SEQ ID NO:212, SEQ ID NO:216, SEQ ID NO:220, SEQ ID NO:224, SEQ ID NO:228, SEQ ID NO:232, SEQ ID NO:236, SEQ ID NO:240, SEQ ID NO:244, SEQ ID NO:248, SEQ ID NO:252, SEQ ID NO:256, SEQ ID NO:260, SEQ ID NO:264, SEQ ID NO:268, SEQ ID NO:272, SEQ ID NO:276, SEQ ID NO:280, SEQ ID NO:284, SEQ ID NO:288, SEQ ID NO:292, SEQ ID NO:296, SEQ ID NO:300, SEQ ID NO:304, SEQ ID

NO:915, and SEQ ID NO:919.

2. A chimeric antigen receptor (CAR), comprising an extracellular antigen-binding domain that binds to Fc Receptor-like 5 (FcRL5), a transmembrane domain and an intracellular domain, wherein the extracellular antigen-binding domain comprises:

(aa) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 311;

(ab) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 320, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 315, 316 and 317;

(ac) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 324, 319 and 325, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 321, 322 and 323;

(ad) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 331, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 326, 327 and 328;

(ae) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 331, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 332, 333 and 334;

(af) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 338, 330 and 339, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 335, 336 and 337;

(ag) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 343, 344 and 345, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 340, 341 and 342;

(ah) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 348, 349 and 350, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 347;

(ai) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 352, 344 and 353, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 351;

(aj) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 357, 358 and 359, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 354, 355 and 356;

(ak) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 363, 364 and 365, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 360, 361 and 362;

(al) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 369, 370 and 371, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 366, 367 and 368;

(am) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 375, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 372, 373 and 374;

(an) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 377, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 376;

(ao) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 381, 382 and 383, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 378, 379 and 380;

(ap) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 385 and 386, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 384;

(aq) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 390, 391 and 392, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 387, 388 and 389;

(ar) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 395, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 393, 355 and 394;

(as) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 397, 398 and 399, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 396;

(at) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 401, 398 and 402, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 400;

(au) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 406, 398 and 407, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 405;

(av) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 409 and 410, and a heavy chain variable region comprising the amino acid sequences set forth in

SEQ ID NOs: 346, 327 and 408;

(aw) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 414, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 413;

(ax) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 416, 417 and 418, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 415;

(ay) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 419, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 349;

(az) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 423, 358 and 424, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 420, 421 and 422;

(ba) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 428, 429 and 430, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 425, 426 and 427;

(bb) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 433, 434 and 435, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 372, 431 and 432;

(bc) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 423, 438 and 439, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 436, 338 and 437;

(bd) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 443, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 440, 441 and 442;

(be) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 447, 448 and 449, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 444, 445 and 446;

(bf) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 452, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 450 and 451;

(bg) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 369, 454 and 455, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 453;

(bh) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs:

318, 319 and 457, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 456;

(bi) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 331, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 458;

(bj) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 460, 461 and 462, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 459;

(bk) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 419, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 453;

(bl) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 423, 438 and 465, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 436, 388 and 464;

(bm) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 468, 469 and 470, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 466 and 467;

(bn) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 474, 358 and 465, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 471, 472 and 473;

(bo) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 477, 478 and 479, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 372, 475 and 476;

(bp) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 483, 484 and 485, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 480, 481 and 482;

(bq) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 433, 487 and 486, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 486;

(br) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 490, 313 and 491, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 489;

(bs) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 493, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 492;

(bt) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 490, 349 and 495, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 494;

(bu) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 498, 344 and 499, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 496 and 497;

(bv) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 503, 504 and 505, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 500, 501 and 502;

(bw) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 508, 349 and 509, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 506 and 507;

(bx) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 513 and 514, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 510, 511 and 512;

(by) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 518, 319 and 519, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 515, 516 and 517;

(bz) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 348, 523 and 524, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 520, 521 and 522;

(ca) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 406, 398 and 528, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 525, 526 and 527;

(cb) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 530, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 529;

(cc) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 531, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 515, 516 and 517;

(cd) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 533, 534 and 535, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 532;

(ce) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 428, 429 and 430, and a heavy chain variable region comprising the amino acid sequences set forth in

SEQ ID NOs: 425, 426 and 536;

(cf) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 540, 398 and 541, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 537, 538 and 539;

(cg) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 406, 398 and 542, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 537, 538 and 539;

(ch) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 544, 448 and 545, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 543;

(ci) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 547, 548 and 549, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 546;

(cj) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 550;

(ck) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 513 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 550;

(cl) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 406, 398 and 554, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 551, 552 and 553;

(cm) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 556, 557 and 558, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310 and 555;

