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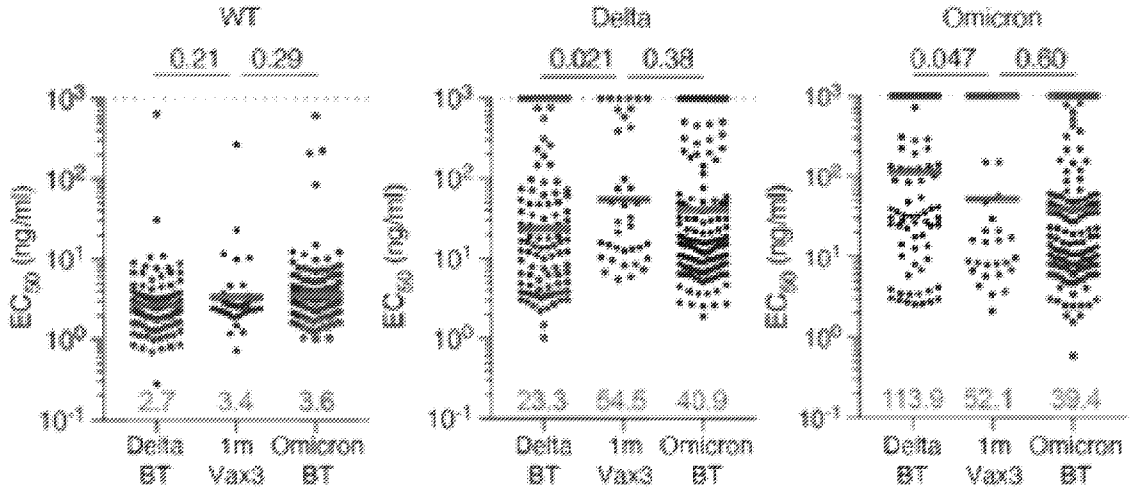
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(54) Title: ANTI-SARS-COV-2 ANTIBODIES AND METHODS OF USE THEREOF

FIG. 3A



(57) Abstract: This disclosure provides novel neutralizing and potent anti-SARS-CoV-2 antibodies, related nucleic acids, related cells, related kits, related compositions, and related methods or uses.

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ANTI-SARS-COV-2 ANTIBODIES AND METHODS OF USE THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 63/371,285, filed August 12, 2022, which is hereby incorporated by reference in its entirety.

REFERENCE TO AN ELECTRONIC SEQUENCE LISTING

[0002] The contents of the electronic sequence listing (070413.20758_SeqListing.xml; Size: 1,420,000 bytes; and Date of Creation: August 9, 2023) is herein incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0003] The present invention relates to antibodies directed to epitopes of SARS-CoV-2 Coronavirus 2 ("SARS-CoV-2"). The present invention further relates to the preparation and use of neutralizing antibodies directed to the SARS-CoV-2 spike (S) glycoproteins for the prevention and treatment of SARS-CoV-2 infection.

BACKGROUND

[0004] Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) emerged in late 2019, causing a global pandemic with more than 500 million infections and over 6 million deaths reported to date. Over the course of the pandemic, SARS-COV-2 continued to evolve, resulting in substantial genetic distance between circulating variants and the initial viral sequence on which vaccines are based. Several of these circulating variants have been designated variants of concern (VoC) and have led to successive waves of infection, most notably by VoCs Alpha (Supasa et al., 2021), Delta (Liu et al., 2021), Omicron (Dejnirattisai et al., 2022).

[0005] Higher rates of re-infection and vaccine-breakthrough infection with the Delta and Omicron variants highlighted the potential for immune escape from neutralizing antibody responses resulting in reduced vaccine efficacy against SARS-CoV-2 infection(Cao et al.; Cele et al., 2022; Dejnirattisai et al., 2022; Gaebler et al., 2022; Hachmann et al., 2022; Kuhlmann et al., 2022; Liu et al., 2021). With the emergence of Omicron BA.1 and related lineages, infection has surged worldwide, and these new variants account for over 95% of recent COVID-19 cases. To date, BA.2.12.1 variant (a BA.2 lineage) contributes 59% of new cases in the United States, while BA.4 and BA.5 caused a fifth wave of COVID-19 infection in South Africa. Nevertheless, vaccine-

elicited immunity continues to provide robust protection against severe disease, even in the face of viral variants(Andrews et al., 2022; Madhi et al., 2022; Wolter et al., 2022; World Health, 2022).

[0006] Previous studies have shown that Delta or Omicron breakthrough infection boosts plasma neutralizing activity against both the Wuhan-Hu-1 strain and the infecting variant, which might suggest recall responses of cross-reactive vaccine-induced memory B cells (Kaku et al., 2022; Quandt et al., 2022; Richardson et al., 2022; Seaman et al., 2022; Servellita et al., 2022). However, far less is known about the memory antibody responses after breakthrough infection.

SUMMARY

[0007] In some embodiments, the present disclosure provides an antibody or antigen-binding fragment thereof that binds to the S polypeptide of a Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) wherein the antibody or antigen-binding fragment thereof comprises: three heavy chain complementarity determining regions (HCDRs) (HCDR1, HCDR2, and HCDR3) of a heavy chain variable region (HCVR) having the amino acid sequence of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391, 393, 395, 397, 399, 401, 403, 405, 407, 409, 411, 413, 415, 417, 419, 421, 423, 425, 427, 429, 431, 433, 435, 437, 439, 441, 443, 445, 447, 449, 451, 453, 455, 457, 459, 461, 463, 465, 467, 469, 471, 473, 475, 477, 479, 481, 483, 485, 487, 489, 491, 493, 495, 497, 499, 501, 503, 505, 507, 509, 511, 513, 515, 517, 519, 521, 523, 525, 527, 529, 531, 533, 535, 537, 539, 541, 543, 545, 547, 549, 551, 553, 555, 557, 559, 561, 563, 565, 567, 569, 571, 573, 575, 577, 579, 581, 583, 585, 587, 589, 591, 593, 595, 597, 599, 601, 603, 605, 607, 609, 611, 613, 615, 617, 619, 621, 623, 625, 627, 629, 631, 633, 635, 637, 639, 641, 643, 645, 647, 649, 651, 653, 655, 657, 659, 661, 663, 665, 667, 669, 671, 673, or 675; and three light chain CDRs (LCDR1, LCDR2, and LCDR3) of a

light chain variable region (LCVR) having the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426, 428, 430, 432, 434, 436, 438, 440, 442, 444, 446, 448, 450, 452, 454, 456, 458, 460, 462, 464, 466, 468, 470, 472, 474, 476, 478, 480, 482, 484, 486, 488, 490, 492, 494, 496, 498, 500, 502, 504, 506, 508, 510, 512, 514, 516, 518, 520, 522, 524, 526, 528, 530, 532, 534, 536, 538, 540, 542, 544, 546, 548, 550, 552, 554, 556, 558, 560, 562, 564, 566, 568, 570, 572, 574, 576, 578, 580, 582, 584, 586, 588, 590, 592, 594, 596, 598, 600, 602, 604, 606, 608, 610, 612, 614, 616, 618, 620, 622, 624, 626, 628, 630, 632, 634, 636, 638, 640, 642, 644, 646, 648, 650, 652, 654, 656, 658, 660, 662, 664, 666, 668, 670, 672, 674, or 676.

[0008] In some embodiments, the antibody or antigen-binding fragment thereof comprises: a heavy chain variable region comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391, 393, 395, 397, 399, 401, 403, 405, 407, 409, 411, 413, 415, 417, 419, 421, 423, 425, 427, 429, 431, 433, 435, 437, 439, 441, 443, 445, 447, 449,

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[0009] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCVR and a LCVR that comprise a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22, 23-24, 25-26, 27-28, 29-30, 31-32, 33-34, 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 47-48, 49-50, 51-52, 53-54, 55-56, 57-58,

59-60, 61-62, 63-64, 65-66, 67-68, 69-70, 71-72, 73-74, 75-76, 77-78, 79-80, 81-82, 83-84, 85-86, 87-88, 89-90, 91-92, 93-94, 95-96, 97-98, 99-100, 101-102, 103-104, 105-106, 107-108, 109-110, 111-112, 113-114, 115-116, 117-118, 119-120, 121-122, 123-124, 125-126, 127-128, 129-130, 131-132, 133-134, 135-136, 137-138, 139-140, 141-142, 143-144, 145-146, 147-148, 149-150, 151-152, 153-154, 155-156, 157-158, 159-160, 161-162, 163-164, 165-166, 167-168, 169-170, 171-172, 173-174, 175-176, 177-178, 179-180, 181-182, 183-184, 185-186, 187-188, 189-190, 191-192, 193-194, 195-196, 197-198, 199-200, 201-202, 203-204, 205-206, 207-208, 209-210, 211-212, 213-214, 215-216, 217-218, 219-220, 221-222, 223-224, 225-226, 227-228, 229-230, 231-232, 233-234, 235-236, 237-238, 239-240, 241-242, 243-244, 245-246, 247-248, 249-250, 251-252, 253-254, 255-256, 257-258, 259-260, 261-262, 263-264, 265-266, 267-268, 269-270, 271-272, 273-274, 275-276, 277-278, 279-280, 281-282, 283-284, 285-286, 287-288, 289-290, 291-292, 293-294, 295-296, 297-298, 299-300, 301-302, 303-304, 305-306, 307-308, 309-310, 311-312, 313-314, 315-316, 317-318, 319-320, 321-322, 323-324, 325-326, 327-328, 329-330, 331-332, 333-334, 335-336, 337-338, 339-340, 341-342, 343-344, 345-346, 347-348, 349-350, 351-352, 353-354, 355-356, 357-358, 359-360, 361-362, 363-364, 365-366, 367-368, 369-370, 371-372, 373-374, 375-376, 377-378, 379-380, 381-382, 383-384, 385-386, 387-388, 389-390, 391-392, 393-394, 395-396, 397-398, 399-400, 401-402, 403-404, 405-406, 407-408, 409-410, 411-412, 413-414, 415-416, 417-418, 419-420, 421-422, 423-424, 425-426, 427-428, 429-430, 431-432, 433-434, 435-436, 437-438, 439-440, 441-442, 443-444, 445-446, 447-448, 449-450, 451-452, 453-454, 455-456, 457-458, 459-460, 461-462, 463-464, 465-466, 467-468, 469-470, 471-472, 473-474, 475-476, 477-478, 479-480, 481-482, 483-484, 485-486, 487-488, 489-490, 491-492, 493-494, 495-496, 497-498, 499-500, 501-502, 503-504, 505-506, 507-508, 509-510, 511-512, 513-514, 515-516, 517-518, 519-520, 521-522, 523-524, 525-526, 527-528, 529-530, 531-532, 533-534, 535-536, 537-538, 539-540, 541-542, 543-544, 545-546, 547-548, 549-550, 551-552, 553-554, 555-556, 557-558, 559-560, 561-562, 563-564, 565-566, 567-568, 569-570, 571-572, 573-574, 575-576, 577-578, 579-580, 581-582, 583-584, 585-586, 587-588, 589-590, 591-592, 593-594, 595-596, 597-598, 599-600, 601-602, 603-604, 605-606, 607-608, 609-610, 611-612, 613-614, 615-616, 617-618, 619-620, 621-622, 623-624, 625-626, 627-628, 629-630, 631-632, 633-634, 635-636, 637-638, 639-640, 641-642, 643-644, 645-646, 647-648, 649-650, 651-652, 653-654, 655-656, 657-658, 659-660, 661-662, 663-664, 665-666, 667-668, 669-670, 671-672, 673-674, or 675-676.

[0010] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCVR and a LCVR that comprise a HCVR/LCVR amino acid sequence pair with at least 75% identity to the amino acid sequence of SEQ ID NOs: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22, 23-24, 25-26, 27-28, 29-30, 31-32, 33-34, 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 47-48, 49-50, 51-52, 53-54, 55-56, 57-58, 59-60, 61-62, 63-64, 65-66, 67-68, 69-70, 71-72, 73-74, 75-76, 77-78, 79-80, 81-82, 83-84, 85-86, 87-88, 89-90, 91-92, 93-94, 95-96, 97-98, 99-100, 101-102, 103-104, 105-106, 107-108, 109-110, 111-112, 113-114, 115-116, 117-118, 119-120, 121-122, 123-124, 125-126, 127-128, 129-130, 131-132, 133-134, 135-136, 137-138, 139-140, 141-142, 143-144, 145-146, 147-148, 149-150, 151-152, 153-154, 155-156, 157-158, 159-160, 161-162, 163-164, 165-166, 167-168, 169-170, 171-172, 173-174, 175-176, 177-178, 179-180, 181-182, 183-184, 185-186, 187-188, 189-190, 191-192, 193-194, 195-196, 197-198, 199-200, 201-202, 203-204, 205-206, 207-208, 209-210, 211-212, 213-214, 215-216, 217-218, 219-220, 221-222, 223-224, 225-226, 227-228, 229-230, 231-232, 233-234, 235-236, 237-238, 239-240, 241-242, 243-244, 245-246, 247-248, 249-250, 251-252, 253-254, 255-256, 257-258, 259-260, 261-262, 263-264, 265-266, 267-268, 269-270, 271-272, 273-274, 275-276, 277-278, 279-280, 281-282, 283-284, 285-286, 287-288, 289-290, 291-292, 293-294, 295-296, 297-298, 299-300, 301-302, 303-304, 305-306, 307-308, 309-310, 311-312, 313-314, 315-316, 317-318, 319-320, 321-322, 323-324, 325-326, 327-328, 329-330, 331-332, 333-334, 335-336, 337-338, 339-340, 341-342, 343-344, 345-346, 347-348, 349-350, 351-352, 353-354, 355-356, 357-358, 359-360, 361-362, 363-364, 365-366, 367-368, 369-370, 371-372, 373-374, 375-376, 377-378, 379-380, 381-382, 383-384, 385-386, 387-388, 389-390, 391-392, 393-394, 395-396, 397-398, 399-400, 401-402, 403-404, 405-406, 407-408, 409-410, 411-412, 413-414, 415-416, 417-418, 419-420, 421-422, 423-424, 425-426, 427-428, 429-430, 431-432, 433-434, 435-436, 437-438, 439-440, 441-442, 443-444, 445-446, 447-448, 449-450, 451-452, 453-454, 455-456, 457-458, 459-460, 461-462, 463-464, 465-466, 467-468, 469-470, 471-472, 473-474, 475-476, 477-478, 479-480, 481-482, 483-484, 485-486, 487-488, 489-490, 491-492, 493-494, 495-496, 497-498, 499-500, 501-502, 503-504, 505-506, 507-508, 509-510, 511-512, 513-514, 515-516, 517-518, 519-520, 521-522, 523-524, 525-526, 527-528, 529-530, 531-532, 533-534, 535-536, 537-538, 539-540, 541-542, 543-544, 545-546, 547-548, 549-550, 551-552, 553-554, 555-556, 557-558, 559-560, 561-562, 563-564, 565-566, 567-568, 569-570, 571-572, 573-574, 575-576, 577-578, 579-580, 581-582, 583-584, 585-586, 587-588, 589-590, 591-592, 593-594, 595-596, 597-598, 599-

600, 601-602, 603-604, 605-606, 607-608, 609-610, 611-612, 613-614, 615-616, 617-618, 619-620, 621-622, 623-624, 625-626, 627-628, 629-630, 631-632, 633-634, 635-636, 637-638, 639-640, 641-642, 643-644, 645-646, 647-648, 649-650, 651-652, 653-654, 655-656, 657-658, 659-660, 661-662, 663-664, 665-666, 667-668, 669-670, 671-672, 673-674, or 675-676.

[0011] In some embodiments, the present disclosure provides an antibody or antigen-binding fragment thereof that binds to the S polypeptide of a Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), wherein the antibody or antigen-binding fragment thereof comprises: (a) a variable heavy chain CDR1 (HCDR1) comprising an amino acid sequence selected from SEQ ID NO: 1354, 1360, 1366, 1372, and 1378; (b) a variable heavy chain CDR2 (HCDR2) comprising an amino acid sequence of SEQ ID NO: 1355, 1361, 1367, 1373, and 1379; (c) a variable heavy chain CDR3 (HCDR3) comprising an amino acid sequence selected from SEQ ID NO: 1356, 1362, 1368, 1374, and 1380; (d) a variable light chain CDR1 (LCDR1) comprising an amino acid sequence selected from SEQ ID NO: 1357, 1363, 1369, 1375, and 1381; (e) a variable light chain CDR2 (LCDR2) comprising an amino acid sequence selected from SEQ ID NO: 1358, 1364, 1370, 1376, and 1382; and (f) a variable light chain CDR3 (LCDR3) comprising an amino acid sequence selected from SEQ ID NO: 1359, 1365, 1371, 1377, and 1383.

[0012] In some embodiments, the antibody or antigen-binding fragment thereof comprises: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1354, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1355, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1356, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1357, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1358, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1359.

[0013] In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 25, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 26.

[0014] In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 25, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 26.

[0015] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1360, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1361, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1362, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1363, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1364, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1365.

[0016] In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 395, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 396. In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 395, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 396.

[0017] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1366, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1367, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1368, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1369, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1370, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1371.

[0018] In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 397, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 398. In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 397, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 398.

[0019] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1372, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1373, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1374, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1375, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1376, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1377.

[0020] In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 191, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 192. In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 191, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 192.

[0021] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1378, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1379, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1380, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1381, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1382, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1383. In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 219, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 220.

[0022] In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 219, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 220.

[0023] In some embodiments, the antibody or antigen-binding fragment thereof is a fully human antibody or antigen-binding fragment thereof.

[0024] In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope within the receptor binding domain (RBD) or the N-terminal domain (NTD) of the S polypeptide. In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope selected from the following: (a) the supersite b-hairpin (residues 152-158 of SEQ ID NO: 1353); (b) the β8-strand (residue 97-102 of SEQ ID NO: 1353); (c) N4-loop (residues 178-188 of SEQ ID NO: 1353); (d) N-linked glycans at positions N122 and N149 of the spike polypeptide of SEQ ID NO: 1353; (e) residues 27-32, 57-60, 210-218, and/or 286-303 of the spike polypeptide of SEQ ID NO: 1353; and/or (f) residues 600-606 of the spike polypeptide of SEQ ID NO: 1353.

[0025] In some embodiments, the present disclosure provides an antibody or antigen-binding fragment thereof, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to a SEQ ID NO selected from column 7 of Table 2, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to a SEQ ID NO selected from column 11 of Table 2, wherein the VH SEQ ID NO and the VL SEQ ID NO are selected from the same row. In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of a SEQ ID NO selected from column 7 of Table 2, and a light chain variable domain (VL) comprising or consisting of a SEQ ID NO selected from column 11 of Table 2, wherein the VH SEQ ID No and the VL SEQ ID NO are selected from the same row.

