Furthermore, the presently disclosed subject matter provides use of an effective amount of the antibody or antigen-binding fragment thereof as described herein, in the manufacture of medicament for treating a tumor in a subject.

The presently disclosed subject matter further provides an antibody or an antigen-binding fragment thereof that specifically binds to human GPRC5D, comprising:

(a) 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 NOS: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85, 89, 93, 274, 286, 298, 310, 322, 334, 346 and 358; and

(b) 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 NOS: 2, 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46, 50, 54, 58, 62, 66, 70, 74, 78, 82, 86, 90, 94, 275, 287, 299, 311, 323, 335, 347 and 359.

The presently disclosed subject matter further provides an antibody or an antigen-binding fragment thereof that specifically binds to human GPRC5D, comprising:

(i) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 124, 125 and 126, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 127, 128 and 129;

(ii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 130, 131 and 132, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 133, 134 and 135;

(iii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 136, 137 and 138, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 139, 140 and 141;

(iv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 142, 143 and 144, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 145, 146 and 147;

(v) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 148, 149 and 150, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 151, 152 and 153;

(vi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 154, 155 and 156, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 157, 158 and 159;

(vii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 160, 161 and 162, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 163, 164 and 165;

(viii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 166, 167 and 168, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 169, 170 and 171;

(ix) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 172, 173 and 174, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 175, 176 and 177;

(x) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 178, 179 and 180, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 181, 182 and 183;

(xi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 184, 185 and 186, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 187, 188 and 189;

(xii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 190, 191 and 192, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 193, 194 and 195;

(xiii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 196, 197 and 198, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 199, 200 and 201;

(xiv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 202, 203 and 204, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 205, 206 and 207;

(xv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 208, 209 and 210, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 211, 212 and 213;

(xvi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 214, 215 and 216, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 217, 218 and 219;

(xvii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 220, 221 and 222, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 223, 224 and 225;

(xviii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 226, 227 and 228, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 229, 230 and 231;

(xix) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 232, 233 and 234, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 235, 236 and 237;

(xx) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 238, 239 and 240, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 241, 242 and 243;

(xxi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 244, 245 and 246, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 247, 248 and 249;

(xxii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 250, 251 and 252, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 253, 254 and 255;

(xxiii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 256, 257 and 258, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 259, 260 and 261;

(xxiv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 262, 263 and 264, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 265, 266 and 267;

(xxv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 268, 269 and 270, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 271, 272 and 273;

(xxvi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 280, 281 and 282, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 283, 284 and 285

(xxvii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 292, 293 and 294, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 295, 296 and 297;

(xxviii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 303, 304 and 305, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 306, 307 and 308;

(xxix) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 316, 317 and 318, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 319, 320 and 321;

(xxx) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 328, 329 and 330, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 331, 332 and 333;

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

(xxxii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 352, 353 and 354, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 355, 356 and 357.

Furthermore, the presently disclosed subject matter provides an antibody or antigen-binding portion thereof, which cross-competes for binding to human GPRC5D with the antibody or antigen-binding portion thereof as described herein.

Furthermore, the presently disclosed subject matter provides an antibody, or an antigen-binding portion thereof, which cross-competes for binding to human GPRC5D with a reference antibody or reference antigen-binding portion thereof comprising:

(i) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:1, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:2;

(ii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:5, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:6;

(iii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:9, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:10;

(iv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:13, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:14;

(v) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:17, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:18;

(vi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:21, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:22;

(vii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:25, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:26;

(viii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:29, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:30;

(ix) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:33, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:34;

(x) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:37, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:38;

(xi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:41, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:42;

(xii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:45, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:46;

(xiii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:49, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:50;

(xiv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:53, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:54;

(xv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:57, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:58;

(xvi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:61, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:62;

(xvii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:65, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:66;

(xviii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:69, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:70;

(xix) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:73, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:74;

(xx) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:77, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:78;

(xxi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:81, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:82;

(xxii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:85, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:86;

(xxiii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:89, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:90

(xxiv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:93, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:94;

(xxv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:274, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:275;

(xxvi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:286, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:287;

(xxvii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:298, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:299;

(xviii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:310, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:311;

(xxi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:322, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:323;

(xxx) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:334, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:335;

(xxxi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:346, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:347; or

(xxxii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:358, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:359.

In addition, the presently disclosed subject matter provides an antibody, or an antigen-binding fragment thereof, comprising an amino acid sequence selected from the group consisting of SEQ ID NOS: 100-123, 276, 288, 300, 312, 324, 336, 348 and 360.