(cn) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 562, 563 and 564, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 559, 560 and 561;

(co) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 568, 504 and 569, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 565, 566 and 567;

(cp) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 571, 572 and 573, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 372, 475 and 570;

(cq) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs:

343, 575 and 576, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 574;

(cr) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 577;

(cs) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 578;

(ct) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 580, 438 and 581, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 436, 388 and 579;

(cu) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 585, 313 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 582, 583 and 584;

(cv) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 312, 586 and 314, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 346, 327 and 578;

(cw) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 588, 385 and 375, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 587; or

(cx) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 592, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 589, 590 and 591;

(cy) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 926, 927 and 928, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 923, 924 and 925; or

(cz) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 932, 933 and 934, and a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 929, 930 and 931.

3. The CAR of claim 1 or 2, wherein the extracellular antigen-binding domain is a single-chain variable fragment (scFv).

4. The CAR of claim 3, wherein the extracellular antigen-binding domain is a murine scFv.

5. The CAR of claim 3, wherein the extracellular antigen-binding domain is a human scFv.

6. The CAR of claim 1 or 2, wherein the extracellular antigen-binding domain is a Fab, which is optionally crosslinked.

7. The CAR of claim 1 or 2, wherein the extracellular antigen-binding domain is a $F(ab')_2$.

8. The CAR of any one of claims 3-7, one or more of the scFv, Fab and $F(ab')_2$ are comprised in a fusion protein with a heterologous sequence to form the extracellular antigen-binding domain.

9. The CAR of any one of claims 1-8, wherein the extracellular antigen-binding domain of the CAR binds to FcRL5 with a binding affinity (K_d) of from about 1×10^{-9} M to about 3×10^{-6} M.

10. The CAR of any one of claims 1-9, wherein the extracellular antigen-binding domain of the CAR binds to domain 7, domain 8 or domain 9 of FcRL5 with a binding affinity (K_d) of from about 1×10^{-9} M to about 3×10^{-6} M.

11. The CAR of any one of claims 1-10, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising an amino acid sequence that is at least about 80%, about 81%, about 82%, about 83%, about 84%, about 85%, about 86%, about 87%, about 88%, about 89%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to an amino acid sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:7, SEQ ID NO:11, SEQ ID NO:15, SEQ ID NO:19, SEQ ID NO:23, SEQ ID NO:27, SEQ ID NO:31, SEQ ID NO:35, SEQ ID NO:39, SEQ ID NO:43, SEQ ID NO:47, SEQ ID NO:51, SEQ ID NO:55, SEQ ID NO:59, SEQ ID NO:63, SEQ ID NO:67, SEQ ID NO:71, SEQ ID NO:75, SEQ ID NO:79, SEQ ID NO:83, SEQ ID NO:87, SEQ ID NO:91, SEQ ID NO:95, SEQ ID NO:99, SEQ ID NO:103, SEQ ID NO:107, SEQ ID NO:111, SEQ ID NO:115, SEQ ID NO:119, SEQ ID NO:123, SEQ ID NO:127, SEQ ID NO:131, SEQ ID NO:135, SEQ ID NO:139, SEQ ID NO:143, SEQ ID NO:147, SEQ ID NO:151, SEQ ID NO:155, SEQ ID NO:159, SEQ ID NO:163, SEQ ID NO:167, SEQ ID NO:171, SEQ ID NO:175, SEQ ID NO:179, SEQ ID NO:183, SEQ ID NO:187, SEQ ID NO:191, SEQ ID NO:195, SEQ ID NO:199, SEQ ID NO:203, SEQ ID NO:207, SEQ ID NO:211, SEQ ID NO:215, SEQ ID NO:219, SEQ ID NO:223, SEQ ID NO:227, SEQ ID NO:231, SEQ ID NO:235, SEQ ID NO:239, SEQ ID NO:243, SEQ ID NO:247, SEQ ID NO:251, SEQ ID NO:255, SEQ ID NO:259, SEQ ID NO:263, SEQ ID NO:267, SEQ ID NO:271, SEQ ID NO:275, SEQ ID NO:279, SEQ ID NO:283, SEQ ID NO:287, SEQ ID NO:291, SEQ ID NO:295, SEQ ID NO:299, SEQ ID NO:303, SEQ ID NO:917 and SEQ ID NO:921.