[0026] In some embodiments, the antibody or antigen-binding fragment thereof neutralizes SARS-CoV-2. In some embodiments, the antibody or antigen-binding fragment thereof inhibits the fusion of SARS-CoV-2 and a host cell membrane. In some embodiments, the antibody or antigen-binding fragment thereof is cytotoxic to a SARS-CoV-2 infected host cell.

[0027] In some embodiments, the antibody or antigen-binding fragment thereof is a multivalent antibody comprising (a) a first target binding site that specifically binds to an epitope within the spike polypeptide, and (b) a second target binding site that binds to an epitope on a different epitope on the spike polypeptide or a different molecule.

[0028] In some embodiments, the antibody or antigen-binding fragment thereof further comprises a variant Fc constant region.

[0029] In some embodiments, the antibody or antigen-binding fragment thereof is a monoclonal antibody, a chimeric antibody, a humanized antibody, or humanized antibody. In some embodiments, the antibody or antigen-binding fragment thereof is a single-chain antibody, Fab, or Fab2 fragment.

[0030] In some embodiments, the antibody or antigen-binding fragment thereof is detectably labeled or conjugated to a toxin, a therapeutic agent, a polymer, a receptor, an enzyme, or a receptor ligand, preferably wherein the polymer is polyethylene glycol (PEG).

[0031] In some embodiments, the present disclosure provides a polynucleotide encoding the antibody or antigen-binding fragment thereof described herein. In some embodiments, the present disclosure provides a vector comprising a polynucleotide described herein. In some embodiments, the present disclosure provides a cultured host cell comprising a vector described herein.

[0032] In some embodiments, the present disclosure provides a pharmaceutical composition comprising an antibody or antigen-binding fragment thereof, polynucleotide, or vector described herein.

[0033] In some embodiments, the present disclosure provides a pharmaceutical composition comprising two or more antibodies or antigen-binding fragments thereof, wherein the two or more antibodies or antigen-binding fragments thereof are selected from: a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22, 23-24, 25-26, 27-28, 29-30, 31-32, 33-34, 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 47-48, 49-50, 51-52, 53-54, 55-56, 57-58, 59-60, 61-62, 63-64, 65-66, 67-68, 69-70, 71-72, 73-74, 75-76, 77-78, 79-80, 81-82, 83-84, 85-86, 87-88, 89-90, 91-92, 93-94, 95-96, 97-98, 99-100, 101-102, 103-104, 105-106, 107-108, 109-110, 111-112, 113-114, 115-116, 117-118, 119-120, 121-122, 123-124, 125-126, 127-128, 129-130, 131-132, 133-134, 135-136, 137-138, 139-140, 141-142, 143-144, 145-146, 147-148, 149-150, 151-152, 153-154, 155-156, 157-158, 159-160, 161-162, 163-164, 165-166, 167-168, 169-170, 171-172, 173-174, 175-176, 177-178, 179-180, 181-182, 183-184, 185-186, 187-188, 189-190, 191-192, 193-194, 195-196, 197-198, 199-200, 201-202, 203-204, 205-206, 207-208, 209-210, 211-212, 213-214, 215-216, 217-218, 219-220, 221-222, 223-224, 225-226, 227-228, 229-230, 231-232, 233-234, 235-236, 237-238, 239-240, 241-242, 243-244, 245-246, 247-248, 249-250, 251-252, 253-254, 255-256, 257-258, 259-260, 261-262, 263-264,

265-266, 267-268, 269-270, 271-272, 273-274, 275-276, 277-278, 279-280, 281-282, 283-284, 285-286, 287-288, 289-290, 291-292, 293-294, 295-296, 297-298, 299-300, 301-302, 303-304, 305-306, 307-308, 309-310, 311-312, 313-314, 315-316, 317-318, 319-320, 321-322, 323-324, 325-326, 327-328, 329-330, 331-332, 333-334, 335-336, 337-338, 339-340, 341-342, 343-344, 345-346, 347-348, 349-350, 351-352, 353-354, 355-356, 357-358, 359-360, 361-362, 363-364, 365-366, 367-368, 369-370, 371-372, 373-374, 375-376, 377-378, 379-380, 381-382, 383-384, 385-386, 387-388, 389-390, 391-392, 393-394, 395-396, 397-398, 399-400, 401-402, 403-404, 405-406, 407-408, 409-410, 411-412, 413-414, 415-416, 417-418, 419-420, 421-422, 423-424, 425-426, 427-428, 429-430, 431-432, 433-434, 435-436, 437-438, 439-440, 441-442, 443-444, 445-446, 447-448, 449-450, 451-452, 453-454, 455-456, 457-458, 459-460, 461-462, 463-464, 465-466, 467-468, 469-470, 471-472, 473-474, 475-476, 477-478, 479-480, 481-482, 483-484, 485-486, 487-488, 489-490, 491-492, 493-494, 495-496, 497-498, 499-500, 501-502, 503-504, 505-506, 507-508, 509-510, 511-512, 513-514, 515-516, 517-518, 519-520, 521-522, 523-524, 525-526, 527-528, 529-530, 531-532, 533-534, 535-536, 537-538, 539-540, 541-542, 543-544, 545-546, 547-548, 549-550, 551-552, 553-554, 555-556, 557-558, 559-560, 561-562, 563-564, 565-566, 567-568, 569-570, 571-572, 573-574, 575-576, 577-578, 579-580, 581-582, 583-584, 585-586, 587-588, 589-590, 591-592, 593-594, 595-596, 597-598, 599-600, 601-602, 603-604, 605-606, 607-608, 609-610, 611-612, 613-614, 615-616, 617-618, 619-620, 621-622, 623-624, 625-626, 627-628, 629-630, 631-632, 633-634, 635-636, 637-638, 639-640, 641-642, 643-644, 645-646, 647-648, 649-650, 651-652, 653-654, 655-656, 657-658, 659-660, 661-662, 663-664, 665-666, 667-668, 669-670, 671-672, 673-674, or 675-676; and a second antibody or antigen-binding fragment thereof comprising a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22, 23-24, 25-26, 27-28, 29-30, 31-32, 33-34, 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 47-48, 49-50, 51-52, 53-54, 55-56, 57-58, 59-60, 61-62, 63-64, 65-66, 67-68, 69-70, 71-72, 73-74, 75-76, 77-78, 79-80, 81-82, 83-84, 85-86, 87-88, 89-90, 91-92, 93-94, 95-96, 97-98, 99-100, 101-102, 103-104, 105-106, 107-108, 109-110, 111-112, 113-114, 115-116, 117-118, 119-120, 121-122, 123-124, 125-126, 127-128, 129-130, 131-132, 133-134, 135-136, 137-138, 139-140, 141-142, 143-144, 145-146, 147-148, 149-150, 151-152, 153-154, 155-156, 157-158, 159-160, 161-162, 163-164, 165-166, 167-168, 169-170, 171-172, 173-174, 175-176, 177-178, 179-180, 181-182, 183-184, 185-186, 187-188, 189-190, 191-192, 193-194, 195-196, 197-198, 199-200, 201-202, 203-204, 205-206, 207-208, 209-210,

211-212, 213-214, 215-216, 217-218, 219-220, 221-222, 223-224, 225-226, 227-228, 229-230, 231-232, 233-234, 235-236, 237-238, 239-240, 241-242, 243-244, 245-246, 247-248, 249-250, 251-252, 253-254, 255-256, 257-258, 259-260, 261-262, 263-264, 265-266, 267-268, 269-270, 271-272, 273-274, 275-276, 277-278, 279-280, 281-282, 283-284, 285-286, 287-288, 289-290, 291-292, 293-294, 295-296, 297-298, 299-300, 301-302, 303-304, 305-306, 307-308, 309-310, 311-312, 313-314, 315-316, 317-318, 319-320, 321-322, 323-324, 325-326, 327-328, 329-330, 331-332, 333-334, 335-336, 337-338, 339-340, 341-342, 343-344, 345-346, 347-348, 349-350, 351-352, 353-354, 355-356, 357-358, 359-360, 361-362, 363-364, 365-366, 367-368, 369-370, 371-372, 373-374, 375-376, 377-378, 379-380, 381-382, 383-384, 385-386, 387-388, 389-390, 391-392, 393-394, 395-396, 397-398, 399-400, 401-402, 403-404, 405-406, 407-408, 409-410, 411-412, 413-414, 415-416, 417-418, 419-420, 421-422, 423-424, 425-426, 427-428, 429-430, 431-432, 433-434, 435-436, 437-438, 439-440, 441-442, 443-444, 445-446, 447-448, 449-450, 451-452, 453-454, 455-456, 457-458, 459-460, 461-462, 463-464, 465-466, 467-468, 469-470, 471-472, 473-474, 475-476, 477-478, 479-480, 481-482, 483-484, 485-486, 487-488, 489-490, 491-492, 493-494, 495-496, 497-498, 499-500, 501-502, 503-504, 505-506, 507-508, 509-510, 511-512, 513-514, 515-516, 517-518, 519-520, 521-522, 523-524, 525-526, 527-528, 529-530, 531-532, 533-534, 535-536, 537-538, 539-540, 541-542, 543-544, 545-546, 547-548, 549-550, 551-552, 553-554, 555-556, 557-558, 559-560, 561-562, 563-564, 565-566, 567-568, 569-570, 571-572, 573-574, 575-576, 577-578, 579-580, 581-582, 583-584, 585-586, 587-588, 589-590, 591-592, 593-594, 595-596, 597-598, 599-600, 601-602, 603-604, 605-606, 607-608, 609-610, 611-612, 613-614, 615-616, 617-618, 619-620, 621-622, 623-624, 625-626, 627-628, 629-630, 631-632, 633-634, 635-636, 637-638, 639-640, 641-642, 643-644, 645-646, 647-648, 649-650, 651-652, 653-654, 655-656, 657-658, 659-660, 661-662, 663-664, 665-666, 667-668, 669-670, 671-672, 673-674, or 675-676, wherein the first antibody or antigen-binding fragment thereof is different from the second antibody or antigen-binding fragment thereof.

[0034] In some embodiments, the two or more of the antibody or antigen-binding fragment thereof comprise: a first antibody or antigen-binding fragment thereof comprising a HCVR/LCVR amino acid sequence pair with at least 75% identity to the amino acid sequence of SEQ ID NOs: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22, 23-24, 25-26, 27-28, 29-30, 31-32, 33-34, 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 47-48, 49-50, 51-52, 53-54, 55-56, 57-58, 59-60, 61-62, 63-64, 65-66, 67-68, 69-70, 71-72, 73-74, 75-76, 77-78, 79-80, 81-82, 83-84, 85-86,

87-88, 89-90, 91-92, 93-94, 95-96, 97-98, 99-100, 101-102, 103-104, 105-106, 107-108, 109-110, 111-112, 113-114, 115-116, 117-118, 119-120, 121-122, 123-124, 125-126, 127-128, 129-130, 131-132, 133-134, 135-136, 137-138, 139-140, 141-142, 143-144, 145-146, 147-148, 149-150, 151-152, 153-154, 155-156, 157-158, 159-160, 161-162, 163-164, 165-166, 167-168, 169-170, 171-172, 173-174, 175-176, 177-178, 179-180, 181-182, 183-184, 185-186, 187-188, 189-190, 191-192, 193-194, 195-196, 197-198, 199-200, 201-202, 203-204, 205-206, 207-208, 209-210, 211-212, 213-214, 215-216, 217-218, 219-220, 221-222, 223-224, 225-226, 227-228, 229-230, 231-232, 233-234, 235-236, 237-238, 239-240, 241-242, 243-244, 245-246, 247-248, 249-250, 251-252, 253-254, 255-256, 257-258, 259-260, 261-262, 263-264, 265-266, 267-268, 269-270, 271-272, 273-274, 275-276, 277-278, 279-280, 281-282, 283-284, 285-286, 287-288, 289-290, 291-292, 293-294, 295-296, 297-298, 299-300, 301-302, 303-304, 305-306, 307-308, 309-310, 311-312, 313-314, 315-316, 317-318, 319-320, 321-322, 323-324, 325-326, 327-328, 329-330, 331-332, 333-334, 335-336, 337-338, 339-340, 341-342, 343-344, 345-346, 347-348, 349-350, 351-352, 353-354, 355-356, 357-358, 359-360, 361-362, 363-364, 365-366, 367-368, 369-370, 371-372, 373-374, 375-376, 377-378, 379-380, 381-382, 383-384, 385-386, 387-388, 389-390, 391-392, 393-394, 395-396, 397-398, 399-400, 401-402, 403-404, 405-406, 407-408, 409-410, 411-412, 413-414, 415-416, 417-418, 419-420, 421-422, 423-424, 425-426, 427-428, 429-430, 431-432, 433-434, 435-436, 437-438, 439-440, 441-442, 443-444, 445-446, 447-448, 449-450, 451-452, 453-454, 455-456, 457-458, 459-460, 461-462, 463-464, 465-466, 467-468, 469-470, 471-472, 473-474, 475-476, 477-478, 479-480, 481-482, 483-484, 485-486, 487-488, 489-490, 491-492, 493-494, 495-496, 497-498, 499-500, 501-502, 503-504, 505-506, 507-508, 509-510, 511-512, 513-514, 515-516, 517-518, 519-520, 521-522, 523-524, 525-526, 527-528, 529-530, 531-532, 533-534, 535-536, 537-538, 539-540, 541-542, 543-544, 545-546, 547-548, 549-550, 551-552, 553-554, 555-556, 557-558, 559-560, 561-562, 563-564, 565-566, 567-568, 569-570, 571-572, 573-574, 575-576, 577-578, 579-580, 581-582, 583-584, 585-586, 587-588, 589-590, 591-592, 593-594, 595-596, 597-598, 599-600, 601-602, 603-604, 605-606, 607-608, 609-610, 611-612, 613-614, 615-616, 617-618, 619-620, 621-622, 623-624, 625-626, 627-628, 629-630, 631-632, 633-634, 635-636, 637-638, 639-640, 641-642, 643-644, 645-646, 647-648, 649-650, 651-652, 653-654, 655-656, 657-658, 659-660, 661-662, 663-664, 665-666, 667-668, 669-670, 671-672, 673-674, or 675-676; and a second antibody or antigen-binding fragment thereof comprising a HCVR/LCVR amino acid sequence pair with at least 75% identity to the amino acid

sequence of SEQ ID NOs: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22, 23-24, 25-26, 27-28, 29-30, 31-32, 33-34, 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 47-48, 49-50, 51-52, 53-54, 55-56, 57-58, 59-60, 61-62, 63-64, 65-66, 67-68, 69-70, 71-72, 73-74, 75-76, 77-78, 79-80, 81-82, 83-84, 85-86, 87-88, 89-90, 91-92, 93-94, 95-96, 97-98, 99-100, 101-102, 103-104, 105-106, 107-108, 109-110, 111-112, 113-114, 115-116, 117-118, 119-120, 121-122, 123-124, 125-126, 127-128, 129-130, 131-132, 133-134, 135-136, 137-138, 139-140, 141-142, 143-144, 145-146, 147-148, 149-150, 151-152, 153-154, 155-156, 157-158, 159-160, 161-162, 163-164, 165-166, 167-168, 169-170, 171-172, 173-174, 175-176, 177-178, 179-180, 181-182, 183-184, 185-186, 187-188, 189-190, 191-192, 193-194, 195-196, 197-198, 199-200, 201-202, 203-204, 205-206, 207-208, 209-210, 211-212, 213-214, 215-216, 217-218, 219-220, 221-222, 223-224, 225-226, 227-228, 229-230, 231-232, 233-234, 235-236, 237-238, 239-240, 241-242, 243-244, 245-246, 247-248, 249-250, 251-252, 253-254, 255-256, 257-258, 259-260, 261-262, 263-264, 265-266, 267-268, 269-270, 271-272, 273-274, 275-276, 277-278, 279-280, 281-282, 283-284, 285-286, 287-288, 289-290, 291-292, 293-294, 295-296, 297-298, 299-300, 301-302, 303-304, 305-306, 307-308, 309-310, 311-312, 313-314, 315-316, 317-318, 319-320, 321-322, 323-324, 325-326, 327-328, 329-330, 331-332, 333-334, 335-336, 337-338, 339-340, 341-342, 343-344, 345-346, 347-348, 349-350, 351-352, 353-354, 355-356, 357-358, 359-360, 361-362, 363-364, 365-366, 367-368, 369-370, 371-372, 373-374, 375-376, 377-378, 379-380, 381-382, 383-384, 385-386, 387-388, 389-390, 391-392, 393-394, 395-396, 397-398, 399-400, 401-402, 403-404, 405-406, 407-408, 409-410, 411-412, 413-414, 415-416, 417-418, 419-420, 421-422, 423-424, 425-426, 427-428, 429-430, 431-432, 433-434, 435-436, 437-438, 439-440, 441-442, 443-444, 445-446, 447-448, 449-450, 451-452, 453-454, 455-456, 457-458, 459-460, 461-462, 463-464, 465-466, 467-468, 469-470, 471-472, 473-474, 475-476, 477-478, 479-480, 481-482, 483-484, 485-486, 487-488, 489-490, 491-492, 493-494, 495-496, 497-498, 499-500, 501-502, 503-504, 505-506, 507-508, 509-510, 511-512, 513-514, 515-516, 517-518, 519-520, 521-522, 523-524, 525-526, 527-528, 529-530, 531-532, 533-534, 535-536, 537-538, 539-540, 541-542, 543-544, 545-546, 547-548, 549-550, 551-552, 553-554, 555-556, 557-558, 559-560, 561-562, 563-564, 565-566, 567-568, 569-570, 571-572, 573-574, 575-576, 577-578, 579-580, 581-582, 583-584, 585-586, 587-588, 589-590, 591-592, 593-594, 595-596, 597-598, 599-600, 601-602, 603-604, 605-606, 607-608, 609-610, 611-612, 613-614, 615-616, 617-618, 619-620, 621-622, 623-624, 625-626, 627-628, 629-630, 631-632, 633-634, 635-636, 637-638, 639-640, 641-642, 643-644,

645-646, 647-648, 649-650, 651-652, 653-654, 655-656, 657-658, 659-660, 661-662, 663-664, 665-666, 667-668, 669-670, 671-672, 673-674, or 675-676, wherein the first antibody or antigen-binding fragment thereof is different from the second antibody or antigen-binding fragment thereof.

[0035] In some embodiments, the present disclosure provides a pharmaceutical composition comprising two or more antibodies or antigen-binding fragments thereof, wherein the two or more antibodies or antigen-binding fragments thereof are selected from: (a) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1354, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1355, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1356, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1357, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1358, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1359; (b) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1360, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1361, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1362, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1363, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1364, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1365; (c) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1366, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1367, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1368, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1369, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1370, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1371; (d) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1372, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1373, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1374, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1375, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1376, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1377; and (e) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1378, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1379, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1380, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1381, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1382, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1383.

[0036] In some embodiments, the two or more monoclonal antibodies or antigen-binding fragments thereof are selected from: (a) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 25, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 26; (b) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 395, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 396; (c) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 397, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 398; (d) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 191, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 192; and (e) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 219, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 220.