In addition, the presently disclosed subject matter provides an anti-GPRC5D scFv antibody comprising a light chain variable region, a heavy chain variable region, a

peptide linker and a His-tag and HA-tag, wherein the His-tag and HA-tag comprises an amino acid sequence of SEQ ID NO:379.

In addition, the presently disclosed subject matter provides an nucleic acid that encodes an antibody or antigen-binding fragment thereof as disclosed herein.

WHAT IS CLAIMED IS:

1. An antibody or an antigen-binding fragment thereof that specifically binds to human GPRC5D, comprising:

(a) 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 NOS: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85, 89, 93, 274, 286, 298, 310, 322, 334, 346 and 358; and

(b) 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 NOS: 2, 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46, 50, 54, 58, 62, 66, 70, 74, 78, 82, 86, 90, 94, 275, 287, 299, 311, 323, 335, 347 and 359.

2. An antibody or an antigen-binding fragment thereof that specifically binds to human GPRC5D, comprising:

(i) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 124, 125 and 126, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 127, 128 and 129;

(ii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 130, 131 and 132, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 133, 134 and 135;

(iii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 136, 137 and 138, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 139, 140 and 141;

(iv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 142, 143 and 144, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 145, 146 and 147;

(v) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 148, 149 and 150, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 151, 152 and 153;

(vi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 154, 155 and 156, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 157, 158 and 159;

(vii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 160, 161 and 162, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 163, 164 and 165;

(viii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 166, 167 and 168, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 169, 170 and 171;

(ix) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 172, 173 and 174, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 175, 176 and 177;

(x) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 178, 179 and 180, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 181, 182 and 183;

(xi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 184, 185 and 186, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 187, 188 and 189;

(xii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 190, 191 and 192, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 193, 194 and 195;

(xiii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 196, 197 and 198, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 199, 200 and 201;

(xiv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 202, 203 and 204, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 205, 206 and 207;

(xv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 208, 209 and 210, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 211, 212 and 213;

(xvi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 214, 215 and 216, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 217, 218 and 219;

(xvii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 220, 221 and 222, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 223, 224 and 225;

(xviii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 226, 227 and 228, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 229, 230 and 231;

(xix) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 232, 233 and 234, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 235, 236 and 237;

(xx) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 238, 239 and 240, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 241, 242 and 243;

(xxi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 244, 245 and 246, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 247, 248 and 249;

(xxii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 250, 251 and 252, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 253, 254 and 255;

(xxiii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 256, 257 and 258, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 259, 260 and 261;

(xxiv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 262, 263 and 264, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 265, 266 and 267;

(xxv) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 268, 269 and 270, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 271, 272 and 273;

(xxvi) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 280, 281 and 282, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 283, 284 and 285;

(xxvii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 292, 293 and 294, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 295, 296 and 297;

(xxviii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 303, 304 and 305, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 306, 307 and 308;

(xxix) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 316, 317 and 318, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 319, 320 and 321;

(xxx) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 328, 329 and 330, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 331, 332 and 333;

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

(xxxii) a heavy chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 352, 353 and 354, and a light chain variable region comprising the amino acid sequences set forth in SEQ ID NOS: 355, 356 and 357.

3. The antibody or antigen-binding fragment thereof of claim 1 or 2, wherein (a) the heavy chain variable region comprises an amino acid sequence that is at least 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 NOS: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85, 89, 93, 274, 286, 298, 310, 322, 334, 346 and 358; and

(b) the light chain variable region comprises an amino acid sequence that is at least 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 NOS: 2, 6, 10, 14, 18, 22, 26, 30, 34, 38, 42, 46, 50, 54, 58, 62, 66, 70, 74, 78, 82, 86, 90, 94, 275, 287, 299, 311, 323, 335, 347 and 359.

4. The antibody or antigen-binding fragment thereof of any one of claims 1-3, wherein (i) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%

or about 99% homologous to the sequence set forth in SEQ ID NO:1, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:2;

(ii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:5, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:6;

(iii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:9, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO10;

(iv) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:13, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:14;

(v) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:17, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:18;

(vi) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:21, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%,

about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:22;

(vii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:25, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:26;

(viii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 29, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 30;

(ix) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 33, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 34;

(x) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 37, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 38;

(xi) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 41, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 42;

(xii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 45, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 46;

(xiii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 49, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 50;

(xiv) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 53, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 54;

(xv) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 57, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 58;

(xvi) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 61, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 62;

(xvii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%,

about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 65, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO: 66;

(xviii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:69, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:70;

(xix) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:73, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:74;

(xx) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:74, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:78;

(xxi) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:81, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:82;

(xxii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:85, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%,

about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:86;

(xxiii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:89, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:90;

(xxiv) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:93, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:94;

(xxv) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:274, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:275;

(xxvi) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:286, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:287;

(xxvii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:288, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:289;

(xxviii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:310, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:311;

(xxix) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:322, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:323;

(xxx) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:334, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:335;

(xxxi) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:346, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:347; or

(xxxii) the heavy chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:358, and the light chain variable region comprises an amino acid sequence that is at least about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98% or about 99% homologous to the sequence set forth in SEQ ID NO:389.