12. The CAR of any one of claims 1-11, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising an amino acid sequence that is at least about 80%, about 81%,

about 82%, about 83%, about 84%, about 85%, about 86%, about 87%, about 88%, about 89%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:8, SEQ ID NO:12, SEQ ID NO:16, SEQ ID NO:20, SEQ ID NO:24, SEQ ID NO:28, SEQ ID NO:32, SEQ ID NO:36, SEQ ID NO:40, SEQ ID NO:44, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:56, SEQ ID NO:60, SEQ ID NO:64, SEQ ID NO:68, SEQ ID NO:72, SEQ ID NO:76, SEQ ID NO:80, SEQ ID NO:84, SEQ ID NO:88, SEQ ID NO:92, SEQ ID NO:96, SEQ ID NO:100, SEQ ID NO:104, SEQ ID NO:108, SEQ ID NO:112, SEQ ID NO:116, SEQ ID NO:120, SEQ ID NO:124, SEQ ID NO:128, SEQ ID NO:132, SEQ ID NO:136, SEQ ID NO:140, SEQ ID NO:144, SEQ ID NO:148, SEQ ID NO:152, SEQ ID NO:156, SEQ ID NO:160, SEQ ID NO:164, SEQ ID NO:168, SEQ ID NO:172, SEQ ID NO:176, SEQ ID NO:180, SEQ ID NO:184, SEQ ID NO:188, SEQ ID NO:192, SEQ ID NO:196, SEQ ID NO:200, SEQ ID NO:204, SEQ ID NO:208, SEQ ID NO:212, SEQ ID NO:216, SEQ ID NO:220, SEQ ID NO:224, SEQ ID NO:228, SEQ ID NO:232, SEQ ID NO:236, SEQ ID NO:240, SEQ ID NO:244, SEQ ID NO:248, SEQ ID NO:252, SEQ ID NO:256, SEQ ID NO:260, SEQ ID NO:264, SEQ ID NO:268, SEQ ID NO:272, SEQ ID NO:276, SEQ ID NO:280, SEQ ID NO:284, SEQ ID NO:288, SEQ ID NO:292, SEQ ID NO:296, SEQ ID NO:300, SEQ ID NO:304, SEQ ID NO:915 and SEQ ID NO:919.

13. The CAR of any one of claims 1-12, wherein the extracellular antigen-binding domain comprises (a) a light chain variable region comprising an amino acid sequence that is at least about 80%, about 81%, about 82%, about 83%, about 84%, about 85%, about 86%, about 87%, about 88%, about 89%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to an amino acid sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:7, SEQ ID NO:11, SEQ ID NO:15, SEQ ID NO:19, SEQ ID NO:23, SEQ ID NO:27, SEQ ID NO:31, SEQ ID NO:35, SEQ ID NO:39, SEQ ID NO:43, SEQ ID NO:47, SEQ ID NO:51, SEQ ID NO:55, SEQ ID NO:59, SEQ ID NO:63, SEQ ID NO:67, SEQ ID NO:71, SEQ ID NO:75, SEQ ID NO:79, SEQ ID NO:83, SEQ ID NO:87, SEQ ID NO:91, SEQ ID NO:95, SEQ ID NO:99, SEQ ID NO:103, SEQ ID NO:107, SEQ ID NO:111, SEQ ID NO:115, SEQ ID NO:119, SEQ ID NO:123, SEQ ID NO:127, SEQ ID NO:131, SEQ ID NO:135, SEQ ID NO:139, SEQ ID NO:143, SEQ ID NO:147, SEQ ID NO:151, SEQ ID NO:155, SEQ ID NO:159, SEQ ID NO:163, SEQ ID NO:167, SEQ ID NO:171, SEQ ID NO:175, SEQ ID NO:179, SEQ ID NO:183, SEQ ID NO:187, SEQ ID NO:191, SEQ ID NO:195, SEQ ID NO:199, SEQ ID NO:203, SEQ ID NO:207, SEQ ID NO:211, SEQ ID NO:215, SEQ ID NO:219, SEQ ID NO:223, SEQ ID NO:227, SEQ ID NO:231, SEQ ID NO:235, SEQ ID NO:239, SEQ ID NO:243, SEQ ID NO:247, SEQ ID NO:251, SEQ ID NO:255, SEQ ID NO:259, SEQ ID NO:263, SEQ ID NO:267, SEQ ID NO:271, SEQ ID NO:275, SEQ ID NO:279, SEQ ID NO:283,