[0037] In some embodiments, the pharmaceutical composition further comprises a pharmaceutically acceptable carrier.

[0038] In some embodiments, the present disclosure provides a pharmaceutical composition for use in treating a SARS-CoV-2 infection in a subject.

[0039] In some embodiments, the present disclosure provides a method of treating a SARS-CoV-2 infection in a subject, comprising administering to the subject therapeutically effective amount of an antibody or antigen-binding fragment thereof or a pharmaceutical composition thereof. In some embodiments, the present disclosure provides a method of neutralizing SARS-CoV-2 in a subject, comprising administering to a subject in need thereof a therapeutically effective amount of an antibody or antigen-binding fragment thereof or a pharmaceutical composition thereof. In some embodiments, the present disclosure provides a method of preventing a SARS-CoV-2 infection in a subject, comprising administering to a subject in need thereof a therapeutically effective amount of an antibody or antigen-binding fragment thereof or pharmaceutical composition thereof.

[0040] In some embodiments, the subject is immunocompromised.

[0041] In some embodiments, the method further comprises administering a second therapeutic agent, preferably wherein the second therapeutic agent comprises an anti-inflammatory drug or an antiviral compound. In some embodiments, (a) the antiviral compound comprises: a nucleoside analog, a peptoid, an oligopeptide, a polypeptide, a protease inhibitor, a 3C-like protease inhibitor, a papain-like protease inhibitor, or an inhibitor of an RNA dependent RNA polymerase; or (b) the antiviral compound is selected from: acyclovir, ganciclovir, vidarabine, foscarnet, cidofovir, amantadine, ribavirin, trifluorothymidine, zidovudine, didanosine, zalcitabine, and an interferon, and preferably wherein the interferon is an interferon-α or an interferon-β. In some embodiments, the second therapeutic agent is administered before, after, or concurrently with the antibody or pharmaceutical composition thereof.

[0042] In some embodiments, the pharmaceutical composition is administered to the subject after the exposure to SARS-CoV-2.

[0043] In some embodiments, the present disclosure provides a kit for detecting a SARS-CoV-2 infection in a subject, comprising an antibody or antigen-binding fragment thereof described herein.

[0044] In some embodiments, the present disclosure provides a method of detecting the presence of a SARS-CoV-2 in a sample, comprising (1) contacting the sample with an antibody or antigen-binding fragment thereof described herein, and (2) detecting the presence of an antibody-antigen complex, wherein the presence of the antibody-antigen complex indicates the presence of SARS-CoV-2. In some embodiments, the antibody or antigen-binding fragment thereof is conjugated to a label, preferably wherein the label is selected from a fluorescent label, a chemiluminescent label, a radiolabel, and an enzyme. In some embodiments, the method further comprises contacting a secondary antibody with the antibody or antigen-binding fragment thereof, wherein the secondary antibody comprises a label. In some embodiments, the method further comprises detecting fluorescence or chemiluminescence of the label, preferably wherein the step of detecting comprises a competitive binding assay or ELISA. In some embodiments, the method further comprises binding the sample to a solid support, preferably wherein the solid support is selected from microparticles, microbeads, magnetic beads, and an affinity purification column. In some embodiments, the sample is a blood sample, a nasal swab, or a throat swab.

[0045] In some embodiments, the present disclosure provides a method of preparing an antibody, or antigen-binding fragment thereof, comprising: (a) obtaining a cultured host cell described herein; (b) culturing the cultured host cell in a medium under conditions permitting expression of a polypeptide encoded by the vector and assembling of an antibody or fragment thereof; and (c) purifying the antibody or fragment from the cultured cell or the medium of the cell.

[0046] In some embodiments, the present disclosure provides a kit comprising a pharmaceutically acceptable dose unit of an antibody or antigen-binding fragment thereof or pharmaceutical composition described herein.

[0047] In some embodiments, the present disclosure provides a kit for the diagnosis, prognosis or monitoring treatment of SARS-CoV-2 in a subject, comprising: an antibody or antigen-binding fragment thereof described herein; and a least one detection reagent that binds specifically to the antibody or antigen-binding fragment thereof described herein.

[0048] In some embodiments, the present disclosure provides a method of neutralizing SARS-CoV-2 in a subject, comprising administering to a subject in need thereof a therapeutically effective amount of two or more antibodies or antigen-binding fragments thereof described herein.

[0049] In some embodiments, the present disclosure provides a method of treating a SARS-CoV-2 in a subject in need thereof, comprising administering to a subject in need thereof a therapeutically effective amount of two or more antibodies or antigen-binding fragments thereof described herein.

[0050] In some embodiments, the present disclosure provides a method of preventing a SARS-CoV-2 in a subject in need thereof, comprising administering to a subject in need thereof a therapeutically effective amount of two or more antibodies or antigen-binding fragments thereof described herein.

[0051] In some embodiments, the two or more antibodies or antigen-binding fragments thereof are selected from: (a) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1354, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1355, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1356, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1357, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1358, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1359; (b) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1360, a HCDR2 comprising an amino acid

sequence of SEQ ID NO: 1361, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1362, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1363, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1364, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1365; (c) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1366, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1367, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1368, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1369, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1370, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1371; (d) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1372, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1373, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1374, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1375, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1376, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1377; and (e) an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1378, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1379, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1380, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1381, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1382, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1383.

[0052] In some embodiments, the two or more monoclonal antibodies or antigen- binding fragments thereof are selected from: (a) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 25, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 26; (b) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 395, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 396; (c) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 397, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 398; (d) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ

ID NO: 191, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 192; and (e) an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 219, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 220.

[0053] In some embodiments, the first antibody or antigen-binding fragment thereof and the second antibody or antigen-binding fragment thereof exhibit synergistic activity.

[0054] In some embodiments, the method further comprises administering to the subject a therapeutically effective amount of a second therapeutic agent or therapy. In some embodiments, the second therapeutic agent comprises an anti-inflammatory drug or an antiviral compound. In some embodiments, (a) the antiviral compound comprises: a nucleoside analog, a peptoid, an oligopeptide, a polypeptide, a protease inhibitor, a 3C-like protease inhibitor, a papain-like protease inhibitor, or an inhibitor of an RNA dependent RNA polymerase; or (b) the antiviral compound is selected from: acyclovir ganciclovir, vidarabine, foscarnet, cidofovir, amantadine, ribavirin, trifluorothymidine, zidovudine, didanosine, zalcitabine, and an interferon, and preferably wherein the interferon is an interferon-α or an interferon-β.

[0055] In some embodiments, the first antibody or antigen-binding fragment thereof is administered before, after, or concurrently with the second antibody or antigen-binding fragment thereof. In some embodiments, the antibody or antigen-binding fragment thereof is administered to the subject intravenously, subcutaneously, or intraperitoneally.

[0056] The foregoing summary is not intended to define every aspect of the disclosure, and additional aspects are described in other sections, such as the following detailed description. The entire document is intended to be related as a unified disclosure, and it should be understood that all combinations of features described herein are contemplated, even if the combination of features are not found together in the same sentence, or paragraph, or section of this document. Other features and advantages of the invention will become apparent from the following detailed description. It should be understood, however, that the detailed description and the specific examples, while indicating specific embodiments of the disclosure, are given by way of illustration only, because various changes and modifications within the spirit and scope of the disclosure will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0057] FIGs. 1a, 1b, and 1c show plasma ELISAs and neutralizing activity of the antibodies. FIG. 1a is a diagram showing blood donation schedules for vaccinated-only individuals 5 months after the 2nd dose (Vax2, top) (Cho et al., 2021), Delta breakthrough infection after Vax2 (Delta BT, 2nd from top), and vaccinated-only individuals 1 month after the 3rd dose (Vax3, 2nd from bottom)(Muecksch et al., 2022) and Omicron breakthrough infection after Vax3 (Omicron BT, bottom). FIG. 1b is a graph showing area under the curve (AUG) for plasma IgG antibody binding to wild-type SARS-CoV-2 (WT) RBD after Vax2 (Cho et al., 2021), Delta BT for n=24 samples, Vax3(Muecksch et al., 2022) and Omicron BA.1 BT for n=26 samples. FIG. 1c shows plasma neutralizing activity against indicated SARS-CoV-2 variants after Vax2 (Cho et al., 2021) for n=18 samples, Delta BT for n=24 samples, Vax3(Muecksch et al., 2022) for n=18 samples and Omicron BA.1 BT for n=26 samples. WT and Omicron BA.1 NT50 values are derived from two previous reports (Gaebler et al., 2022; Schmidt et al., 2022). See Example 1 for a list of all substitutions/deletions/insertions in the spike variants. All experiments were performed at least in duplicate. The bars and values in FIGs. 1a, 1b, and 1c represent geometric mean values. Statistical significance in FIG. 1b and 1c was determined by a two-tailed Kruskal-Wallis test with subsequent Dunn's multiple comparisons.

[0058] FIGs. 2a, 2b, 2c, 2d, and 2e show characterization of anti-SARS-CoV-2 RBD memory B cells after breakthrough infection. FIG. 2a shows representative flow cytometry plots indicating PE-WT-RBD and AlexaFluor-647-WT-RBD binding memory B cells from 4 individuals after Delta breakthrough infection following Vax2 (Delta BT), 2 individuals 1 month after Vax3, and 6 individuals after Omicron BA.1 breakthrough infection following Vax3 (Omicron BT). The number of WT RBD-specific B cells is indicated in FIG. 2b, 5 months after Vax2 (Cho et al., 2021), Delta BT (n=24), 1 month after Vax3 (Muecksch et al., 2022) and Omicron BT (n=29). c, Graphs showing the percentage of WT-, Delta-, and Omicron BA.1-RBD cross-binding B cells determined by flow cytometer in vaccinees (Vax3) and breakthrough individuals (Delta BT) or (Omicron BT) (See also in FIG. 5b). FIG. 2d depicts pie charts showing the distribution of IgG antibody sequences obtained from WT-specific memory B cells from: 2 individuals assayed sequentially 1 month after the 3rd mRNA dose (Vax3) an Omicron infection (left); 4 individuals after Delta breakthrough (Delta), and 4 individuals after Omicron breakthrough (Omicron). The number inside the circle indicates the number of sequences analyzed for the individual denoted

above the circle. Pie slice size is proportional to the number of clonally related sequences. The black outline and associated numbers indicate the percentage of clonal sequences detected at each time point. Patterned slices indicate persisting clones (same IGHV and IGLV genes, with highly similar CDR3s) found at more than one timepoint within the same individual. Grey slices indicate clones unique to the timepoint. White slices indicate sequences isolated only once per time point. FIG. 2e shows number of nucleotide somatic hypermutations (SHM) in IGHV + IGLV in WT-RBD-specific sequences after Delta or Omicron breakthrough infection, compared to 5 months after Vax2, and 1 month after Vax3. The bars and numbers in FIG. 2b and FIG. 2c represent geometric mean, and in FIG. 2e, represent median values. FIG. 2e shows the results of statistical analysis in FIG. 2b and FIG. 2c that were determined by a two-tailed Kruskal-Wallis test with subsequent Dunn's multiple-comparisons test and in FIG. 2e by two-tailed Mann-Whitney test.

[0059] FIGs. 3a, 3b, 3c, 3d, 3e, and 3f show characterization of anti-SARS-CoV-2 RBD monoclonal antibodies. FIG. 3a are graphs showing half-maximal effective concentration (EC50) of n=342 monoclonal antibodies measured by ELISA against WT-RBD, Delta-RBD, and Omicron BA.1-spike protein. Antibodies were obtained memory B cells after Delta breakthrough (Delta BT), after mRNA Vax3, and Omicron breakthrough (Omicron BT). FIG. 3b is a graph showing anti-SARS-CoV-2 neutralizing activity of monoclonal antibodies measured by a SARS-CoV-2 pseudotype virus neutralization assay using WT SARS-CoV-2 pseudovirus. IC50 values for all antibodies, including the 288 reported and tested herein, and 350 previously reported (Cho et al., 2021; Muecksch et al., 2022). FIGs. 3c-d are graphs showing IC50s of monoclonal antibodies against WT, Delta-RBD, and Omicron BA.1 SARS-CoV-2 pseudoviruses. Each dot represents one antibody, where 333 total antibodies were tested, including the 288 reported herein, and 45 5m-Vax2 antibodies previously reported (Cho et al., 2021; Muecksch et al., 2022). Values represent geometric mean values. In addition, 105 antibodies distributed over all four cohorts were also tested against Omicron BA.4/5 pseudovirus. FIG. 3e shows ring plots depicting fraction of neutralizing (IC50<1000ng/ml) antibodies against WT, Delta-RBD, and Omicron BA.1 SARS-CoV-2 pseudoviruses, and non-neutralizing (IC50>1000 ng/ml) antibodies from each time point. FIG. 3f shows ring plots depicting fraction of mAbs that are neutralizing (IC50 1-1000 ng/mL, white), or non-neutralizing (IC50>1000 ng/mL, black) against Omicron BA.4/5. Number in inner circles indicates number of antibodies tested. The deletions/substitutions corresponding to viral variants used in Figs. 3c-f were incorporated into a spike protein that also includes the R683G

substitution, which disrupts the furin cleavage site and increases particle infectivity. Neutralizing activity against mutant pseudoviruses was compared to a wild-type (WT) SARS-CoV-2 spike sequence (NC_045512), carrying R683G where appropriate. The bars and values in FIGs. 3a, 3b, and 3d represent geometric mean values. Statistical significance in FIGs. 3a and 3b was determined by a two-tailed Kruskal-Wallis test with subsequent Dunn's multiple comparisons, in FIG. 3c was determined by a two-tailed Wilcoxon test and in FIG. 3d was determined by a two-tailed Mann-Whitney test.

[0060] FIGs. 4a, 4b, and 4c show the results of plasma ELISA. FIGs. 4a-b are graphs showing area under the curve (AUC) for plasma IgG binding to FIG. 4a, SARS-CoV-2 Delta-RBD and FIG. 4b, Omicron-Spike for vaccinated individuals after Vax2(Cho et al., 2021), Delta breakthrough (Delta BT, n=24), and vaccinated individuals after Vax3 (Muecksch et al., 2022) and Omicron breakthrough infection after Vax3 (Omicron BT, n=26). All experiments were performed at least in duplicate and repeated twice. Bars and values represent geometric mean values. Statistical significance in FIG. 4a and FIG. 4b was determined by a two-tailed Kruskal-Wallis test with subsequent Dunn's multiple comparisons.

[0061] FIGs. 5a, 5b, 5c, 5d, 5e, and 5f show the results of flow cytometry. FIGs. 5a-b show gating strategy for phenotyping. Gating was on lymphocytes singlets that were $CD20^+$ and CD3-CD8-CD16-Ova-. Anti-IgG, IgM, and IgA antibodies were used for B cell phenotype analysis. Antigen-specific cells were detected based on binding to WT RBD-PE^+ and RBD-$AF647^+$, or to Delta -RBD and Omicron BA.1-RBD. FIGs. 5c-e are graphs showing the frequency of IgM, IgG, and IgA isotype expression in FIG. 5c, WT RBD+ MBCs, FIG. 5d, WT+Delta+ RBD binding MBCs, FIG. 5e, WT+Omicron BA.1+ RBD binding MBCs cells. FIG. 5f shows gating strategy for single-cell sorting for CD20+ B cells for WT RBD-PE and RBD-AF647. Statistical significance in FIG. 5c was determined by a two-tailed Kruskal-Wallis test with subsequent Dunn's multiple comparisons.

[0062] FIGs. 6a, 6b, 6c, 6d, 6e, 6f, 6g show frequency distribution of human V genes and antibody gene somatic hypermutations analysis. FIGs. 6a-c shows comparison of the frequency distribution of human V genes for heavy chain and light chains of anti-RBD antibodies from this study and from a database of shared clonotypes of human B cell receptor generated by Cinque Soto et al. (Soto et al., 2019). The graphs show relative abundance of human IGHV (left panel), IGKV (middle panel) and IGLV (right panel) genes in Sequence Read Archive accession

SRP010970 (bottom), antibodies obtained from Delta breakthrough infection (top), and Vax2 (middle). FIGs. 6d-f, same as FIG. 6a. FIGs. 6-c are graphs showing relative abundance of human IGHV (left panel), IGKV (middle panel), and IGLV (right panel) genes in Sequence Read Archive accession SRP010970 (bottom), antibodies obtained from Omicron BA.1 breakthrough infection (top), and Vax3 (middle). Statistical significance was determined by the two-sided binomial test. * = $p \leq 0.05$, ** = $p \leq 0.01$, *** = $p \leq 0.001$, **** = $p \leq 0.0001$. FIG. 6g shows number of nucleotide somatic hypermutations (SHM) in IGHV and IGLV in WT-RBD-specific sequences, separately after Delta or Omicron breakthrough infection, to Vax2 (Cho et al., 2021), and Vax3 (Muecksch et al., 2022). The bars and numbers in FIG. 6g represent the median value.

[0063] FIGs. 7a and 7b show mAb affinity and epitopes of the antibodies. FIG. 7a is a graph showing affinity measurements (KDs) for WT RBD measured by BLI for antibodies cloned from vaccinated individuals after Delta or Omicron breakthrough infection, compared to Vax2 (Cho et al., 2021), and Vax3(Muecksch et al., 2022). FIG. 7b shows the results of epitope mapping performed by competition BLI, comparing mAbs cloned from vaccinated individuals after Delta (n=48) or Omicron BA.1 (n=49) breakthrough infection, compared to Vax2 (Cho et al., 2021), and Vax3(Muecksch et al., 2022). Pie charts show the distribution of the antibody classes among all RBD-binding antibodies (upper panel), WT neutralizing antibodies only (middle panel) or non-neutralizing antibodies only (lower panel). Bars represent geometric mean values. Statistical significance was determined by using FIG. 7a, by a two-tailed Kruskal Wallis test with subsequent Dunn's multiple comparisons; FIG. 7b, by a two-tailed Chi-square test.

[0064] FIG. 8 shows neutralizing breadth of the antibodies. Ring plots show fraction of mAbs in FIGs. 3c-e that are neutralizing (IC50 1-1000 ng/mL, white), or non-neutralizing (IC50>1000 ng/mL, black) for mutant or variant SARS-CoV-2 pseudovirus indicated across the top at the time point indicated to the left. The number inside the circle indicates the number of antibodies tested. The deletions/substitutions corresponding to viral variants were incorporated into a spike protein that also includes the R683G substitution, which disrupts the furin cleavage site and increases particle infectivity. Neutralizing activity against mutant pseudoviruses was compared to a wild-type (WT) SARS-CoV-2 spike sequence (NC_045512), carrying R683G where appropriate. All experiments were performed at least in duplicate and repeated twice. Statistical significance was determined by using a two-sided Fisher's exact test.