5. The antibody or antigen-binding fragment thereof of any one of claims 1-4, wherein (i) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:1, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:2;

(ii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:5, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:6;

(iii) the heavy chain variable region comprises theamino acid sequence set forth in SEQ ID NO:9, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:10;

(iv) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:13, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:14;

(v) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:17, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:18;

(vi) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:21, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:22;

(vii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:25, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:26;

(viii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:29, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:30;

(ix) the heavy chain variable region comprises an amino acid sequence set forth in SEQ ID NO:33, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:34;

(x) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:37, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:38;

(xi) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:41, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:42;

(xii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:45, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:46;

(xiii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:49, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:50;

(xiv) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:53, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:54;

(xv) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:57, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:58;

(xvi) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:61, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:62;

(xvii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:65, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:66;

(xviii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:69, the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:70;

(xix) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:73, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:74;

(xx) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:77, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:78;

(xxi) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:81, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:82;

(xxii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:85, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:86;

(xxiii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:89, the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:90;

(xxiv) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:93, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:94;

(xxv) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:274, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:275;

(xxvi) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:286, the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:287;

(xxvii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:298, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:299;

(xxviii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:310, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:311;

(xxix) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:322, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:323;

(xxx) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:334, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:335;

(xxxi) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:346, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:347; or

(xxxii) the heavy chain variable region comprises the amino acid sequence set forth in SEQ ID NO:358, and the light chain variable region comprises the amino acid sequence set forth in SEQ ID NO:359.

6. An antibody or antigen-binding portion thereof, which cross-competes for binding to human GPRC5D with the antibody or antigen-binding portion thereof of any one of claims 1-5.

7. An antibody, or an antigen-binding portion thereof, which cross-competes for binding to human GPRC5D with a reference antibody or reference antigen-binding portion thereof comprising:

(i) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:1, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:2;

(ii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:5, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:6;

(iii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:9, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:10;

(iv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:13, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:14;

(v) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:17, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:18;

(vi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:21, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:22;

(vii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:25, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:26;

(viii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:29, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:30;

(ix) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:33, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:34;

(x) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:37, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:38;

(xi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:41, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:42;

(xii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:45, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:46;

(xiii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:49, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:50;

(xiv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:53, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:54;

(xv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:57, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:58;

(xvi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:61, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:62;

(xvii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:65, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:66;

(xviii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:69, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:70;

(xix) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:73, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:74;

(xx) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:77, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:78;

(xxi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:81, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:82;

(xxii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:85, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:86;

(xxiii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:89, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:90;

(xxiv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:93, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:94;

(xxv) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:274, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:275;

(xxvi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:286, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:287;

(xxvii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:298, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:299;

(xviii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:310, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:311;

(xxi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:322, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:323;

(xxx) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:334, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:335;

(xxxi) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:346, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:347; or

(xxxii) a heavy chain variable region comprising the amino acid sequence set forth in SEQ ID NO:358, and a light chain variable region comprising the amino acid sequence set forth in SEQ ID NO:359.

8. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the GPRC5D comprises the amino acid sequence set forth in SEQ ID NO:97.

9. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to one, two, three or four epitope region selected from the group consisting of an epitope region in N-terminal region comprising amino acids 1-27 of SEQ ID NO:97, an epitope region in ECL1 region comprising amino acids 85-93 of SEQ ID NO:97, an epitope region in ECL2 region comprising amino acids 145-167 of SEQ ID NO:97, and an epitope region in ECL3 region comprising amino acids 226-239 of SEQ ID NO:97.

10. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 16-23 of SEQ ID NO:97.

11. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 15-23 of SEQ ID NO:97.

12. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 16-25 of SEQ ID NO:97.

13. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 10-17 of SEQ ID NO:97.

14. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 5-17 of SEQ ID NO:97.

15. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 85-95 of SEQ ID NO:97.

16. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 157-164 of SEQ ID NO:97.

17. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 157-167 of SEQ ID NO:97.

18. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 230-237 of SEQ ID NO:97.

19. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 229-237 of SEQ ID NO:97.

20. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 230-243 of SEQ ID NO:97.