SEQ ID NO:287, SEQ ID NO:291, SEQ ID NO:295, SEQ ID NO:299, SEQ ID NO:303, SEQ ID NO:917 and SEQ ID NO:921; and (b) a heavy chain variable region comprising an amino acid sequence that is at least about 80%, about 81%, about 82%, about 83%, about 84%, about 85%, about 86%, about 87%, about 88%, about 89%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:8, SEQ ID NO:12, SEQ ID NO:16, SEQ ID NO:20, SEQ ID NO:24, SEQ ID NO:28, SEQ ID NO:32, SEQ ID NO:36, SEQ ID NO:40, SEQ ID NO:44, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:56, SEQ ID NO:60, SEQ ID NO:64, SEQ ID NO:68, SEQ ID NO:72, SEQ ID NO:76, SEQ ID NO:80, SEQ ID NO:84, SEQ ID NO:88, SEQ ID NO:92, SEQ ID NO:96, SEQ ID NO:100, SEQ ID NO:104, SEQ ID NO:108, SEQ ID NO:112, SEQ ID NO:116, SEQ ID NO:120, SEQ ID NO:124, SEQ ID NO:128, SEQ ID NO:132, SEQ ID NO:136, SEQ ID NO:140, SEQ ID NO:144, SEQ ID NO:148, SEQ ID NO:152, SEQ ID NO:156, SEQ ID NO:160, SEQ ID NO:164, SEQ ID NO:168, SEQ ID NO:172, SEQ ID NO:176, SEQ ID NO:180, SEQ ID NO:184, SEQ ID NO:188, SEQ ID NO:192, SEQ ID NO:196, SEQ ID NO:200, SEQ ID NO:204, SEQ ID NO:208, SEQ ID NO:212, SEQ ID NO:216, SEQ ID NO:220, SEQ ID NO:224, SEQ ID NO:228, SEQ ID NO:232, SEQ ID NO:236, SEQ ID NO:240, SEQ ID NO:244, SEQ ID NO:248, SEQ ID NO:252, SEQ ID NO:256, SEQ ID NO:260, SEQ ID NO:264, SEQ ID NO:268, SEQ ID NO:272, SEQ ID NO:276, SEQ ID NO:280, SEQ ID NO:284, SEQ ID NO:288, SEQ ID NO:292, SEQ ID NO:296, SEQ ID NO:300, SEQ ID NO:304, SEQ ID NO:915 and SEQ ID NO:919.

14. The CAR of any one of claims 1-13, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:7, SEQ ID NO:11, SEQ ID NO:15, SEQ ID NO:19, SEQ ID NO:23, SEQ ID NO:27, SEQ ID NO:31, SEQ ID NO:35, SEQ ID NO:39, SEQ ID NO:43, SEQ ID NO:47, SEQ ID NO:51, SEQ ID NO:55, SEQ ID NO:59, SEQ ID NO:63, SEQ ID NO:67, SEQ ID NO:71, SEQ ID NO:75, SEQ ID NO:79, SEQ ID NO:83, SEQ ID NO:87, SEQ ID NO:91, SEQ ID NO:95, SEQ ID NO:99, SEQ ID NO:103, SEQ ID NO:107, SEQ ID NO:111, SEQ ID NO:115, SEQ ID NO:119, SEQ ID NO:123, SEQ ID NO:127, SEQ ID NO:131, SEQ ID NO:135, SEQ ID NO:139, SEQ ID NO:143, SEQ ID NO:147, SEQ ID NO:151, SEQ ID NO:155, SEQ ID NO:159, SEQ ID NO:163, SEQ ID NO:167, SEQ ID NO:171, SEQ ID NO:175, SEQ ID NO:179, SEQ ID NO:183, SEQ ID NO:187, SEQ ID NO:191, SEQ ID NO:195, SEQ ID NO:199, SEQ ID NO:203, SEQ ID NO:207, SEQ ID NO:211, SEQ ID NO:215, SEQ ID NO:219, SEQ ID NO:223, SEQ ID NO:227, SEQ ID NO:231, SEQ ID NO:235, SEQ ID NO:239, SEQ ID NO:243, SEQ ID NO:247, SEQ ID NO:251, SEQ ID NO:255, SEQ ID NO:259, SEQ ID NO:263, SEQ ID NO:267, SEQ ID NO:271, SEQ ID NO:275, SEQ ID NO:279, SEQ ID NO:283, SEQ ID NO:287, SEQ ID NO:291, SEQ ID NO:295, SEQ ID NO:299, SEQ ID NO:303,

SEQ ID NO:917, SEQ ID NO:921.