DETAILED DESCRIPTION OF THE INVENTION

[0065] SARS-CoV-2 represents a serious public health concern. Methods to diagnose and treat persons who are infected with SARS-CoV-2 provide the opportunity to either prevent or control further spread of infection by SARS-CoV-2. These methods are especially important due to the ability of SARS-CoV-2 to infect persons through an airborne route. This invention is based, at least in part, on unexpected neutralizing activities of the disclosed anti-SARS-CoV-2 antibodies or antigen-binding fragments thereof. These antibodies and antigen-binding fragments constitute a novel therapeutic strategy in protection from SARS-CoV-2 infections.

1.1. Definitions

[0066] To aid in understanding the detailed description of the compositions and methods according to the disclosure, a few express definitions are provided to facilitate an unambiguous disclosure of the various aspects of the disclosure. Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs.

[0067] The terms "a", "an", and "the", as used herein, include plural references unless the context clearly dictates otherwise.

[0068] The term "about", as used herein, in reference to a number or range of numbers, is understood to mean the stated number and numbers +/- 10% thereof, or 10% below the lower listed limit and 10% above the higher listed limit for the values listed for a range.

[0069] The term "between", as used in a phrase as such "between A and B" or "between A-B" refers to a range including both A and B.

[0070] The terms "or" and "and/or", as used herein, include any, and all, combinations of one or more of the associated listed items.

[0071] The terms "including", "includes", "included", and other forms, as used herein, are not limiting.

[0072] The terms "comprise" and its grammatical equivalents, as used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0073] A "neutralizing antibody" is one that can neutralize the ability of that pathogen to initiate and/or perpetuate an infection in a host and/or in target cells *in vitro*. "Broadly neutralizing anti-

SARS-CoV-2 antibodies" refer to antibodies that neutralize more than one SARS-CoV-2 virus strains/variants in a neutralization assay. A broad neutralizing anti-SARS-CoV-2 antibody may neutralize at least 2, 3, 4, 5, 6, 7, 8, 9 or more different strains/variants of SARS-CoV-2.

[0074] The term "antibody" as referred to herein includes whole antibodies and any antigen-binding fragment or single chains thereof. Whole antibodies are glycoproteins comprising at least two heavy (H) chains and two light (L) chains inter-connected by disulfide bonds. Each heavy chain is comprised of a heavy chain variable region (abbreviated herein as VH) and a heavy chain constant region. The heavy chain constant region is comprised of three domains, CH1, CH2, and CH3. Each light chain is comprised of a light chain variable region (abbreviated herein as VL) and a light chain constant region. The light chain constant region is comprised of one domain, CL. The VH and VL regions can be further subdivided into regions of hypervariability, termed complementarity determining regions (CDR), interspersed with regions that are more conserved, termed framework regions (FR). Each VH and VL is composed of three CDRs and four FRs, arranged from amino-terminus to carboxy-terminus in the following order: FR1, CDR1, FR2, CDR2, FR3, CDR3, FR4. The heavy chain variable region CDRs and FRs are HFR1, HCDR1, HFR2, HCDR2, HFR3, HCDR3, HFR4. The light chain variable region CDRs and FRs are LFR1, LCDR1, LFR2, LCDR2, LFR3, LCDR3, LFR4. The variable regions of the heavy and light chains contain a binding domain that interacts with an antigen. The constant regions of the antibodies can mediate the binding of the immunoglobulin to host tissues or factors, including various cells of the immune system (e.g., effector cells) and the first component (CIq) of the classical complement system.

[0075] The term "antigen-binding fragment or portion" of an antibody (or simply "antibody fragment or portion"), as used herein, refers to one or more fragments of an antibody that retain the ability to specifically bind to an antigen (e.g., a spike or S protein of SARS-CoV-2 virus). It has been shown that the antigen-binding function of an antibody can be performed by fragments of a full-length antibody. Examples of binding fragments encompassed within the term "antigen-binding fragment or portion" of an antibody include (i) a Fab fragment, a monovalent fragment consisting of the VL, VH, CL, and CHI domains; (ii) a F(ab')2 fragment, a bivalent fragment comprising two Fab fragments linked by a disulfide bridge at the hinge region; (iii) a Fab' fragment, which is essentially a Fab with part of the hinge region (see, FUNDAMENTAL IMMUNOLOGY (Paul ed., 3rd ed. 1993)); (iv) a Fd fragment consisting of the VH and CHI domains; (v) a Fv

fragment consisting of the VL and VH domains of a single arm of an antibody, (vi) a dAb fragment (Ward et al., (1989) Nature 341:544-546), which consists of a VH domain; (vii) an isolated CDR; and (viii) a nanobody, a heavy chain variable region containing a single variable domain and two constant domains. Furthermore, although the two domains of the Fv fragment, VL and VH, are coded for by separate genes, they can be joined, using recombinant methods, by a synthetic linker that enables them to be made as a single protein chain in which the VL and VH regions pair to form monovalent molecules (known as single chain Fv or scFv); see, e.g., Bird et al. (1988) Science 242:423-426; and Huston et al. (1988) Proc. Natl. Acad. Sci. USA 85:5879-5883). Such single chain antibodies are also intended to be encompassed within the term "antigen-binding fragment or portion" of an antibody. These antibody fragments are obtained using conventional techniques known to those with skill in the art, and the fragments are screened for utility in the same manner as are intact antibodies.

[0076] The term "antigen" refers to a molecule or a portion of a molecule capable of being bound by an antibody or an antigen-binding fragment thereof and additionally capable of being used in an animal to produce antibodies capable of binding to an epitope of that antigen. An antigen may be a polypeptide, carbohydrate, nucleic acid, lipid, hapten, or other naturally occurring or synthetic compound.

[0077] An "isolated antibody," as used herein, is intended to refer to an antibody that is substantially free of other antibodies having different antigenic specificities (e.g., an isolated antibody that specifically binds to a spike or S protein of SARS-CoV-2 virus is substantially free of antibodies that specifically bind antigens other than the neuraminidase). An isolated antibody can be substantially free of other cellular material and/or chemicals.

[0078] The terms "monoclonal antibody" or "monoclonal antibody composition" as used herein refer to a preparation of antibody molecules of single molecular composition. A monoclonal antibody composition displays a single binding specificity and affinity for a particular epitope.

[0079] The term "human antibody" is intended to include antibodies having variable regions in which both the framework and CDR regions are derived from human germline immunoglobulin sequences. Furthermore, if the antibody contains a constant region, the constant region also is derived from human germline immunoglobulin sequences. The human antibodies of the invention can include amino acid residues not encoded by human germline immunoglobulin sequences (e.g., mutations introduced by random or site-specific mutagenesis *in vitro* or by somatic mutation *in*

vivo). However, the term "human antibody," as used herein, is not intended to include antibodies in which CDR sequences derived from the germline of another mammalian species, such as a mouse, have been grafted onto human framework sequences.

[0080] The term "human monoclonal antibody" refers to antibodies displaying a single binding specificity, which have variable regions in which both the framework and CDR regions are derived from human germline immunoglobulin sequences. In one embodiment, the human monoclonal antibodies can be produced by a hybridoma that includes a B cell obtained from a transgenic nonhuman animal, e.g., a transgenic mouse, having a genome comprising a human heavy chain transgene and a light chain transgene fused to an immortalized cell.

[0081] The term "recombinant human antibody," as used herein, includes all human antibodies that are prepared, expressed, created, or isolated by recombinant means, such as (a) antibodies isolated from an animal (e.g., a mouse) that is transgenic or transchromosomal for human immunoglobulin genes or a hybridoma prepared therefrom (described further below), (b) antibodies isolated from a host cell transformed to express the human antibody, e.g., from a transfectoma, (c) antibodies isolated from a recombinant, combinatorial human antibody library, and (d) antibodies prepared, expressed, created or isolated by any other means that involve splicing of human immunoglobulin gene sequences to other DNA sequences. Such recombinant human antibodies have variable regions in which the framework and CDR regions are derived from human germline immunoglobulin sequences. In some embodiments, however, such recombinant human antibodies can be subjected to *in vitro* mutagenesis (or, when an animal transgenic for human Ig sequences is used, *in vivo* somatic mutagenesis) and thus the amino acid sequences of the VH and VL regions of the recombinant antibodies are sequences that, while derived from and related to human germline VH and VL sequences, may not naturally exist within the human antibody germline repertoire *in vivo*.

[0082] The term "isotype" refers to the antibody class (e.g., IgM or IgG1) that is encoded by the heavy chain constant region genes. The phrases "an antibody recognizing an antigen" and "an antibody specific for an antigen" are used interchangeably herein with the term "an antibody which binds specifically to an antigen."

[0083] The term "human antibody derivatives" refers to any modified form of the human antibody, e.g., a conjugate of the antibody and another agent or antibody. The term "humanized antibody" is intended to refer to antibodies in which CDR sequences derived from the germline of

another mammalian species, such as a mouse, have been grafted onto human framework sequences. Additional framework region modifications can be made within the human framework sequences.

[0084] The term "chimeric antibody" is intended to refer to antibodies in which the variable region sequences are derived from one species, and the constant region sequences are derived from another species, such as an antibody in which the variable region sequences are derived from a mouse antibody, and the constant region sequences are derived from a human antibody. The term can also refer to an antibody in which its variable region sequence or CDR(s) is derived from one source (e.g., an IgA1 antibody), and the constant region sequence or Fc is derived from a different source (e.g., a different antibody, such as an IgG, IgA2, IgD, IgE or IgM antibody).

[0085] The term "effective amount" or "therapeutically effective amount", as used herein, refers to an amount of a therapeutic (e.g., a pharmaceutical composition provided herein) which is sufficient to treat, diagnose, prevent, delay the onset of, reduce and/or ameliorate the severity and/or duration of a given condition, disorder or disease and/or a symptom related thereto. The term also encompasses an amount necessary for the reduction, slowing, or amelioration of the advancement or progression of a given disease, reduction, slowing, or amelioration of the recurrence, development or onset of a given disease, and/or to improve or enhance the prophylactic or therapeutic effect (s) of another therapy or to serve as a bridge to another therapy.

[0086] The invention encompasses isolated or substantially purified nucleic acids, peptides, polypeptides, or proteins. In the context of the present invention, an "isolated" nucleic acid, DNA or RNA molecule or an "isolated" polypeptide is a nucleic acid, DNA molecule, RNA molecule, or polypeptide that exists apart from its native environment and is therefore not a product of nature. An isolated nucleic acid, DNA molecule, RNA molecule, or polypeptide may exist in a purified form or may exist in a non-native environment such as, for example, a transgenic host cell. A "purified" nucleic acid molecule, peptide, polypeptide, or protein, or a fragment thereof, is substantially free of other cellular material, or culture medium when produced by recombinant techniques, or substantially free of chemical precursors or other chemicals when chemically synthesized. In one embodiment, an "isolated" nucleic acid is free of sequences that naturally flank the nucleic acid (i.e., sequences located at the 5' and 3' ends of the nucleic acid) in the genomic DNA of the organism from which the nucleic acid is derived. For example, in various embodiments, the isolated nucleic acid molecule can contain less than about 5 kb, 4 kb, 3 kb, 2 kb, 1 kb, 0.5 kb, or 0.1 kb of nucleotide sequences that naturally flank the nucleic acid molecule in

genomic DNA of the cell from which the nucleic acid is derived. A protein, peptide, or polypeptide that is substantially free of cellular material includes preparations of protein, peptide, or polypeptide having less than about 30%, 20%, 10%, or 5% (by dry weight) of contaminating protein. When the protein of the invention, or biologically active portion thereof, is recombinantly produced, preferably culture medium represents less than about 30%, 20%, 10%, or 5% (by dry weight) of chemical precursors or non-protein-of-interest chemicals.

[0087] The terms "polypeptide," "peptide," and "protein" are used interchangeably herein to refer to polymers of amino acids of any length. The polymer may be linear or branched, it may comprise modified amino acids, and it may be interrupted by non-amino acids. The terms also encompass an amino acid polymer that has been modified; for example, disulfide bond formation, glycosylation, lipidation, acetylation, phosphorylation, pegylation, or any other manipulation, such as conjugation with a labeling component. As used herein, the term "amino acid" includes natural and/or unnatural or synthetic amino acids, including glycine and both the D or L optical isomers, and amino acid analogs and peptidomimetics.

[0088] A peptide or polypeptide "fragment" as used herein refers to a less than full-length peptide, polypeptide, or protein. For example, a peptide or polypeptide fragment can have at least about 3, at least about 4, at least about 5, at least about 10, at least about 20, at least about 30, at least about 40 amino acids in length, or single unit lengths thereof. For example, fragment may be 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, or more amino acids in length. There is no upper limit to the size of a peptide fragment. However, in some embodiments, peptide fragments can be less than about 500 amino acids, less than about 400 amino acids, less than about 300 amino acids, or less than about 250 amino acids in length. Preferably the peptide fragment can elicit an immune response when used to inoculate an animal. A peptide fragment may be used to elicit an immune response by inoculating an animal with a peptide fragment in combination with an adjuvant, a peptide fragment that is coupled to an adjuvant, or a peptide fragment that is coupled to arsanilic acid, sulfanilic acid, an acetyl group, or a picryl group. A peptide fragment can include a non-amide bond and can be a peptidomimetic.

[0089] As used herein, the term "conjugate" or "conjugation" or "linked" as used herein refers to the attachment of two or more entities to form one entity. A conjugate encompasses both peptide-small molecule conjugates as well as peptide-protein/peptide conjugates.

[0090] The term "recombinant," as used herein, refers to antibodies or antigen-binding fragments thereof of the invention created, expressed, isolated, or obtained by technologies or methods known in the art as recombinant DNA technology, which include, e.g., DNA splicing and transgenic expression. The term refers to antibodies expressed in a non-human mammal (including transgenic non-human mammals, e.g., transgenic mice), or a cell (e.g., CHO cells) expression system or isolated from a recombinant combinatorial human antibody library.

[0091] A "nucleic acid" or "polynucleotide" refers to a DNA molecule (for example, but not limited to, a cDNA or genomic DNA) or an RNA molecule (for example, but not limited to, an mRNA), and includes DNA or RNA analogs. A DNA or RNA analog can be synthesized from nucleotide analogs. The DNA or RNA molecules may include portions that are not naturally occurring, such as modified bases, modified backbone, deoxyribonucleotides in an RNA, etc. The nucleic acid molecule can be single-stranded or double-stranded.

[0092] The term "substantial identity" or "substantially identical," when referring to a nucleic acid or fragment thereof, indicates that, when optimally aligned with appropriate nucleotide insertions or deletions with another nucleic acid (or its complementary strand), there is nucleotide sequence identity in at least about 90%, and more preferably at least about 95%, 96%, 97%, 98% or 99% of the nucleotide bases, as measured by any well-known algorithm of sequence identity, such as FASTA, BLAST or GAP, as discussed below. A nucleic acid molecule having substantial identity to a reference nucleic acid molecule may, in certain instances, encode a polypeptide having the same or substantially similar amino acid sequence as the polypeptide encoded by the reference nucleic acid molecule.

[0093] As applied to polypeptides, the term "substantial similarity" or "substantially similar" means that two peptide sequences, when optimally aligned, such as by the programs GAP or BESTFIT using default gap weights, share at least 90% sequence identity, even more preferably at least 95%, 98% or 99% sequence identity. Preferably, residue positions, which are not identical, differ by conservative amino acid substitutions. A "conservative amino acid substitution" is one in which an amino acid residue is substituted by another amino acid residue having a side chain (R group) with similar chemical properties (e.g., charge or hydrophobicity). In general, a conservative amino acid substitution will not substantially change the functional properties of a protein. In cases where two or more amino acid sequences differ from each other by conservative substitutions, the percent or degree of similarity may be adjusted upwards to correct for the

conservative nature of the substitution. Means for making this adjustment are well known to those of skill in the art. See, e.g., Pearson (1994) Methods Mol. Biol. 24: 307-331, which is herein incorporated by reference. Examples of groups of amino acids that have side chains with similar chemical properties include 1) aliphatic side chains: glycine, alanine, valine, leucine, and isoleucine; 2) aliphatic- hydroxyl side chains: serine and threonine; 3) amide-containing side chains: asparagine and glutamine; 4) aromatic side chains: phenylalanine, tyrosine, and tryptophan; 5) basic side chains: lysine, arginine, and histidine; 6) acidic side chains: aspartate and glutamate, and 7) sulfur-containing side chains: cysteine and methionine. Preferred conservative amino acids substitution groups are: valine-leucine-isoleucine, phenylalanine-tyrosine, lysine-arginine, alanine-valine, glutamate-aspartate, and asparagine-glutamine. Alternatively, a conservative replacement is any change having a positive value in the PAM250 log-likelihood matrix disclosed in Gonnet et al. (1992) Science 256: 1443 45, herein incorporated by reference. A "moderately conservative" replacement is any change having a nonnegative value in the PAM250 log-likelihood matrix.

[0094] Sequence similarity for polypeptides is typically measured using sequence analysis software. Protein analysis software matches similar sequences using measures of similarity assigned to various substitutions, deletions, and other modifications, including conservative amino acid substitutions. For instance, GCG software contains programs such as GAP and BESTFIT, which can be used with default parameters to determine sequence homology or sequence identity between closely related polypeptides, such as homologous polypeptides from different species of organisms or between a wild-type protein and a mutein thereof. See, e.g., GCG Version 6.1. Polypeptide sequences also can be compared using FASTA with default or recommended parameters; a program in GCG Version 6.1. FASTA (e.g., FASTA2 and FASTA3) provides alignments and percent sequence identity of the regions of the best overlap between the query and search sequences (Pearson (2000) supra). Another preferred algorithm when comparing a sequence of the invention to a database containing a large number of sequences from different organisms is the computer program BLAST, especially BLASTP or TBLASTN, using default parameters. See, e.g., Altschul et al. (1990) J. Mol. Biol. 215: 403-410 and (1997) Nucleic Acids Res. 25:3389-3402, each of which is herein incorporated by reference.

[0095] As used herein, the term "affinity" refers to the strength of the sum total of noncovalent interactions between a single binding site of a molecule (e.g., an antibody) and its binding partner

(e.g., an antigen). Unless indicated otherwise, as used herein, "binding affinity" refers to intrinsic binding affinity, which reflects a 1:1 interaction between members of a binding pair (e.g., antibody and antigen). The affinity of a molecule X for its partner Y can generally be represented by the dissociation constant (KD). Affinity can be measured by common methods known in the art, including those described herein.

[0096] The term "specifically binds," or "binds specifically to," or the like, refers to an antibody that binds to a single epitope, e.g., under physiologic conditions., but which does not bind to more than one epitope. Accordingly, an antibody that specifically binds to a polypeptide will bind to an epitope that is present on the polypeptide, but which is not present on other polypeptides. Specific binding can be characterized by an equilibrium dissociation constant of at least about 1 x 10-8 M or less (e.g., a smaller KD denotes a tighter binding). Methods for determining whether two molecules specifically bind are well known in the art and include, for example, equilibrium dialysis, surface plasmon resonance, and the like. As described herein, antibodies have been identified by surface plasmon resonance, e.g., BIACORE™, which bind specifically to a spike or S protein of a SARS-CoV-2 virus.