21. The antibody or antigen-binding fragment thereof of any one of claims 1-7, wherein the antibody or antigen-binding fragment thereof binds to an epitope region comprising amino acids 227-237 of SEQ ID NO:97.

22. An antibody, or an antigen-binding fragment thereof, comprising an amino acid sequence selected from the group consisting of SEQ ID NOS: 100-123, 276, 288, 300, 312, 324, 336, 348 and 360.

23. An anti-GPRC5D scFv antibody comprising a light chain variable region, a heavy chain variable region, a peptide linker and a His-tag and HA-tag, wherein the His-tag and HA-tag comprises an amino acid sequence of SEQ ID NO:379.

24. The antibody or antigen-binding portion thereof of any one of claims 1-23, wherein the antibody or antigen-binding portion thereof binds to human GPRC5D with a binding affinity (K_d) of from about 1×10^{-9} M to about 1×10^{-8} M.

25. The antibody or antigen-binding fragment thereof of any one of claims 1-24, wherein the antibody comprises a human variable region framework region.

26. The antibody or antigen-binding fragment thereof of any one of claims 1-25, which is a fully human or an antigen-binding fragment thereof.

27. The antibody or antigen-binding fragment thereof of any one of claims 1-25, which is a chimeric antibody or an antigen-binding fragment thereof.

28. The antibody or antigen-binding portion thereof of any one of claims 1-25, which is a humanized antibody or an antigen-binding fragment thereof.

29. The antibody or antigen-binding fragment thereof of any one of claims 1-28, wherein the antigen-binding fragment of the antibody is an Fab, Fab', F(ab')2, Fv or single chain Fv (scFv).

30. A composition comprising the antibody or antigen-binding fragment thereof of any one of claims 1-29, and a pharmaceutically acceptable carrier.

31. An immunoconjugate comprising the antibody or antigen-binding fragment thereof of any one of claims 1-29, linked to a therapeutic agent.

32. The immunoconjugate of claim 31, wherein said therapeutic agent is a drug, cytotoxin, or a radioactive isotope.

33. A composition comprising the immunoconjugate of claim 31 or 32 and a pharmaceutically acceptable carrier.

34. A bispecific molecule comprising the antibody or antigen-binding fragment thereof of anyone of claims 1-29, linked to a second functional moiety.

35. The bispecific molecule of claim 34, wherein the second functional moiety has a different binding specificity than said antibody or antigen binding fragment thereof.

36. The bispecific molecule of claim 35, wherein the second functional moiety has a binding specificity for an immune cell.

37. The bispecific molecule of claim 35, wherein the second functional moiety has a binding specificity for CD3.

38. A composition comprising the bispecific molecule of any one of claims 34-37 and a pharmaceutically acceptable carrier.

39. An nucleic acid that encodes an antibody or antigen-binding fragment thereof of any one of claims 1-29.

40. An expression vector comprising the nucleic acid molecule of claim 39.

41. A host cell comprising the expression vector of claim 40.

42. A method for detecting GPRCSD in a whole cell or tissue, comprising:

contacting a cell or tissue with the antibody or antigen-binding fragment thereof of any one of claims 1-29, wherein said antibody or antigen-binding fragment thereof comprises a detectable label;

and determining the amount of the labeled antibody or antigen-binding fragment thereof bound to said cell or tissue by measuring the amount of detectable label associated with said cell or tissue, wherein the amount of bound antibody or antigen-binding fragment thereof indicates the amount of GPRCSD in said cell or tissue.

43. Use of an effective amount of the antibody or antigen-binding fragment thereof of any one of claims 1-29, in the manufacture of medicament for treating a tumor in a subject.

44. The use of claim 43, wherein the method reduces the number of the tumor cells.

45. The use of claim 43, wherein the method reduces the tumor size.

46. The use of claim 43, wherein the method eradicates the tumor in the subject.

47. The use of any one of claims 43-46 , wherein the tumor is multiple myeloma or Waldenstrom's Macroglobulinemia.

48. The use of claim 47, wherein the tumor is multiple myeloma.

49. The use of any one of claims 43-48, wherein the subject is a human.

50. A kit for treating a tumor, comprising the antibody or antigen-binding fragment thereof of any one of claims 1-29.

51. The kit of claim 50, wherein the kit further comprises written instructions for using the antibody or antigen-binding fragment thereof for treating a subject having a tumor.

52. The kit of claim 50 or 51 , wherein the tumor is multiple myeloma or Waldenstrom's Macroglobulinemia.

53. The kit of any one of claims 50-52 , wherein the tumor is multiple myeloma.