15. The CAR of any one of claims 1-14, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:8, SEQ ID NO:12, SEQ ID NO:16, SEQ ID NO:20, SEQ ID NO:24, SEQ ID NO:28, SEQ ID NO:32, SEQ ID NO:36, SEQ ID NO:40, SEQ ID NO:44, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:56, SEQ ID NO:60, SEQ ID NO:64, SEQ ID NO:68, SEQ ID NO:72, SEQ ID NO:76, SEQ ID NO:80, SEQ ID NO:84, SEQ ID NO:88, SEQ ID NO:92, SEQ ID NO:96, SEQ ID NO:100, SEQ ID NO:104, SEQ ID NO:108, SEQ ID NO:112, SEQ ID NO:116, SEQ ID NO:120, SEQ ID NO:124, SEQ ID NO:128, SEQ ID NO:132, SEQ ID NO:136, SEQ ID NO:140, SEQ ID NO:144, SEQ ID NO:148, SEQ ID NO:152, SEQ ID NO:156, SEQ ID NO:160, SEQ ID NO:164, SEQ ID NO:168, SEQ ID NO:172, SEQ ID NO:176, SEQ ID NO:180, SEQ ID NO:184, SEQ ID NO:188, SEQ ID NO:192, SEQ ID NO:196, SEQ ID NO:200, SEQ ID NO:204, SEQ ID NO:208, SEQ ID NO:212, SEQ ID NO:216, SEQ ID NO:220, SEQ ID NO:224, SEQ ID NO:228, SEQ ID NO:232, SEQ ID NO:236, SEQ ID NO:240, SEQ ID NO:244, SEQ ID NO:248, SEQ ID NO:252, SEQ ID NO:256, SEQ ID NO:260, SEQ ID NO:264, SEQ ID NO:268, SEQ ID NO:272, SEQ ID NO:276, SEQ ID NO:280, SEQ ID NO:284, SEQ ID NO:288, SEQ ID NO:292, SEQ ID NO:296, SEQ ID NO:300, SEQ ID NO:304, SEQ ID NO:915, SEQ ID NO:919.

16. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:915.

17. The CAR of any one of claims 1-16, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:917.

18. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:919.

19. The CAR of any one of claims 1-18, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:921.

20. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:144.

21. The CAR of any one of claims 1-20, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:143.

22. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises a

heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:216.

23. The CAR of any one of claims 1-22, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:215.

24. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:220.

25. The CAR of any one of claims 1-24, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:219.

26. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:236.

27. The CAR of any one of claims 1-26, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:235.

28. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:268.

29. The CAR of any one of claims 1-28, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:267.

30. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:116.

31. The CAR of any one of claims 1-30, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:115.

32. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:172.

33. The CAR of any one of claims 1-32, wherein the extracellular antigen-binding domain comprises a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:171.

34. The CAR of any one of claims 1-15, wherein the extracellular antigen-binding domain comprises (a) a light chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NO:3, SEQ ID NO:7, SEQ ID NO:11, SEQ ID NO:15, SEQ ID NO:19, SEQ ID NO:23, SEQ ID NO:27, SEQ ID NO:31, SEQ ID NO:35, SEQ ID NO:39, SEQ ID NO:43, SEQ ID NO:47, SEQ ID

NO:51, SEQ ID NO:55, SEQ ID NO:59, SEQ ID NO:63, SEQ ID NO:67, SEQ ID NO:71, SEQ ID NO:75, SEQ ID NO:79, SEQ ID NO:83, SEQ ID NO:87, SEQ ID NO:91, SEQ ID NO:95, SEQ ID NO:99, SEQ ID NO:103, SEQ ID NO:107, SEQ ID NO:111, SEQ ID NO:115, SEQ ID NO:119, SEQ ID NO:123, SEQ ID NO:127, SEQ ID NO:131, SEQ ID NO:135, SEQ ID NO:139, SEQ ID NO:143, SEQ ID NO:147, SEQ ID NO:151, SEQ ID NO:155, SEQ ID NO:159, SEQ ID NO:163, SEQ ID NO:167, SEQ ID NO:171, SEQ ID NO:175, SEQ ID NO:179, SEQ ID NO:183, SEQ ID NO:187, SEQ ID NO:191, SEQ ID NO:195, SEQ ID NO:199, SEQ ID NO:203, SEQ ID NO:207, SEQ ID NO:211, SEQ ID NO:215, SEQ ID NO:219, SEQ ID NO:223, SEQ ID NO:227, SEQ ID NO:231, SEQ ID NO:235, SEQ ID NO:239, SEQ ID NO:243, SEQ ID NO:247, SEQ ID NO:251, SEQ ID NO:255, SEQ ID NO:259, SEQ ID NO:263, SEQ ID NO:267, SEQ ID NO:271, SEQ ID NO:275, SEQ ID NO:279, SEQ ID NO:283, SEQ ID NO:287, SEQ ID NO:291, SEQ ID NO:295, SEQ ID NO:299, SEQ ID NO:303, SEQ ID NO:917, SEQ ID NO:921; and (b) a heavy chain variable region comprising an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:8, SEQ ID NO:12, SEQ ID NO:16, SEQ ID NO:20, SEQ ID NO:24, SEQ ID NO:28, SEQ ID NO:32, SEQ ID NO:36, SEQ ID NO:40, SEQ ID NO:44, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:56, SEQ ID NO:60, SEQ ID NO:64, SEQ ID NO:68, SEQ ID NO:72, SEQ ID NO:76, SEQ ID NO:80, SEQ ID NO:84, SEQ ID NO:88, SEQ ID NO:92, SEQ ID NO:96, SEQ ID NO:100, SEQ ID NO:104, SEQ ID NO:108, SEQ ID NO:112, SEQ ID NO:116, SEQ ID NO:120, SEQ ID NO:124, SEQ ID NO:128, SEQ ID NO:132, SEQ ID NO:136, SEQ ID NO:140, SEQ ID NO:144, SEQ ID NO:148, SEQ ID NO:152, SEQ ID NO:156, SEQ ID NO:160, SEQ ID NO:164, SEQ ID NO:168, SEQ ID NO:172, SEQ ID NO:176, SEQ ID NO:180, SEQ ID NO:184, SEQ ID NO:188, SEQ ID NO:192, SEQ ID NO:196, SEQ ID NO:200, SEQ ID NO:204, SEQ ID NO:208, SEQ ID NO:212, SEQ ID NO:216, SEQ ID NO:220, SEQ ID NO:224, SEQ ID NO:228, SEQ ID NO:232, SEQ ID NO:236, SEQ ID NO:240, SEQ ID NO:244, SEQ ID NO:248, SEQ ID NO:252, SEQ ID NO:256, SEQ ID NO:260, SEQ ID NO:264, SEQ ID NO:268, SEQ ID NO:272, SEQ ID NO:276, SEQ ID NO:280, SEQ ID NO:284, SEQ ID NO:288, SEQ ID NO:292, SEQ ID NO:296, SEQ ID NO:300, SEQ ID NO:304, SEQ ID NO:915, SEQ ID NO:919.