[0097] Preferably, the antibody binds to a spike or S protein with "high affinity," namely with a KD of 1 X 10-7 M or less, more preferably 5 x 10-8 M or less, more preferably 3 x 10-8 M or less, more preferably 1 x 10-8 M or less, more preferably 5 x 10-9 M or less or even more preferably 1 x 10-9 M or less, as determined by surface plasmon resonance, e.g., BIACORE™. The term "does not substantially bind" to a protein or cells, as used herein, means does not bind or does not bind with a high affinity to the protein or cells, i.e., binds to the protein or cells with a KD of 1 x 10-6 M or more, more preferably 1 x 10-5 M or more, more preferably 1 x 10-4 M or more, more preferably 1 x 10-3 M or more, even more preferably 1 x 10-2 M or more.

[0098] The term "Kassoc" or "Ka," as used herein, is intended to refer to the association rate of a particular antibody-antigen interaction, whereas the term "Kdis" or "Kd," as used herein, is intended to refer to the dissociation rate of a particular antibody-antigen interaction. The term "KD," as used herein, is intended to refer to the dissociation constant, which is obtained from the ratio of Kd to Ka (i.e., Kd/Ka) and is expressed as a molar concentration (M). KD values for antibodies can be determined using methods well established in the art. A preferred method for determining the KD of an antibody is by using surface plasmon resonance, preferably using a biosensor system such as a BIACORE™ system.

[0099] Antibodies that "compete with another antibody for binding to a target" refer to antibodies that inhibit (partially or completely) the binding of the other antibody to the target. Whether two antibodies compete with each other for binding to a target, i.e., whether and to what extent one antibody inhibits the binding of the other antibody to a target, may be determined using known competition experiments. In some embodiments, an antibody competes with, and inhibits binding of another antibody to a target by at least 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100%. The level of inhibition or competition may be different depending on which antibody is the "blocking antibody" (i.e., the cold antibody that is incubated first with the target). Competition assays can be conducted as described, for example, in Ed Harlow and David Lane, Cold Spring Harb Protoc; 2006 or in Chapter 11 of "Using Antibodies" by Ed Harlow and David Lane, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, USA 1999. Competing antibodies bind to the same epitope, an overlapping epitope or to adjacent epitopes (e.g., as evidenced by steric hindrance). Other competitive binding assays include: solid phase direct or indirect radioimmunoassay (RIA), solid phase direct or indirect enzyme immunoassay (EIA), sandwich competition assay (see Stahli et al., Methods in Enzymology 9:242 (1983)); solid phase direct biotin-avidin EIA (see Kirkland et al., J. Immunol. 137:3614 (1986)); solid phase direct labeled assay, solid phase direct labeled sandwich assay (see Harlow and Lane, Antibodies: A Laboratory Manual, Cold Spring Harbor Press (1988)); solid phase direct label RIA using 1-125 label (see Morel et al., Mol. Immunol. 25(1):7 (1988)); solid phase direct biotin-avidin EIA (Cheung et al., Virology 176:546 (1990)); and direct labeled RIA. (Moldenhauer et al., Scand. J. Immunol. 32:77 (1990)).

[00100] The term "epitope" as used herein refers to an antigenic determinant that interacts with a specific antigen-binding site in the variable region of an antibody molecule known as a paratope. A single antigen may have more than one epitope. Thus, different antibodies may bind to different areas on an antigen and may have different biological effects. The term "epitope" also refers to a site on an antigen to which B and/or T cells respond. It also refers to a region of an antigen that is bound by an antibody. Epitopes may be defined as structural or functional. Functional epitopes are generally a subset of the structural epitopes and have those residues that directly contribute to the affinity of the interaction. Epitopes may also be conformational, that is, composed of non-linear amino acids. In some embodiments, epitopes may include determinants that are chemically active surface groupings of molecules such as amino acids, sugar side chains, phosphoryl groups,

or sulfonyl groups, and, In some embodiments, may have specific three-dimensional structural characteristics, and/or specific charge characteristics. An epitope typically includes at least 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15 amino acids in a unique spatial conformation. Methods for determining what epitopes are bound by a given antibody (i.e., epitope mapping) are well known in the art and include, for example, immunoblotting and immune-precipitation assays, wherein overlapping or contiguous peptides from a spike or S protein are tested for reactivity with a given antibody. Methods of determining spatial conformation of epitopes include techniques in the art and those described herein, for example, x-ray crystallography and 2-dimensional nuclear magnetic resonance (see, e.g., Epitope Mapping Protocols in Methods in Molecular Biology, Vol. 66, G. E. Morris, Ed. (1996)).

[00101] The term "epitope mapping" refers to the process of identification of the molecular determinants for antibody-antigen recognition.

[00102] The term "binds to an epitope" or "recognizes an epitope" with reference to an antibody or antibody fragment refers to continuous or discontinuous segments of amino acids within an antigen. Those of skill in the art understand that the terms do not necessarily mean that the antibody or antibody fragment is in direct contact with every amino acid within an epitope sequence.

[00103] The term "binds to the same epitope" with reference to two or more antibodies means that the antibodies bind to the same, overlapping, or encompassing continuous or discontinuous segments of amino acids. Those of skill in the art understand that the phrase "binds to the same epitope" does not necessarily mean that the antibodies bind to or contact exactly the same amino acids. The precise amino acids that the antibodies contact can differ. For example, a first antibody can bind to a segment of amino acids that is completely encompassed by the segment of amino acids bound by a second antibody. In another example, a first antibody binds one or more segments of amino acids that significantly overlap the one or more segments bound by the second antibody. For the purposes herein, such antibodies are considered to "bind to the same epitope."

[00104] As used herein, the term "immune response" refers to a biological response within a vertebrate against foreign agents, which response protects the organism against these agents and diseases caused by them. An immune response is mediated by the action of a cell of the immune system (for example, a T lymphocyte, B lymphocyte, natural killer (NK) cell, macrophage, eosinophil, mast cell, dendritic cell, or neutrophil) and soluble macromolecules produced by any

of these cells or the liver (including antibodies, cytokines, and complement) that results in selective targeting, binding to, damage to, destruction of, and/or elimination from the vertebrate's body of invading pathogens, cells or tissues infected with pathogens, cancerous or other abnormal cells, or, in cases of autoimmunity or pathological inflammation, normal human cells or tissues. An immune reaction includes, e.g., activation or inhibition of a T cell, e.g., an effector T cell or a Th cell, such as a CD4+ or CD8+ T cell, or the inhibition of a Treg cell.

[00105] The term "detectable label" as used herein refers to a molecule capable of detection, including, but not limited to, radioactive isotopes, fluorescers, chemiluminescers, chromophores, enzymes, enzyme substrates, enzyme cofactors, enzyme inhibitors, chromophores, dyes, metal ions, metal sols, ligands (e.g., biotin, avidin, streptavidin or haptens), intercalating dyes and the like. The term "fluorescer" refers to a substance or a portion thereof that is capable of exhibiting fluorescence in the detectable range.

[00106] In many embodiments, the terms "subject" and "patient" are used interchangeably irrespective of whether the subject has or is currently undergoing any form of treatment. As used herein, the terms "subject" and "subjects" may refer to any vertebrate, including, but not limited to, a mammal (e.g., cow, pig, camel, llama, horse, goat, rabbit, sheep, hamsters, guinea pig, cat, dog, rat, and mouse, a non-human primate (for example, a monkey, such as a cynomolgus monkey, chimpanzee, etc.) and a human). The subject may be a human or a non-human. In more exemplary aspects, the mammal is a human. As used herein, the expression "a subject in need thereof" or "a patient in need thereof" means a human or non-human mammal that exhibits one or more symptoms or indications of disorders (e.g., neuronal disorders, autoimmune diseases, and cardiovascular diseases), and/or who has been diagnosed with inflammatory disorders. In some embodiments, the subject is a mammal. In some embodiments, the subject is human.

[00107] The term "host cell", as used herein, refers to a particular subject cell into which an exogenous nucleic acid molecule may be introduced and the progeny or potential progeny of such a cell. Progeny of such a cell may not be identical to the parent cell comprising the nucleic acid molecule due to mutations or environmental influences that may occur in succeeding generations or integration of the nucleic acid molecule into the host cell genome.

[00108] As used herein, the term "disease" is intended to be generally synonymous and is used interchangeably with the terms "disorder" and "condition" (as in medical condition), in that all reflect an abnormal condition (e.g., inflammatory disorder) of the human or animal body or of one

of its parts that impairs normal functioning, is typically manifested by distinguishing signs and symptoms, and causes the human or animal to have a reduced duration or quality of life.

[00109] As used herein, the term "treating" or "treatment" of any disease or disorder refers in one embodiment, to ameliorating the disease or disorder (i.e., arresting or reducing the development of the disease or at least one of the clinical symptoms thereof). In another embodiment, "treating" or "treatment" refers to ameliorating at least one physical parameter, which may not be discernible by the patient. In yet another embodiment, "treating" or "treatment" refers to modulating the disease or disorder, either physically, (e.g., stabilization of a discernible symptom), physiologically, (e.g., stabilization of a physical parameter), or both. In yet another embodiment, "treating" or "treatment" refers to preventing or delaying the onset or development or progression of the disease or disorder.

[00110] The terms "prevent," "preventing," "prevention," "prophylactic treatment" and the like refer to reducing the probability of developing a disorder or condition in a subject, who does not have, but is at risk of or susceptible to developing a disorder or condition.

[00111] The terms "decrease," "reduced," "reduction," "decrease," or "inhibit" are all used herein generally to mean a decrease by a statistically significant amount. However, for avoidance of doubt, "reduced," "reduction," "decrease," or "inhibit" means a decrease by at least 10% as compared to a reference level, for example, a decrease by at least about 20%, or at least about 30%, or at least about 40%, or at least about 50%, or at least about 60%, or at least about 70%, or at least about 80%, or at least about 90% or up to and including a 100% decrease (e.g., absent level as compared to a reference sample), or any decrease between 10-100% as compared to a reference level.

[00112] As used herein, the term "agent" denotes a chemical compound, a mixture of chemical compounds, a biological macromolecule (such as a nucleic acid, an antibody, a protein or portion thereof, e.g., a peptide), or an extract made from biological materials such as bacteria, plants, fungi, or animal (particularly mammalian) cells or tissues. The activity of such agents may render it suitable as a "therapeutic agent," which is a biologically, physiologically, or pharmacologically active substance (or substances) that acts locally or systemically in a subject.

[00113] As used herein, the terms "therapeutic agent," "therapeutic capable agent," or "treatment agent" are used interchangeably and refer to a molecule or compound that confers some beneficial effect upon administration to a subject. The beneficial effect includes enablement of diagnostic

determinations; amelioration of a disease, symptom, disorder, or pathological condition; reducing or preventing the onset of a disease, symptom, disorder, or condition; and generally counteracting a disease, symptom, disorder or pathological condition.

[00114] The term "therapeutic effect" is art-recognized and refers to a local or systemic effect in animals, particularly mammals, and more particularly humans caused by a pharmacologically active substance.

[00115] The term "effective amount," "effective dose," or "effective dosage" is defined as an amount sufficient to achieve or at least partially achieve a desired effect. A "therapeutically effective amount" or "therapeutically effective dosage" of a drug or therapeutic agent is any amount of the drug that, when used alone or in combination with another therapeutic agent, promotes disease regression evidenced by a decrease in severity of disease symptoms, an increase in frequency and duration of disease symptom-free periods, or a prevention of impairment or disability due to the disease affliction. A "prophylactically effective amount" or a "prophylactically effective dosage" of a drug is an amount of the drug that, when administered alone or in combination with another therapeutic agent to a subject at risk of developing a disease or of suffering a recurrence of disease, inhibits the development or recurrence of the disease. The ability of a therapeutic or prophylactic agent to promote disease regression or inhibit the development or recurrence of the disease can be evaluated using a variety of methods known to the skilled practitioner, such as in human subjects during clinical trials, in animal model systems predictive of efficacy in humans, or by assaying the activity of the agent in *in vitro* assays.

[00116] Doses are often expressed in relation to bodyweight. Thus, a dose which is expressed as [g, mg, or other unit]/kg (or g, mg etc.) usually refers to [g, mg, or other unit] "per kg (or g, mg etc.) bodyweight," even if the term "bodyweight" is not explicitly mentioned.

[00117] As used herein, the term "composition" or "pharmaceutical composition" refers to a mixture of at least one component useful within the invention with other components, such as carriers, stabilizers, diluents, dispersing agents, suspending agents, thickening agents, and/or excipients. The pharmaceutical composition facilitates administration of one or more components of the invention to an organism.

[00118] As used herein, the term "pharmaceutically acceptable" refers to a material, such as a carrier or diluent, which does not abrogate the biological activity or properties of the composition, and is relatively non-toxic, i.e., the material may be administered to an individual without causing

undesirable biological effects or interacting in a deleterious manner with any of the components of the composition in which it is contained.

[00119] As used herein, the term "pharmaceutically acceptable carrier" includes a pharmaceutically acceptable salt, pharmaceutically acceptable material, composition or carrier, such as a liquid or solid filler, diluent, excipient, solvent or encapsulating material, involved in carrying or transporting a compound(s) of the present invention within or to the subject such that it may perform its intended function. Typically, such compounds are carried or transported from one organ, or portion of the body, to another organ, or portion of the body. Each salt or carrier must be "acceptable" in the sense of being compatible with the other ingredients of the formulation and not injurious to the subject. Some examples of materials that may serve as pharmaceutically acceptable carriers include: sugars, such as lactose, glucose, and sucrose; starches, such as corn starch and potato starch; cellulose, and its derivatives, such as sodium carboxymethyl cellulose, ethyl cellulose, and cellulose acetate; powdered tragacanth; malt; gelatin; talc; excipients, such as cocoa butter and suppository waxes; oils, such as peanut oil, cottonseed oil, safflower oil, sesame oil, olive oil, corn oil, and soybean oil; glycols, such as propylene glycol; polyols, such as glycerin, sorbitol, mannitol, and polyethylene glycol; esters, such as ethyl oleate and ethyl laurate; agar; buffering agents, such as magnesium hydroxide and aluminum hydroxide; alginic acid; pyrogen-free water; isotonic saline; Ringer's solution; ethyl alcohol; phosphate buffer solutions; diluent; granulating agent; lubricant; binder; disintegrating agent; wetting agent; emulsifier; coloring agent; release agent; coating agent; sweetening agent; flavoring agent; perfuming agent; preservative; antioxidant; plasticizer; gelling agent; thickener; hardener; setting agent; suspending agent; surfactant; humectant; carrier; stabilizer; and other non-toxic compatible substances employed in pharmaceutical formulations, or any combination thereof. As used herein, "pharmaceutically acceptable carrier" also includes any and all coatings, antibacterial and antifungal agents, and absorption delaying agents, and the like that are compatible with the activity of one or more components of this disclosure, and are physiologically acceptable to the subject. Supplementary active compounds may also be incorporated into the compositions.

[00120] "Combination" therapy, as used herein, unless otherwise clear from the context, is meant to encompass administration of two or more therapeutic agents in a coordinated fashion and includes, but is not limited to, concurrent dosing. Specifically, combination therapy encompasses both co-administration (e.g., administration of a co-formulation or simultaneous administration of

separate therapeutic compositions) and serial or sequential administration, provided that administration of one therapeutic agent is conditioned in some way on the administration of another therapeutic agent. For example, one therapeutic agent may be administered only after a different therapeutic agent has been administered and allowed to act for a prescribed period of time. See, e.g., Kohrt et al. (2011) Blood 117:2423.

[00121] As used herein, the term "co-administration" or "co-administered" refers to the administration of at least two agent(s) or therapies to a subject. In some embodiments, the co-administration of two or more agents/therapies is concurrent. In other embodiments, a first agent/therapy is administered prior to a second agent/therapy. Those of skill in the art understand that the formulations and/or routes of administration of the various agents/therapies used may vary.

[00122] As used herein, the term "contacting," when used in reference to any set of components, includes any process whereby the components to be contacted are mixed into the same mixture (for example, are added into the same compartment or solution), and does not necessarily require actual physical contact between the recited components. The recited components can be contacted in any order or any combination (or sub-combination) and can include situations where one or some of the recited components are subsequently removed from the mixture, optionally prior to addition of other recited components. For example, "contacting A with B and C" includes any and all of the following situations: (i) A is mixed with C, then B is added to the mixture; (ii) A and B are mixed into a mixture; B is removed from the mixture, and then C is added to the mixture; and (iii) A is added to a mixture of B and C.

[00123] "Sample," "test sample," and "patient sample" may be used interchangeably herein. The sample can be a sample of serum, urine plasma, amniotic fluid, cerebrospinal fluid, cells, or tissue. Such a sample can be used directly as obtained from a patient or can be pre-treated, such as by filtration, distillation, extraction, concentration, centrifugation, inactivation of interfering components, addition of reagents, and the like, to modify the character of the sample in some manner as discussed herein or otherwise as is known in the art. The terms "sample" and "biological sample" as used herein generally refer to a biological material being tested for and/or suspected of containing an analyte of interest, such as antibodies. The sample may be any tissue sample from the subject. The sample may comprise protein from the subject.

[00124] As used herein, the term "*in vitro*" refers to events that occur in an artificial environment, e.g., in a test tube or reaction vessel, in cell culture, etc., rather than within a multi-cellular organism.

[00125] As used herein, the term "*in vivo*" refers to events that occur within a multi-cellular organism, such as a non-human animal.

[00126] As used herein, the singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise.

[00127] As used herein, the terms "including," "comprising," "containing," or "having" and variations thereof are meant to encompass the items listed thereafter and equivalents thereof as well as additional subject matter unless otherwise noted.

[00128] As used herein, the phrases "in one embodiment," "in various embodiments," "in some embodiments," and the like are used repeatedly. Such phrases do not necessarily refer to the same embodiment, but they may unless the context dictates otherwise.

[00129] As used herein, the terms "and/or" or "/" means any one of the items, any combination of the items, or all of the items with which this term is associated.

[00130] As used herein, the word "substantially" does not exclude "completely," e.g., a composition that is "substantially free" from Y may be completely free from Y. Where necessary, the word "substantially" may be omitted from the definition of the invention.

[00131] As used herein, the term "each," when used in reference to a collection of items, is intended to identify an individual item in the collection but does not necessarily refer to every item in the collection. Exceptions can occur if explicit disclosure or context clearly dictates otherwise.

[00132] As used herein, the term "approximately" or "about," as applied to one or more values of interest, refers to a value that is similar to a stated reference value. In some embodiments, the term "approximately" or "about" refers to a range of values that fall within 25%, 20%, 19%, 18%, 17%, 16%, 15%, 14%, 13%, 12%, 11%, 10%, 9%, 8%, 7%, 6%, 5%, 4%, 3%, 2%, 1%, or less in either direction (greater than or less than) of the stated reference value unless otherwise stated or otherwise evident from the context (except where such number would exceed 100% of a possible value). Unless indicated otherwise herein, the term "about" is intended to include values, e.g., weight percents, proximate to the recited range that are equivalent in terms of the functionality of the individual ingredient, the composition, or the embodiment.

[00133] As disclosed herein, a number of ranges of values are provided. It is understood that each intervening value, to the tenth of the unit of the lower limit, unless the context clearly dictates otherwise, between the upper and lower limits of that range is also specifically disclosed. Each smaller range between any stated value or intervening value in a stated range and any other stated or intervening value in that stated range is encompassed within the invention. The upper and lower limits of these smaller ranges may independently be included or excluded in the range, and each range where either, neither, or both limits are included in the smaller ranges is also encompassed within the invention, subject to any specifically excluded limit in the stated range. Where the stated range includes one or both of the limits, ranges excluding either or both of those included limits are also included in the invention.

[00134] The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

[00135] All methods described herein are performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. In regard to any of the methods provided, the steps of the method may occur simultaneously or sequentially. When the steps of the method occur sequentially, the steps may occur in any order, unless noted otherwise. In cases in which a method comprises a combination of steps, each and every combination or sub-combination of the steps is encompassed within the scope of the disclosure, unless otherwise noted herein.

[00136] Each publication, patent application, patent, and other reference cited herein is incorporated by reference in its entirety to the extent that it is not inconsistent with the present disclosure. Publications disclosed herein are provided solely for their disclosure prior to the filing date of the present invention. Nothing herein is to be construed as an admission that the present invention is not entitled to antedate such publication by virtue of prior invention. Further, the dates of publication provided may be different from the actual publication dates, which may need to be independently confirmed.

[00137] It is understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to persons skilled in the art and are to be included within the spirit and purview of this application and scope of the appended claims.

1.2. Antibodies and Antigen-binding fragments

[00138] In one aspect, this disclosure provides novel isolated and recombinantly modified anti-SARS-CoV-2 antibodies or antigen-binding fragments thereof. In some embodiments, antibodies or antigen-binding fragments thereof described herein are broadly neutralizing antibodies that neutralize multiple SARS-CoV-2 virus strains. The antibodies are able to protect a subject prophylactically and therapeutically against a lethal challenge with a SARS-CoV-2 virus.

[00139] In one aspect, this disclosure provides an isolated anti-SARS-CoV-2 antibody or antigen-binding fragment thereof that binds specifically to a SARS-CoV-2 antigen. In some embodiments, the SARS-CoV-2 antigen comprises a portion of a spike (S) polypeptide, such as a S polypeptide of a human or an animal SARS-CoV-2. In some embodiments, the antibodies described herein are monoclonal antibodies.

[00140] In some embodiments, the monoclonal antibodies, or antigen-binding fragments thereof, specifically bind to the S polypeptide of a SARS-CoV-2, or a domain of the spike protein. In some embodiments, the monoclonal antibodies or antigen-binding fragments thereof bind to the receptor binding domain (RBD) of the S polypeptide (also referred to herein as the Spike protein). In some embodiments, the monoclonal antibodies or antigen-binding fragments thereof bind to the N-terminal domain (NTD) of the Spike protein. In some embodiments, the monoclonal antibodies or antigen-binding fragments thereof bind to the S2 domain of the Spike protein.

[00141] In some embodiments, the monoclonal antibodies or antigen-binding fragments thereof bind to the RBD of the Spike protein (e.g., amino acids 319-541 of SEQ ID NO: 1353). In some embodiments, the monoclonal antibodies or antigen-binding fragments thereof bind to the N-terminal domain (NTD) (e.g., residues 14--305 of SEQ ID NO: 1353) of the S polypeptide. In some embodiments, the monoclonal antibodies or antigen-binding fragments thereof bind to the supersite b-hairpin (residues 152-158 of SEQ ID NO: 1353). In some embodiments, the monoclonal antibodies or antigen-binding fragments thereof bind to the β8-strand (residue 97-102 of SEQ ID NO: 1353), N4-loop (residues 178-188 of SEQ ID NO: 1353), and/or N-linked glycans at positions N122 and N149 of the S polypeptide. In some embodiments, the monoclonal antibodies or antigen-binding fragments thereof bind to residues 27-32, 57-60, 210-218, and/or 286-303 of the S polypeptide of SEQ ID NO: 1353. In some embodiments, the monoclonal antibodies or antigen-binding fragments thereof bind to residues 600-606 of the S polypeptide of SEQ ID NO: 1353.

[00142] In some embodiments, the antibody or antigen-binding fragment thereof is capable of neutralizing a SARS-CoV-2 virus at an IC50 concentration of less than 50 (e.g., 1, 5, 10, 20, 30, 40, 50) μg/ml.

[00143] The monoclonal antibodies or antigen-binding fragment thereof disclosed herein can be used for detecting and treating SARS-CoV-2. For instance, they can be useful in a cocktail approach designed to minimize the chances of escape that can readily occur with single antibody approaches.

[00144] The spike protein is important because it is present on the outside of intact SARS-CoV-2. Thus, it presents a target that can be used to inhibit or eliminate an intact virus before the virus has an opportunity to infect a cell. A representative amino acid sequence is provided below:

[00145] MFVFLVLLPLVSSQCVNLTTRTQLPPAYTNSFTRGVYYPDKVFRSSVLHSTQD
LFLPFFSNVTWFHAIHVSGTNGTKRFDNPVLPFNDGVYFASTEKSNIIRGWIFGTTLDSKT
QSLLIVNNATNVVIKVCEFQFCNDPFLGVYYHKNNKSWMESEFRVYSSANNCTFEYVS
QPFLMDLEGKQGNFKNLREFVFKNIDGYFKIYSKHTPINLVRDLPQGFSALEPLVDLPIGI
NITRFQTLLALHRSYLTPGDSSSGWTAGAAAYYVGYLQPRTFLLKYNENGTITDAVDCA
LDPLSETKCTLKSFTVEKGIYQTSNFRVQPTESIVRFPNITNLCPFGEVFNATRFASVYAW
NRKRISNCVADYSVLYNSASFSTFKCYGVSPTKLNDLCFTNVYADSFVIRGDEVRQIAPG
QTGKIADYNYKLPDDFTGCVIAWNSNNLDSKVGGNYNYLYRLFRKSNLKPFERDISTEI
YQAGSTPCNGVEGFNCYFPLQSYGFQPTNGVGYQPYRVVVLSFELLHAPATVCGPKKST
NLVKNKCVNFNFNGLTGTGVLTESNKKFLPFQQFGRDIADTTDAVRDPQTLEILDITPCS
FGGVSVITPGTNTSNQVAVLYQDVNCTEVPVAIHADQLTPTWRVYSTGSNVFQTRAGC
LIGAEHVNNSYECDIPIGAGICASYQTQTNSPRRARSVASQSIIAYTMSLGAENSVAYSNN
SIAIPTNFTISVTTEILPVSMTKTSVDCTMYICGDSTECSNLLLQYGSFCTQLNRALTGIAV
EQDKNTQEVFAQVKQIYKTPPIKDFGGFNFSQILPDPSKPSKRSFIEDLLFNKVTLADAGF
IKQYGDCLGDIAARDLICAQKFNGLTVLPPLLTDEMIAQYTSALLAGTITSGWTFGAGAA
LQIPFAMQMAYRFNGIGVTQNVLYENQKLIANQFNSAIGKIQDSLSSTASALGKLQDVV
NQNAQALNTLVKQLSSNFGAISSVLNDILSRLDKVEAEVQIDRLITGRLQSLQTYVTQQLI
RAAEIRASANLAATKMSECVLGQSKRVDFCGKGYHLMSFPQSAPHGVVFLHVTYVPAQ
EKNFTTAPAICHDGKAHFPREGVFVSNGTHWFVTQRNFYEPQIITTDNTFVSGNCDVVIG
IVNNTVYDPLQPELDSFKEELDKYFKNHTSPDVDLGDISGINASVVNIQKEIDRLNEVAK

NLNESLIDLQELGKYEQYIKWPWYIWLGFIAGLIAIVMVTIMLCCMTSCCSCLKGCCSCG SCCKFDEDDSEPVLKGVKLHYT (Accession ID: NC_045512.2) (SEQ ID NO: 1353)

[00146] The total length of SARS-CoV-2 S is 1273 amino acids and consists of a signal peptide (amino acids 1–13) located at the N-terminus, the S1 subunit (14–685 residues), and the S2 subunit (686–1273 residues); the last two regions are responsible for receptor binding and membrane fusion, respectively. In the S1 subunit, there is an N-terminal domain (14–305 residues) and a receptor-binding domain (RBD, 319–541 residues); the fusion peptide (FP) (788–806 residues), heptapeptide repeat sequence 1 (HR1) (912–984 residues), HR2 (1163–1213 residues), TM domain (1213–1237 residues), and cytoplasm domain (1237–1273 residues) comprise the S2 subunit. S protein trimers visually form a characteristic bulbous, crown-like halo surrounding the viral particle. Based on the structure of coronavirus S protein monomers, the S1 and S2 subunits form the bulbous head and stalk region.

[00147] Listed below in Table 2 are amino acid sequences of the heavy chain (HC) variable regions (HCVR) and light chain (LC) variable regions (LCVR) of exemplary antibodies. "HVCR" is also referred to herein as "VH" and LCVR is also referred to herein as "VL".

[00148] In some embodiments, the antibody or antigen-binding fragment thereof comprises: (i) a heavy chain variable region having an amino acid sequence with at least 75% (e.g., 75%, 78%, 80%, 82%, 84%, 85%, 86%, 88%, 90%, 92%, 94%, 95%, 96%, 97%, 98%, 99%) identity to one selected from those in Table 2; and/or (ii) a light chain variable region having an amino acid sequence with at least 75% (e.g., 75%, 78%, 80%, 82%, 84%, 85%, 86%, 88%, 90%, 92%, 94%, 95%, 96%, 97%, 98%, 99%) identity to one selected from those in Table 2.

[00149] In some embodiments, the antibody or antigen-binding fragment thereof comprises: (i) a heavy chain variable region having an amino acid sequence selected from those in Table 2; and/or (ii) a light chain variable region having an amino acid sequence selected from those in Table 2.

[00150] In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable region and a light chain variable region that comprises an amino acid sequence pair selected from those in Table 2.

[00151] In some embodiments, the antibody or antigen-binding fragment thereof comprises three heavy chain complementarity determining regions (HCDRs) (HCDR1, HCDR2, and HCDR3) of a heavy chain variable region having the amino acid sequence of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63,

65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391, 393, 395, 397, 399, 401, 403, 405, 407, 409, 411, 413, 415, 417, 419, 421, 423, 425, 427, 429, 431, 433, 435, 437, 439, 441, 443, 445, 447, 449, 451, 453, 455, 457, 459, 461, 463, 465, 467, 469, 471, 473, 475, 477, 479, 481, 483, 485, 487, 489, 491, 493, 495, 497, 499, 501, 503, 505, 507, 509, 511, 513, 515, 517, 519, 521, 523, 525, 527, 529, 531, 533, 535, 537, 539, 541, 543, 545, 547, 549, 551, 553, 555, 557, 559, 561, 563, 565, 567, 569, 571, 573, 575, 577, 579, 581, 583, 585, 587, 589, 591, 593, 595, 597, 599, 601, 603, 605, 607, 609, 611, 613, 615, 617, 619, 621, 623, 625, 627, 629, 631, 633, 635, 637, 639, 641, 643, 645, 647, 649, 651, 653, 655, 657, 659, 661, 663, 665, 667, 669, 671, 673, or 675; and three light chain CDRs (LCDR1, LCDR2, and LCDR3) of a light chain variable region having the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426, 428, 430, 432, 434, 436, 438, 440, 442, 444, 446, 448, 450, 452, 454, 456, 458, 460, 462, 464, 466, 468, 470, 472, 474, 476, 478, 480, 482, 484, 486, 488, 490, 492, 494, 496, 498, 500, 502, 504, 506, 508, 510, 512, 514, 516, 518, 520, 522, 524, 526, 528, 530, 532, 534, 536, 538, 540, 542, 544, 546, 548, 550, 552, 554, 556, 558, 560, 562, 564, 566, 568, 570, 572, 574, 576, 578, 580, 582, 584, 586, 588, 590, 592, 594, 596, 598, 600,

602, 604, 606, 608, 610, 612, 614, 616, 618, 620, 622, 624, 626, 628, 630, 632, 634, 636, 638, 640, 642, 644, 646, 648, 650, 652, 654, 656, 658, 660, 662, 664, 666, 668, 670, 672, 674, or 676.

[00152] A person of ordinary skill in the art will understand that various CDR numbering schemes (such as the Kabat, Chothia, Enhanced Chothia, IMGT, AHoAbM, Contact numbering schemes) can be used to determine CDR positions.

[00153] In some embodiments, the antibody or antigen-binding fragment thereof comprises: a heavy chain variable region comprising an amino acid sequence with at least 75% (e.g., 75%, 78%, 80%, 82%, 84%, 85%, 86%, 88%, 90%, 92%, 94%, 95%, 96%, 97%, 98%, 99%) identity to the amino acid sequence of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391, 393, 395, 397, 399, 401, 403, 405, 407, 409, 411, 413, 415, 417, 419, 421, 423, 425, 427, 429, 431, 433, 435, 437, 439, 441, 443, 445, 447, 449, 451, 453, 455, 457, 459, 461, 463, 465, 467, 469, 471, 473, 475, 477, 479, 481, 483, 485, 487, 489, 491, 493, 495, 497, 499, 501, 503, 505, 507, 509, 511, 513, 515, 517, 519, 521, 523, 525, 527, 529, 531, 533, 535, 537, 539, 541, 543, 545, 547, 549, 551, 553, 555, 557, 559, 561, 563, 565, 567, 569, 571, 573, 575, 577, 579, 581, 583, 585, 587, 589, 591, 593, 595, 597, 599, 601, 603, 605, 607, 609, 611, 613, 615, 617, 619, 621, 623, 625, 627, 629, 631, 633, 635, 637, 639, 641, 643, 645, 647, 649, 651, 653, 655, 657, 659, 661, 663, 665, 667, 669, 671, 673, or 675; or comprising the amino acid sequence of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253,

255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391, 393, 395, 397, 399, 401, 403, 405, 407, 409, 411, 413, 415, 417, 419, 421, 423, 425, 427, 429, 431, 433, 435, 437, 439, 441, 443, 445, 447, 449, 451, 453, 455, 457, 459, 461, 463, 465, 467, 469, 471, 473, 475, 477, 479, 481, 483, 485, 487, 489, 491, 493, 495, 497, 499, 501, 503, 505, 507, 509, 511, 513, 515, 517, 519, 521, 523, 525, 527, 529, 531, 533, 535, 537, 539, 541, 543, 545, 547, 549, 551, 553, 555, 557, 559, 561, 563, 565, 567, 569, 571, 573, 575, 577, 579, 581, 583, 585, 587, 589, 591, 593, 595, 597, 599, 601, 603, 605, 607, 609, 611, 613, 615, 617, 619, 621, 623, 625, 627, 629, 631, 633, 635, 637, 639, 641, 643, 645, 647, 649, 651, 653, 655, 657, 659, 661, 663, 665, 667, 669, 671, 673, or 675; and/or a light chain variable region comprising an amino acid sequence with at least 75% (e.g., 75%, 78%, 80%, 82%, 84%, 85%, 86%, 88%, 90%, 92%, 94%, 95%, 96%, 97%, 98%, 99%) identity to the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426, 428, 430, 432, 434, 436, 438, 440, 442, 444, 446, 448, 450, 452, 454, 456, 458, 460, 462, 464, 466, 468, 470, 472, 474, 476, 478, 480, 482, 484, 486, 488, 490, 492, 494, 496, 498, 500, 502, 504, 506, 508, 510, 512, 514, 516, 518, 520, 522, 524, 526, 528, 530, 532, 534, 536, 538, 540, 542, 544, 546, 548, 550, 552, 554, 556, 558, 560, 562, 564, 566, 568, 570, 572, 574, 576, 578, 580, 582, 584, 586, 588, 590, 592, 594, 596, 598, 600, 602, 604, 606, 608, 610, 612, 614, 616, 618, 620, 622, 624, 626, 628, 630, 632, 634, 636, 638, 640, 642, 644, 646, 648, 650, 652, 654, 656, 658, 660, 662, 664, 666, 668, 670, 672, 674, or 676; or comprising the amino acid sequence of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54,

56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426, 428, 430, 432, 434, 436, 438, 440, 442, 444, 446, 448, 450, 452, 454, 456, 458, 460, 462, 464, 466, 468, 470, 472, 474, 476, 478, 480, 482, 484, 486, 488, 490, 492, 494, 496, 498, 500, 502, 504, 506, 508, 510, 512, 514, 516, 518, 520, 522, 524, 526, 528, 530, 532, 534, 536, 538, 540, 542, 544, 546, 548, 550, 552, 554, 556, 558, 560, 562, 564, 566, 568, 570, 572, 574, 576, 578, 580, 582, 584, 586, 588, 590, 592, 594, 596, 598, 600, 602, 604, 606, 608, 610, 612, 614, 616, 618, 620, 622, 624, 626, 628, 630, 632, 634, 636, 638, 640, 642, 644, 646, 648, 650, 652, 654, 656, 658, 660, 662, 664, 666, 668, 670, 672, 674, or 676.