35. The CAR of any one of claims 1-17 and 34, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:915; and (b) a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:917.

36. The CAR of any one of claims 1-15, 18, 19, and 34, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:919; and (b) a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:921.

37. The CAR of any one of claims 1-15, 20, 21, and 34, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:144, and (b) a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:143.

38. The CAR of any one of claims 1-15, 22, 23, and 34, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:216, and (b) a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:215.

39. The CAR of any one of claims 1-15, 24, 25, and 34, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:220, and (b) a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:219.

40. The CAR of any one of claims 1-15, 26, 27, and 34, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:236, and (b) a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:235.

41. The CAR of any one of claims 1-15, 28, 29, and 34, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:268, and (b) a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:267.

42. The CAR of any one of claims 1-15, 30, 31, and 34, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:116, and (b) a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:115.

43. The CAR of any one of claims 1-15, 32, 33, and 34, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:172, and (b) a light chain variable region comprising amino acids having the sequence set forth in SEQ ID NO:171.

44. The CAR of any one of claims 1-43, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 923, 924 and 925; and (b) a light chain variable region comprising the amino acid sequences set forth in SEQ ID

NOs: 926, 927 and 928.

45. The CAR of any one of claims 1-43, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 929, 930 and 931; and (b) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 932, 933 and 934.

46. The CAR of any one of claims 1-43, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 463; and (b) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 419.

47. The CAR of any one of claims 1-43, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 515, 516 and 517; and (b) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 318, 319 and 531.

48. The CAR of any one of claims 1-43, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 403, 404 and 532; and (b) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 533, 534 and 535.

49. The CAR of any one of claims 1-43, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 411, 412 and 543; and (b) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 544, 448 and 545.

50. The CAR of any one of claims 1-43, wherein the extracellular antigen-binding domain comprises (a) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 372, 475 and 570; and (b) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 571, 572 and 573.

51. The CAR of any one of claims 1-43, wherein the extracellular antigen-binding domain comprises: (a) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 440, 441 and 442 and (b) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 329, 330 and 443.

52. The CAR of any one of claims 1-43, wherein the extracellular antigen-binding domain comprises: (a) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 309, 310

and 489 and (b) a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOs: 490, 313 and 491.

53. The CAR of any one of claims 1-52, wherein the extracellular antigen-binding domain comprises a linker between a heavy chain variable region and a light chain variable region of the extracellular antigen-binding domain.

54. The CAR of claim 53, wherein the linker comprises an amino acid sequence selected from the group consisting of SEQ ID NO:307 and SEQ ID NO:897.

55. The CAR of any one of claims 1-54, wherein the extracellular antigen-binding domain comprises a signal peptide that is covalently joined to the 5' terminus of the extracellular antigen-binding domain.