[00154] In some embodiments, the antibody or antigen-binding fragment thereof comprises a heavy chain variable region (HCVR) and a light chain variable region (LCVR) that comprise a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22, 23-24, 25-26, 27-28, 29-30, 31-32, 33-34, 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 47-48, 49-50, 51-52, 53-54, 55-56, 57-58, 59-60, 61-62, 63-64, 65-66, 67-68, 69-70, 71-72, 73-74, 75-76, 77-78, 79-80, 81-82, 83-84, 85-86, 87-88, 89-90, 91-92, 93-94, 95-96, 97-98, 99-100, 101-102, 103-104, 105-106, 107-108, 109-110, 111-112, 113-114, 115-116, 117-118, 119-120, 121-122, 123-124, 125-126, 127-128, 129-130, 131-132, 133-134, 135-136, 137-138, 139-140, 141-142, 143-144, 145-146, 147-148, 149-150, 151-152, 153-154, 155-156, 157-158, 159-160, 161-162, 163-164, 165-166, 167-168, 169-170, 171-172, 173-174, 175-176, 177-178, 179-180, 181-182, 183-184, 185-186, 187-188, 189-190, 191-192, 193-194, 195-196, 197-198, 199-200, 201-202, 203-204, 205-206, 207-208, 209-210, 211-212, 213-214, 215-216, 217-218, 219-220, 221-222, 223-224, 225-226, 227-228, 229-230, 231-232, 233-234, 235-236, 237-238, 239-240, 241-242, 243-244, 245-246, 247-248, 249-250, 251-252, 253-254, 255-256, 257-258, 259-260, 261-262, 263-264, 265-266, 267-268, 269-270, 271-272, 273-274, 275-276, 277-278,

279-280, 281-282, 283-284, 285-286, 287-288, 289-290, 291-292, 293-294, 295-296, 297-298, 299-300, 301-302, 303-304, 305-306, 307-308, 309-310, 311-312, 313-314, 315-316, 317-318, 319-320, 321-322, 323-324, 325-326, 327-328, 329-330, 331-332, 333-334, 335-336, 337-338, 339-340, 341-342, 343-344, 345-346, 347-348, 349-350, 351-352, 353-354, 355-356, 357-358, 359-360, 361-362, 363-364, 365-366, 367-368, 369-370, 371-372, 373-374, 375-376, 377-378, 379-380, 381-382, 383-384, 385-386, 387-388, 389-390, 391-392, 393-394, 395-396, 397-398, 399-400, 401-402, 403-404, 405-406, 407-408, 409-410, 411-412, 413-414, 415-416, 417-418, 419-420, 421-422, 423-424, 425-426, 427-428, 429-430, 431-432, 433-434, 435-436, 437-438, 439-440, 441-442, 443-444, 445-446, 447-448, 449-450, 451-452, 453-454, 455-456, 457-458, 459-460, 461-462, 463-464, 465-466, 467-468, 469-470, 471-472, 473-474, 475-476, 477-478, 479-480, 481-482, 483-484, 485-486, 487-488, 489-490, 491-492, 493-494, 495-496, 497-498, 499-500, 501-502, 503-504, 505-506, 507-508, 509-510, 511-512, 513-514, 515-516, 517-518, 519-520, 521-522, 523-524, 525-526, 527-528, 529-530, 531-532, 533-534, 535-536, 537-538, 539-540, 541-542, 543-544, 545-546, 547-548, 549-550, 551-552, 553-554, 555-556, 557-558, 559-560, 561-562, 563-564, 565-566, 567-568, 569-570, 571-572, 573-574, 575-576, 577-578, 579-580, 581-582, 583-584, 585-586, 587-588, 589-590, 591-592, 593-594, 595-596, 597-598, 599-600, 601-602, 603-604, 605-606, 607-608, 609-610, 611-612, 613-614, 615-616, 617-618, 619-620, 621-622, 623-624, 625-626, 627-628, 629-630, 631-632, 633-634, 635-636, 637-638, 639-640, 641-642, 643-644, 645-646, 647-648, 649-650, 651-652, 653-654, 655-656, 657-658, 659-660, 661-662, 663-664, 665-666, 667-668, 669-670, 671-672, 673-674, or 675-676.

[00155] In some embodiments, the antibody is selected from B1030, B1032, B2014, B2058, and B2117 antibodies, as listed in Table 2. Sequences for exemplary antibodies are provided in Table 3 below:

Table 3: Exemplary Antibody Sequences

Clone	Heavy Chain	AA SEQ	SEQ ID	Light Chain	AA SEQ	SEQ ID
B2014	CDR1	**GYTFSDYH**	1354	CDR1	**TSNIGAGYD**	**1357**
	CDR2	**INPSGGGA**	1355	CDR2	**DNN**	**1358**
	CDR3	**ARGTPPSRGWYGGFDN**	1356	CDR3	**QSFDSTLSGSTFV**	**1359**
	VH	QVQLVQSGAELKRPGASVK VSCKAS**GYTFSDYH**MNWVR QAPGQGLEWMGI**INPSGGG A**SYPQKFQGRVTMTRDTST STVFMQLNSLTYEDTAVYY C**ARGTPPSRGWYGGFDN**WG QGTLVTVSS	25	VL	QSVLTQPPSVSGAPGQR ITISCTGS**TSNIGAGYD** VQWYQQLPGTAPKLLIF **DNN**NRPSGVPDRFSGSK SGTSASLAITGLQAEDE ADYYC**QSFDSTLSGSTF V**FGPGTKVTVL	26

Clone	Heavy Chain	AA SEQ	SEQ ID	Light Chain	AA SEQ	SEQ ID
B1030	CDR1	GYTFTSYY	1360	CDR1	SSNIGSNP	1363
	CDR2	INPSDGGA	1361	CDR2	SNN	1364
	CDR3	ARALRHHSSGWYSALDFQH	1362	CDR3	AAWDDSLYV	1365
	VH	QVQLVQSGAEVKKPGASVR VSCKASGYTFTSYYMHWVR QAPGQGLEWMGIINPSDGG ASYAQKFQGRVTMTSDTST STVYMELSSLRSEDTAVYY CARALRHHSSGWYSALDFQ HWGQGTLVTVSS	395	VL	QSVLTQPPSASGTPGQR VTISCSGSSSNIGSNPV NWYQQLPGTAPRLLIYS NNQRPSGVPDRFSGSKS GTSASLAISGLQSEDEA DYYCAAWDDSLYVFGTG TKVTVL	396
B1032	CDR1	GFTFEDFA	1366	CDR1	NIGSES	1369
	CDR2	VSWNSGTI	1367	CDR2	DDS	1370
	CDR3	VKDMATYYKDISGTYGMDV	1368	CDR3	QVWDASSDHVV	1371
	VH	EVQLVESGGGLVQPGRSLR LSCEASGFTFEDFAMHWVR QAPGKGLEWVSGVSWNSGT IGYGDSVKGRFIIIRDNAK NSVYLQMNSLRPEDTAFYY CVKDMATYYKDISGTYGMD VWGQGTTVTVSS	397	VL	SYELTQTPSVSVAPGQT ARITCVGNNIGSESVHW YQQKSGRAPVLVVYDDS DRPSGIPERFSGSTSGT TATLIINRVEAGDEAGY YCQVWDASSDHVVFGGG TKLTVL	398
B2058	CDR1	GLTVSSNY	1372	CDR1	QSISSY	1375
	CDR2	IYPGGST	1373	CDR2	AAS	1376
	CDR3	ARGDGYTDYYYGLDV	1374	CDR3	QQRG	1377
	VH	EVQLVESGGGLIQPGGSLR LSCAASGLTVSSNYMSWVR QAPGKGLEWVSVIYPGGST FYADSVKGRFTISRDNSKN TLYLQLNSLRADDTAVYFC ARGDGYTDYYYGLDVWGQG TTVTVSS	191	VL	DIQLTQSPSSLSASVGD RVTITCRASQSISSYLN WYQQKPGKAPKLLIYAA SSLQSGVPSRFSGSGSG TDFTLTISSLQPEDFAT YYCQQRGFGQGTKVEIK	192
B2117	CDR1	GYIFPNYG	1378	CDR1	QSVTRSY	1381
	CDR2	ISAHDDQT	1379	CDR2	DAS	1382
	CDR3	AREGAGAFFAWSSTWHGER AAFDI	1380	CDR3	QLYGTSST	1383
	VH	QVQLVQSGADVRQPGASVK VSCKASGYIFPNYGISWVR QAPGQGLEWMGWISAHDDQ TNYAQRLQGRITMTTDPST STAYMELRGLRSDDTAMYY CAREGAGAFFAWSSTWHGE RAAFDIWGQGTMVTVSS	219	VH	EIVLTQSPGTLSLSPGE RAALSCRASQSVTRSYL AWYQQKPGQAPRLLIFD ASSRATGIPDRFSGSAS GTDFTLTISRLEPEDFA VYYCQLYGTSSTFGQGT KVEIK	220

[00156] In some embodiments, the antibody or antigen-binding fragment thereof comprises a variable heavy chain CDR1 (HCDR1) comprising an amino acid sequence of SEQ ID NO: 1354. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO:1360. In some embodiments, the antibody or

antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO:1366. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO:1372. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO:1378. In some embodiments, the HCDR1 comprises an amino acid sequence that is at least 75% or at least 87% identical to one of SEQ ID NOs: 1354, 1360, 1366, 1372, or 1378. In some embodiments, the HCDR1 comprises an amino acid sequence that is 100% identical to one of SEQ ID NOs: 1354, 1360, 1366, 1372, or 1378 except for the substitution or deletion of one or two amino acids.

[00157] In some embodiments, the antibody or antigen-binding fragment thereof comprises a variable heavy chain CDR2 HCDR2 comprising an amino acid sequence of SEQ ID NO: 1355. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1361. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1367. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1373. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1379. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR2 comprising an amino acid sequence that is at least 71%, at least 75%, at least 85%, or at least 87% identical to one of SEQ ID NOs: 1355, 1361, 1367, 1373, or 1379. In some embodiments, the HCDR2 comprises an amino acid sequence that is at least 100% identical to one of SEQ ID NOs: 1355, 1361, 1367, 1373, or 1379 except for the substitution or deletion of one or two amino acids.

[00158] In some embodiments, the antibody or antigen-binding fragment thereof comprises a variable heavy chain CDR3 (HCDR3) comprising an amino acid sequence of SEQ ID NO: 1356. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1362. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1368. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1374. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR3 comprising an amino acid

sequence of SEQ ID NO: 1380. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR3 comprising an amino acid sequence that is at least at least 75%, at least 81%, at least 85%, at least 86%, at least 87%, at least 89%, at least 93%, at least 94%, or at least 95% identical to one of SEQ ID NOs: 1356, 1362, 1368, 1374, or 1380. In some embodiments, the HCDR3 comprises an amino acid sequence that is at least 100% identical to one of SEQ ID NOs: 1356, 1362, 1368, 1374, or 1380 except for the substitution or deletion of one or two amino acids.

[00159] In some embodiments, the antibody or antigen-binding fragment thereof comprises a variable light chain CDR1 (LCDR1) comprising an amino acid sequence of SEQ ID NO: 1357. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1363. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1369. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1375. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1381. In some embodiments, the antibody or antigen-binding fragment thereof comprises an LCDR1 comprises an amino acid sequence that is at least 77% or at least 88% identical to one of SEQ ID NOs: 1357, 1363, 1369, 1375, or 1381. In some embodiments, the LCDR1 comprises an amino acid sequence that is at least 100% identical to one of SEQ ID NOs: 1357, 1363, 1369, 1375, or 1381 except for the substitution or deletion of one or two amino acids.

[00160] In some embodiments, the antibody or antigen-binding fragment thereof comprises a variable light chain CDR2 (LCDR2) comprising an amino acid sequence of SEQ ID NO: 1358. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1364. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1370. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1379. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1382. In some embodiments, the antibody or antigen-binding fragment thereof comprises an LCDR2 comprises an amino acid sequence that is at least 66% identical to one of SEQ ID NOs: 1358, 1364, 1370, 1376, or 1382. In some embodiments, the LCDR2

comprises an amino acid sequence that is at least 100% identical to one of SEQ ID NOs: 1358, 1364, 1370, 1376, or 1382 except for the substitution or deletion of one amino acid.

[00161] In some embodiments, the antibody or antigen-binding fragment thereof comprises a variable light chain CDR3 (LCDR3) comprising an amino acid sequence of SEQ ID NO: 1359. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1365. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1371. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1377. In some embodiments, the antibody or antigen-binding fragment thereof comprises a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1383. In some embodiments, the antibody or antigen-binding fragment thereof comprises an LCDR3 comprises an amino acid sequence that is at least 50%, at least 75%, at least 77%, at least 81%, at least 84%, at least 87%, at least 88%, at least 90%, or at least 92% identical to one of SEQ ID NOs: 1359, 1365, 1371, 1377, or 1383. In some embodiments, the LCDR3 comprises an amino acid sequence that is at least 100% identical to one of SEQ ID NOs: 1359, 1365, 1371, 1377, or 1383 except for the substitution or deletion of one or two amino acids.

[00162] In some embodiments, the antibody or antigen-binding fragment thereof comprises: 1) a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1354, 1360, 1366, 1372, or 1378; 2) a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1355, 1361, 1367, 1373, or 1379; 3) a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1356, 1362, 1368, 1374, or 1380; 4) a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1357, 1363, 1369, 1375, or 1381; 5) a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1358, 1364, 1370, 1376, or 1382; and 6) a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1359, 1365, 1371, 1377, or 1383.

[00163] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1354, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1355, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1356, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1357, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1358, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1359. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 consisting of SEQ ID NO: 1354, a HCDR2 consisting of

SEQ ID NO: 1355, a HCDR3 consisting of SEQ ID NO: 1356, a LCDR1 consisting of SEQ ID NO: 1357, a LCDR2 consisting of SEQ ID NO: 1358, and a LCDR3 consisting of SEQ ID NO: 1359.

[00164] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 25. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 25. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 25. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 26. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence of SEQ ID NO: 26. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 26.

[00165] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 25 and a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 26. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 25 and a VL comprising an amino acid sequence of SEQ ID NO: 26. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL consisting of SEQ ID NO: 25 and a VL consisting of SEQ ID NO: 26.

[00166] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1360, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1361, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1362, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1363, a LCDR2

comprising an amino acid sequence of SEQ ID NO: 1364, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1365. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 consisting of SEQ ID NO: 1360, a HCDR2 consisting of SEQ ID NO: 1361, a HCDR3 consisting of SEQ ID NO: 1362, a LCDR1 consisting of SEQ ID NO: 1363, a LCDR2 consisting of SEQ ID NO: 1364, and a LCDR3 consisting of SEQ ID NO: 1365.

[00167] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 395. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 395. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 395. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 396. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence of SEQ ID NO: 396. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL consisting of SEQ ID NO: 396.

[00168] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 395 and a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 396. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 395 and a VL comprising an amino acid sequence of SEQ ID NO: 396. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 395 and a VL consisting of SEQ ID NO: 396.

[00169] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1366, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1367, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1368, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1369, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1370, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1371. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 consisting of SEQ ID NO: 1366, a HCDR2 consisting of SEQ ID NO: 1367, a HCDR3 consisting of SEQ ID NO: 1368, a LCDR1 consisting of SEQ ID NO: 1369, a LCDR2 consisting of SEQ ID NO: 1370, and a LCDR3 consisting of SEQ ID NO: 1371.

[00170] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 397. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 397. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 397. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 398. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence of SEQ ID NO: 398. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL consisting of SEQ ID NO: 398.

[00171] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 397 and a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 398. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 397 and a VL

comprising an amino acid sequence of SEQ ID NO: 398. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 397 and a VL consisting of SEQ ID NO: 398.

[00172] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1372, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1373, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1374, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1375, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1376, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1377. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 consisting of SEQ ID NO: 1372, a HCDR2 consisting of SEQ ID NO: 1373, a HCDR3 consisting of SEQ ID NO: 1374, a LCDR1 consisting of SEQ ID NO: 1375, a LCDR2 consisting of SEQ ID NO: 1376, and a LCDR3 consisting of SEQ ID NO: 1377.

[00173] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 191. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 191. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 191. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 192. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence of SEQ ID NO: 192. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL consisting of SEQ ID NO: 192.

[00174] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 191 and a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%,

about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 192. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 191 and a VL comprising an amino acid sequence of SEQ ID NO: 192. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 191 and a VL consisting of SEQ ID NO: 192.

[00175] In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1378, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1379, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1380, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1381, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1382, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1383. In some embodiments, the antibody or antigen-binding fragment thereof comprises a HCDR1 consisting of SEQ ID NO: 1378, a HCDR2 consisting of SEQ ID NO: 1379, a HCDR3 consisting of SEQ ID NO: 1380, a LCDR1 consisting of SEQ ID NO: 1381, a LCDR2 consisting of SEQ ID NO: 1382, and a LCDR3 consisting of SEQ ID NO: 1383.

[00176] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 219. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 219. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 219. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 220. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL comprising an amino acid sequence of SEQ ID NO: 220. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VL consisting of SEQ ID NO: 220.

[00177] In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about

85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 219 and a VL comprising an amino acid sequence that is at least about 70%, about 75%, about 80%, about 85%, about 90%, about 91%, about 92%, about 93%, about 94%, about 95%, about 96%, about 97%, about 98%, or about 99% identical to SEQ ID NO: 220. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH comprising an amino acid sequence of SEQ ID NO: 219 and a VL comprising an amino acid sequence of SEQ ID NO: 220. In some embodiments, the antibody or antigen-binding fragment thereof comprises a VH consisting of SEQ ID NO: 219 and a VL consisting of SEQ ID NO: 220.

[00178] In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope within the N-terminal domain (NTD) of the S polypeptide. In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope within the receptor binding domain (RBD) of the S polypeptide. In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope within the subdomain (SD) of the S polypeptide. In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope within the S2 subunit of the S polypeptide.

[00179] In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope outside of the N-terminal domain (NTD) of the S polypeptide. In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope outside of the receptor binding domain (RBD) of the S polypeptide. In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope outside of the subdomain (SD) of the S polypeptide. In some embodiments, the antibody or antigen-binding fragment thereof binds to an epitope outside of the S2 subunit of the S polypeptide.

[00180] In some embodiments, the antibody or antigen-binding fragment thereof is a neutralizing antibody or antigen-binding fragment thereof. In some embodiments, the antibody or antigen-binding fragment thereof neutralizes SARS-CoV-2. In some embodiments, the antibody or antigen-binding fragment thereof inhibits the fusion of SARS-CoV-2 and host cell membrane.

[00181] In some embodiments, the antibody or antigen-binding fragment thereof is a non-neutralizing antibody or antigen-binding fragment thereof. In some embodiments, the antibody or antigen-binding fragment thereof is cytotoxic to a SARS-CoV-2 infected host cell.

[00182] In some embodiments, the monoclonal antibodies, or antigen-binding fragments thereof, described herein are an IgG1, IgG2, IgG3, or IgG4 isotype. In some embodiments, the monoclonal antibodies, or antigen-binding fragments thereof, described herein are IgG1 isotypes.

[00183] In some embodiments, the antibody or antigen-binding fragment thereof comprises (a) a first target binding site that specifically binds to an epitope within the S polypeptide, and (b) a second target binding site that binds to a different epitope on the S polypeptide or on a different molecule. In some embodiments, the multivalent antibody is a bivalent or bispecific antibody.

[00184] In some embodiments, the antibody or the antigen-binding fragment thereof further comprises a variant Fc constant region. In some embodiments, the antibody is a monoclonal antibody. In some embodiments, the antibody is a chimeric antibody, a humanized antibody, or a humanized monoclonal antibody. In some embodiments, the antibody or antigen-binding fragment thereof is a single-chain antibody, Fab or Fab2 fragment.

[00185] In some embodiments, the antibody or the antigen-binding fragment thereof further comprises a variant Fc constant region. The antibody can be a monoclonal antibody. In some embodiments, the antibody can be a chimeric antibody, a humanized antibody, or a humanized monoclonal antibody. In some embodiments, the antibody or antigen-binding fragment thereof can be a single-chain antibody, Fab or Fab2 fragment.