56. The CAR of any one of claims 1-55, wherein the FcRL5 comprises the amino acid sequence set forth in SEQ ID NO:899.

57. The CAR of any one of claims 1-56, wherein the extracellular antigen-binding domain binds an epitope comprising the amino acid sequence set forth in SEQ ID NO:964.

58. The CAR of any one of claims 1-56, wherein the extracellular antigen-binding domain binds to an epitope comprising the amino acid sequence set forth in SEQ ID NO:965.

59. The CAR of any one of claims 1-58, wherein the transmembrane domain comprises a CD8 polypeptide, a CD28 polypeptide, a CD3ζ polypeptide, a CD4 polypeptide, a 4-1BB polypeptide, an OX40 polypeptide, an ICOS polypeptide, a CTLA-4 polypeptide, a PD-1 polypeptide, a LAG-3 polypeptide, a 2B4 polypeptide, a BTLA polypeptide, or a combination thereof.

60. The CAR of any one of claims 1-59, wherein the transmembrane domain comprises a CD8 polypeptide.

61. The CAR of any one of claims 1-59, wherein the transmembrane domain comprises a CD28 polypeptide.

62. The CAR of any one of claims 1-59, wherein the intracellular domain comprises a CD3ζ polypeptide.

63. The CAR of any one of claims 1-62, wherein the intracellular domain further comprises at least one signaling region.

64. The CAR of claim 63, wherein the at least one signaling region comprises a CD28 polypeptide, a 4-

1BB polypeptide, an OX40 polypeptide, an ICOS polypeptide, a PD-1 polypeptide, a CTLA-4 polypeptide, a LAG-3 polypeptide, a 2B4 polypeptide, a BTLA polypeptide, or a combination thereof.

65. The CAR of claim 63 or 64, wherein the signaling region is a co-stimulatory signaling region.

66. The CAR of claim 65, wherein the at least one co-stimulatory signaling region comprises a CD28 polypeptide, a 4-1BB polypeptide, an OX40 polypeptide, an ICOS polypeptide, a DAP-10 polypeptide, or a combination thereof.

67. The CAR of claim 65, wherein the at least one co-stimulatory signaling region comprises a CD28 polypeptide.

68. The CAR of any one of claims 1-67, wherein the CAR comprises a transmembrane domain comprising a CD28 polypeptide, an intracellular domain comprising a CD3ζ polypeptide, and a co-stimulatory signaling domain comprising a CD28 polypeptide.

69. The CAR of any one of claims 1-67, wherein the CAR comprises a transmembrane domain comprising a CD8 polypeptide, an intracellular domain comprising a CD3ζ polypeptide, and an co-stimulatory signaling domain comprising a 4-1BB polypeptide.

70. The CAR of any one of claims 1-69, wherein the CAR is recombinantly expressed.

71. The CAR of any one of claims 1-70, wherein the CAR is expressed from a vector.

72. The CAR of claim 71, wherein the vector is a γ-retroviral rector.

73. An isolated immunoresponsive cell comprising the CAR of any one of the preceding claims.

74. The isolated immunoresponsive cell of claim 73, wherein the immunoresponsive cell is transduced with the CAR.

75. The isolated immunoresponsive cell of claim 73 or 74, wherein the CAR is constitutively expressed on the surface of the immunoresponsive cell.

76. The isolated immunoresponsive cell of any one of claims 73-76, wherein the isolated immunoresponsive cell is further transduced with at least one co-stimulatory ligand such that the immunoresponsive cell expresses the at least one co-stimulatory ligand.

77. The isolated immunoresponsive cell of claim 76, wherein the at least one co-stimulatory ligand is selected from the group consisting of 4-1BBL, CD80, CD86, CD70, OX40L, CD48, TNFRSF14, and

combinations thereof.

78. The isolated immunoresponsive cell of any one of claims 73-77, wherein the isolated immunoresponsive cell is further transduced with at least one cytokine such that the immunoresponsive cell secrets the at least one cytokine.

79. The isolated immunoresponsive cell of claim 78, wherein the at least one cytokine is selected from the group consisting of IL-2, IL-3, IL-6, IL-7, IL-11, IL-12, IL-15, IL-17, IL-21, and combinations thereof.

80. The isolated immunoresponsive cell of any one of claims 73-79, wherein the immunoresponsive cell is selected from the group consisting of a T cell, a Natural Killer (NK) cell, a cytotoxic T lymphocyte (CTL), a regulatory T cell, a human embryonic stem cell, a lymphoid progenitor cell, a T cell-precursor cell, and a pluripotent stem cell from which lymphoid cells may be differentiated.

81. The isolated immunoresponsive cell of claim 80, wherein the immunoresponsive cell is a T cell.

82. An isolated nucleic acid molecule encoding the chimeric antigen receptor (CAR) of any one of claims 1-72.

83. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs:951-959.

84. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence having the sequence set forth in SEQ ID NO:951.

85. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence having the sequence set forth in SEQ ID NO:952.

86. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence having the sequence set forth in SEQ ID NO:953.

87. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence having the sequence set forth in SEQ ID NO:954.

88. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence having the sequence set forth in SEQ ID NO:955.

89. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence having the sequence set forth in SEQ ID NO:956.

90. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence having the sequence set forth in SEQ ID NO:957.

91. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence having the sequence set forth in SEQ ID NO:958.

92. The isolated nucleic acid molecule of claim 82, comprising a nucleic acid sequence having the sequence set forth in SEQ ID NO:959.

93. A vector comprising the isolated nucleic acid molecule of any one of claims 82-92.

94. The vector of claim 93, wherein the vector is a γ-retroviral rector.

95. A host cell expressing the nucleic acid molecule of any one of claims 82-92.

96. The host cell of claim 95, wherein the host cell is a T cell.

97. Use of an effective amount of the immunoresponsive cell of any one of claims 73-81 in the manufacture of a medicament for reducing tumor burden in a subject.

98. The use of claim 97, wherein the immunoresponsive cell reduces the number of tumor cells.

99. The use of claim 97, wherein the immunoresponsive cell reduces tumor size.

100. The use of claim 97, wherein the immunoresponsive cell eradicates the tumor in the subject.

101. The use of any one of claims 97-100, wherein the tumor is selected from the group consisting of multiple myeloma, Non-Hodgkin Lymphoma (especially Mantle Cell), Hodgkin Lymphoma, Chronic Lymphocytic Leukemia (CLL), Acute lymphocytic leukemia (ALL), Hairy Cell Leukemia, Burketts Lymphoma, and Waldenstrom's Macroglobulinemia.

102. The use of any one of claims 97-101, wherein the tumor is multiple myeloma.

103. The use of any one of claims 97-102, wherein the subject is a human.

104. The use of any one of claims 97-103, wherein the immunoresponsive cell is a T cell.

105. Use of an effective amount of the immunoresponsive cell of any one of claims 73-81 in the manufacture of a medicament for increasing or lengthening survival of a subject having a neoplasm.

106. The use of claim 105, wherein the neoplasm is selected from the group consisting of multiple

myeloma, Non-Hodgkin Lymphoma (especially Mantle Cell), Hodgkin Lymphoma, Chronic Lymphocytic Leukemia (CLL), Acute lymphocytic leukemia (ALL), Hairy Cell Leukemia, Burketts Lymphoma, and Waldenstrom's Macroglobulinemia.

107. The use of claim 105 or 106, wherein the neoplasm is multiple myeloma.

108. The use of any one of claims 105-107, wherein the immunoresponsive cell reduces or eradicates tumor burden in the subject.

109. A method for producing an immunoresponsive cell that binds to Fc Receptor-like 5 (FcRL5), comprising introducing into the immunoresponsive cell a nucleic acid sequence that encodes a chimeric antigen receptor (CAR) of any one of claims 1-72.

110. A pharmaceutical composition comprising an effective amount of the immunoresponsive cell of any one of claims 73-81 and a pharmaceutically acceptable excipient.

111. The pharmaceutical composition of claim 110, wherein the pharmaceutical composition is for treating a neoplasm.

112. The pharmaceutical composition of claim 111, wherein the neoplasm is selected from the group consisting of multiple myeloma, Non-Hodgkin Lymphoma (especially Mantle Cell), Hodgkin Lymphoma, Chronic Lymphocytic Leukemia (CLL), Acute lymphocytic leukemia (ALL), Hairy Cell Leukemia, Burketts Lymphoma, and Waldenstrom's Macroglobulinemia.

113. The pharmaceutical composition of any one of claim 110, 111 and 112, wherein the neoplasm is multiple myeloma.

114. A kit for treating a neoplasm, comprising the immunoresponsive cell of any one of claims 73-81.

115. The kit of claim 114, wherein the kit further comprises written instructions for using the immunoresponsive cell for treating a subject having a neoplasm.

116. The kit of claim 114 or 115, wherein the neoplasm is selected from the group consisting of multiple myeloma, Non-Hodgkin Lymphoma (especially Mantle Cell), Hodgkin Lymphoma, Chronic Lymphocytic Leukemia (CLL), Acute lymphocytic leukemia (ALL), Hairy Cell Leukemia, Burketts Lymphoma, and Waldenstrom's Macroglobulinemia.

117. The kit of any one of claim 114, 115 and 116, wherein the neoplasm is multiple myeloma.