[00186] In some embodiments, the antibody or antigen-binding fragment thereof can be detectably labeled or conjugated to a toxin, a therapeutic agent, a polymer (e.g., polyethylene glycol (PEG)), a receptor, an enzyme, or a receptor ligand. For example, an antibody of the present invention may be coupled to a toxin (e.g., a tetanus toxin). Such antibodies may be used to treat animals, including humans, that are infected with the virus that is etiologically linked to SARS-CoV-2. The toxin-coupled antibody is thought to bind to a portion of a spike protein presented on an infected cell, and then kill the infected cell.

[00187] In another example, an antibody of the present invention may be coupled to a detectable tag. Such antibodies may be used within diagnostic assays to determine if an animal, such as a human, is infected with SARS-CoV-2. Examples of detectable tags include fluorescent proteins (i.e., green fluorescent protein, red fluorescent protein, yellow fluorescent protein), fluorescent markers (i.e., fluorescein isothiocyanate, rhodamine, texas red), radiolabels (i.e., 3H, 32P, 125I), enzymes (i.e., β-galactosidase, horseradish peroxidase, β-glucuronidase, alkaline phosphatase), or an affinity tag (i.e., avidin, biotin, streptavidin). Methods to couple antibodies to a detectable tag

are known in the art. Harlow et al., Antibodies: A Laboratory Manual, page 319 (Cold Spring Harbor Pub. 1988).

Fragment

[00188] In some embodiments, an antibody provided herein is an antibody fragment. Antibody fragments include, but are not limited to, Fab, Fab', Fab'-SH, F(ab')2, Fv, and single-chain Fv (scFv) fragments, and other fragments described below, e.g., diabodies, triabodies tetrabodies, and single-domain antibodies. For a review of certain antibody fragments, see Hudson et al., Nat. Med. 9:129-134 (2003). For a review of scFv fragments, see, e.g., Pluckthun, in The Pharmacology of Monoclonal Antibodies, vol. 113, Rosenburg and Moore eds., (Springer-Verlag, New York), pp. 269-315 (1994); see also WO 93/16185; and U.S. Pat. Nos. 5,571,894 and 5,587,458. For discussion of Fab and F(ab')2 fragments comprising salvage receptor binding epitope residues and having increased *in vivo* half-life, see U.S. Pat. No. 5,869,046.

[00189] Diabodies are antibody fragments with two antigen-binding sites that may be bivalent or bispecific. See, for example, EP 404,097; WO 1993/01161; Hudson et al., Nat. Med. 9:129-134 (2003); and Hollinger et al., Proc. Natl. Acad. Sci. USA 90: 6444-6448 (1993). Triabodies and tetrabodies are also described in Hudson et al., Nat. Med. 9:129-134 (2003).

[00190] Single-domain antibodies are antibody fragments comprising all or a portion of the heavy chain variable domain or all or a portion of the light chain variable domain of an antibody. In some embodiments, a single-domain antibody is a human single-domain antibody (DOMANTIS, Inc., Waltham, Mass.; see, e.g., U.S. Pat. No. 6,248,516).

[00191] Antibody fragments can be made by various techniques, including but not limited to proteolytic digestion of an intact antibody as well as production by recombinant host cells (e.g., E. coli or phage), as described herein.

Chimeric and Humanized Antibodies

[00192] In some embodiments, an antibody provided herein is a chimeric antibody. Certain chimeric antibodies are described, e.g., in U.S. Pat. No. 4,816,567; and Morrison et al., Proc. Natl. Acad. Sci. USA, 81:6851-6855 (1984)). In one example, a chimeric antibody comprises a non-human variable region (e.g., a variable region derived from a mouse, rat, hamster, rabbit, or non-human primate, such as a monkey) and a human constant region. In a further example, a chimeric antibody is a "class switched" antibody in which the class or subclass has been changed from that of the parent antibody. Chimeric antibodies include antigen-binding fragments thereof.

[00193] In some embodiments, a chimeric antibody is a humanized antibody. Typically, a non-human antibody is humanized to reduce immunogenicity to humans, while retaining the specificity and affinity of the parental non-human antibody. Generally, a humanized antibody comprises one or more variable domains in which HVRs, e.g., CDRs, (or portions thereof) are derived from a non-human antibody, and FRs (or portions thereof) are derived from human antibody sequences. A humanized antibody optionally will also comprise at least a portion of a human constant region. In some embodiments, some FR residues in a humanized antibody are substituted with corresponding residues from a non-human antibody (e.g., the antibody from which the HVR residues are derived), e.g., to restore or improve antibody specificity or affinity.

[00194] Humanized antibodies and methods of making them are reviewed, e.g., in Almagro and Fransson, Front. Biosci. 13:1619-1633 (2008), and are further described, e.g., in Riechmann et al., Nature 332:323-329 (1988); Queen et al., Proc. Nat'l Acad. Sci. USA 86:10029-10033 (1989); U.S. Pat. Nos. 5,821,337, 7,527,791, 6,982,321, and 7,087,409; Kashmiri et al., Methods 36:25-34 (2005) (describing specificity determining region (SDR) grafting); Padlan, Mol. Immunol. 28:489-498 (1991) (describing "resurfacing"); Dall'Acqua et al., Methods 36:43-60 (2005) (describing "FR shuffling"); and Osbourn et al., Methods 36:61-68 (2005) and Klimka et al., Br. J. Cancer, 83:252-260 (2000) (describing the "guided selection" approach to FR shuffling).

[00195] Human framework regions that may be used for humanization include but are not limited to: framework regions selected using the "best-fit" method (see, e.g., Sims et al. J. Immunol. 151:2296 (1993)); framework regions derived from the consensus sequence of human antibodies of a particular subgroup of light or heavy chain variable regions (see, e.g., Carter et al. Proc. Natl. Acad. Sci. USA, 89:4285 (1992); and Presta et al. J. Immunol., 151:2623 (1993)); human mature (somatically mutated) framework regions or human germline framework regions (see, e.g., Almagro and Fransson, Front. Biosci. 13:1619-1633 (2008)); and framework regions derived from screening FR libraries (see, e.g., Baca et al., J. Biol. Chem. 272:10678-10684 (1997) and Rosok et al., J. Biol. Chem. 271:22611-22618 (1996)).

Human Antibodies

[00196] In some embodiments, an antibody provided herein is a human antibody. Human antibodies can be produced using various techniques known in the art or using techniques described herein. Human antibodies are described generally in van Dijk and van de Winkel, Curr. Opin. Pharmacol. 5: 368-74 (2001) and Lonberg, Curr. Opin. Immunol. 20:450-459 (2008).

[00197] Human antibodies may be prepared by administering an immunogen to a transgenic animal that has been modified to produce intact human antibodies or intact antibodies with human variable regions in response to antigenic challenge. Such animals typically contain all or a portion of the human immunoglobulin loci, which replace the endogenous immunoglobulin loci, or which are present extrachromosomally or integrated randomly into the animal's chromosomes. In such transgenic mice, the endogenous immunoglobulin loci have generally been inactivated. For review of methods for obtaining human antibodies from transgenic animals, see Lonberg, Nat. Biotech. 23:1117-1125 (2005). See also, e.g., U.S. Pat. Nos. 6,075,181 and 6,150,584 describing XENOMOUSE™ technology; U.S. Pat. No. 5,770,429 describing HUMAB technology; U.S. Pat. No. 7,041,870 describing K-M MOUSE technology, and U.S. Patent Application Publication No. US 2007/0061900, describing VELOCIMOUSE™ technology). Human variable regions from intact antibodies generated by such animals may be further modified, e.g., by combining with a different human constant region.

[00198] Human antibodies can also be made by hybridoma-based methods. Human myeloma and mouse-human heteromyeloma cell lines for the production of human monoclonal antibodies have been described. (See, e.g., Kozbor J. Immunol., 133: 3001 (1984); Brodeur et al., Monoclonal Antibody Production Techniques and Applications, pp. 51-63 (Marcel Dekker, Inc., New York, 1987); and Boerner et al., J. Immunol., 147: 86 (1991).) Human antibodies generated via human B-cell hybridoma technology are also described in Li et al., Proc. Natl. Acad. Sci. USA, 103:3557-3562 (2006). Additional methods include those described, for example, in U.S. Pat. No. 7,189,826 (describing production of monoclonal human IgM antibodies from hybridoma cell lines) and Ni, Xiandai Mianyixue, 26(4):265-268 (2006) (describing human-human hybridomas). Human hybridoma technology (Trioma technology) is also described in Vollmers and Brandlein, Histology and Histopathology, 20(3):927-937 (2005) and Vollmers and Brandlein, Methods and Findings in Experimental and Clinical Pharmacology, 27(3):185-91 (2005).

[00199] Human antibodies may also be generated by isolating Fv clone variable domain sequences selected from human-derived phage display libraries. Such variable domain sequences may then be combined with a desired human constant domain. Techniques for selecting human antibodies from antibody libraries are described below.

[00200] Antibodies of the invention may be isolated by screening combinatorial libraries for antibodies with the desired activity or activities. For example, a variety of methods are known in

the art for generating phage display libraries and screening such libraries for antibodies possessing the desired binding characteristics. Such methods are reviewed, e.g., in Hoogenboom et al., in Methods in Molecular Biology 178:1-37 (O'Brien et al., ed., Human Press, Totowa, N.J., 2001) and further described, e.g., in the McCafferty et al., Nature 348:552-554; Clackson et al., Nature 352: 624-628 (1991); Marks et al., J. Mol. Biol. 222: 581-597 (1992); Marks and Bradbury, in Methods in Molecular Biology 248:161-175 (Lo, ed., Human Press, Totowa, N.J., 2003); Sidhu et al., J. Mol. Biol. 338(2): 299-310 (2004); Lee et al., J. Mol. Biol. 340(5): 1073-1093 (2004); Fellouse, Proc. Natl. Acad. Sci. USA 101(34): 12467-12472 (2004); and Lee et al., J. Immunol. Methods 284(1-2): 119-132 (2004).

[00201] In certain phage display methods, repertoires of VH and VL genes are separately cloned by polymerase chain reaction (PCR) and recombined randomly in phage libraries, which can then be screened for antigen-binding phage as described in Winter et al., Ann. Rev. Immunol., 12: 433-455 (1994). Phage typically displays antibody fragments, either as scFv fragments or as Fab fragments. Libraries from immunized sources provide high-affinity antibodies to the immunogen without the requirement of constructing hybridomas. Alternatively, the naive repertoire can be cloned (e.g., from human) to provide a single source of antibodies to a wide range of non-self and also self-antigens without any immunization as described by Griffiths et al., EMBO J, 12: 725-734 (1993). Finally, naive libraries can also be made synthetically by cloning unrearranged V-gene segments from stem cells and using PCR primers containing random sequences to encode the highly variable CDR3 regions and to accomplish rearrangement *in vitro*, as described by Hoogenboom and Winter, J. Mol. Biol., 227: 381-388 (1992). Patent publications describing human antibody phage libraries include, for example, U.S. Pat. No. 5,750,373, and US Patent Publication Nos. 2005/0079574, 2005/0119455, 2005/0266000, 2007/0117126, 2007/0160598, 2007/0237764, 2007/0292936, and 2009/0002360. Antibodies or antibody fragments isolated from human antibody libraries are considered human antibodies or human antibody fragments herein.

Variants

[00202] In some embodiments, amino acid sequence variants of the antibodies provided herein are contemplated. For example, it may be desirable to improve the binding affinity and/or other biological properties of the antibody. Amino acid sequence variants of an antibody may be prepared by introducing appropriate modifications into the nucleotide sequence encoding the

antibody, or by peptide synthesis. Such modifications include, for example, deletions from, and/or insertions into and/or substitutions of residues within the amino acid sequences of the antibody. Any combination of deletion, insertion, and substitution can be made to arrive at the final construct, provided that the final construct possesses the desired characteristics, e.g., antigen- binding.

[00203] Substitution of one or more CDR residues or omission of one or more CDRs is also possible. Antibodies have been described in the scientific literature in which one or two CDRs can be dispensed with for binding. Padlan et al. (1995 FASEB J. 9:133-139) analyzed the contact regions between antibodies and their antigens, based on published crystal structures, and concluded that only about one fifth to one third of CDR residues actually contact the antigen. Padlan also found many antibodies in which one or two CDRs had no amino acids in contact with an antigen (see also, Vajdos et al. 2002 J Mol Biol 320:415-428).

[00204] CDR residues not contacting antigen can be identified based on previous studies (for example residues H60-H65 in CDRH2 are often not required), from regions of Kabat CDRs lying outside Chothia CDRs, by molecular modeling and/or empirically. If a CDR or residue(s) thereof is omitted, it is usually substituted with an amino acid occupying the corresponding position in another human antibody sequence or a consensus of such sequences. Positions for substitution within CDRs and amino acids to substitute can also be selected empirically.

[00205] The fragments, whether attached to other sequences or not, can also include insertions, deletions, substitutions, or other selected modifications of particular regions or specific amino acids residues, provided the activity of the antibody or antibody fragment is not significantly altered or impaired compared to the non-modified antibody or antibody fragment. These modifications can provide for some additional property, such as to remove/add amino acids capable of disulfide bonding, to increase its bio-longevity, to alter its secretory characteristics, etc. In any case, the antibody or antibody fragment must possess a bioactive property, such as specific binding to its cognate antigen. Functional or active regions of the antibody or antibody fragment may be identified by mutagenesis of a specific region of the protein, followed by expression and testing of the expressed polypeptide. Such methods are readily apparent to a skilled practitioner in the art and can include site-specific mutagenesis of the nucleic acid encoding the antibody or antibody fragment. (Zoller, M.J. Curr. Opin. Biotechnol. 3:348-354, 1992).

[00206] As discussed herein there are numerous variants and derivatives of the antibodies, CDRs, VH, and VL proteins disclosed herein. Protein variants and derivatives are well understood to those

of skill in the art and in can involve amino acid sequence modifications. For example, amino acid sequence modifications typically fall into one or more of three classes: substitutional, insertional or deletional variants. As used herein, "insertions" refer to a change in an amino acid or nucleotide sequence resulting in the addition of one or more amino acid or nucleotide residues, respectively, as compared to the parent, often the naturally occurring, molecule. Insertions include amino and/or carboxyl terminal fusions as well as intrasequence insertions of single or multiple amino acid residues. Insertions ordinarily will be smaller insertions than those of amino or carboxyl terminal fusions, for example, on the order of one to four residues. Immunogenic fusion protein derivatives, such as those described in the examples, are made by fusing a polypeptide sufficiently large to confer immunogenicity to the target sequence by cross-linking *in vitro* or by recombinant cell culture transformed with DNA encoding the fusion. Deletions are characterized by the removal of one or more amino acid residues from the protein sequence. Typically, no more than about from 2 to 6 residues are deleted at any one site within the protein molecule. These variants ordinarily are prepared by site specific mutagenesis of nucleotides in the DNA encoding the protein, thereby producing DNA encoding the variant, and thereafter expressing the DNA in recombinant cell culture. Techniques for making substitution mutations at predetermined sites in DNA having a known sequence are well known, for example M13 primer mutagenesis and PCR mutagenesis. Amino acid substitutions are typically of single residues but can occur at a number of different locations at once; insertions usually will be on the order of about from 1 to 10 amino acid residues; and deletions will range about from 1 to 30 residues. Deletions or insertions preferably are made in adjacent pairs, i.e., a deletion of 2 residues or insertion of 2 residues. Substitutions, deletions, insertions, or any combination thereof may be combined to arrive at a final construct. The mutations must not place the sequence out of reading frame and preferably will not create complementary regions that could produce secondary mRNA structure. Substitutional variants are those in which at least one residue has been removed and a different residue inserted in its place. Such substitutions generally are made in accordance with the following Table B and are referred to as conservative substitutions.

Table A: Amino Acid Abbreviations

Amino Acid	Abbreviations	
Alanine	Ala	A
allosoleucine	AIle	
Arginine	Arg	R

Amino Acid	Abbreviations	
asparagine	Asn	N
aspartic acid	Asp	D
Cysteine	Cys	C
glutamic acid	Glu	E
Glutamine	Gln	Q
Glycine	Gly	G
Histidine	His	H
Isolelucine	Ile	I
Leucine	Leu	L
Lysine	Lys	K
phenylalanine	Phe	F
proline	Pro	P
pyroglutamic acid	pGlu	
Serine	Ser	S
Threonine	Thr	T
Tyrosine	Tyr	Y
Tryptophan	Trp	W
Valine	Val	V

Table B: Amino Acid Substitutions - Exemplary Conservative Substitutions

Original AA	Conservative Substitution
Ala	Ser
Arg	Lys; Gln
Asn	Gln; His
Asp	Glu
Cys	Ser
Gln	Asn, Lys
Glu	Asp
Gly	Pro
His	Asn;Gln
Ile	Leu; Val
Leu	Ile; Val
Lys	Arg; Gln
Met	Leu; Ile
Phe	Met; Leu; Tyr
Ser	Thr
Thr	Ser
Trp	Tyr
Tyr	Trp; Phe
Val	Ile; Leu

[00207] Substantial changes in function or immunological identity are made by selecting substitutions that are less conservative than those in Table B, i.e., selecting residues that differ more significantly in their effect on maintaining (a) the structure of the polypeptide backbone in the area of the substitution, for example as a sheet or helical conformation, (b) the charge or hydrophobicity of the molecule at the target site or (c) the bulk of the side chain. Conservative amino acid substitutions include the ones in which the amino acid residue is replaced with an amino acid residue having similar structural or chemical properties. Families of amino acid residues having similar side chains have been defined in the art. These families include amino acids with basic side chains (e.g., lysine, arginine, histidine), acidic side chains (e.g., aspartic acid, glutamic acid), uncharged polar side chains (e.g., glycine, asparagine, glutamine, serine, threonine, tyrosine, cystine, tryptophan), nonpolar side chains (e.g., alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine), beta-branched side chains (e.g., threonine, valine, isoleucine) and aromatic side chains (e.g., tyrosine, phenylalanine, tryptophan, histidine).

[00208] The substitutions which in general are expected to produce the greatest changes in the protein properties will be those in which (a) a hydrophilic residue, e.g. seryl or threonyl, is substituted for (or by) a hydrophobic residue, e.g. leucyl, isoleucyl, phenylalanyl, valyl or alanyl; (b) a cysteine or proline is substituted for (or by) any other residue; (c) a residue having an electropositive side chain, e.g., lysyl, arginyl, or histidyl, is substituted for (or by) an electronegative residue, e.g., glutamyl or aspartyl; or (d) a residue having a bulky side chain, e.g., phenylalanine, is substituted for (or by) one not having a side chain, e.g., glycine, in this case, (e) by increasing the number of sites for sulfation and/or glycosylation.

[00209] The replacement of one amino acid residue with another that is biologically and/or chemically similar is known to those skilled in the art as a conservative substitution. For example, a conservative substitution would be replacing one hydrophobic residue for another, or one polar residue for another. The substitutions include combinations such as, for example, Gly, Ala; Val, Ile, Leu; Asp, Glu; Asn, Gln; Ser, Thr; Lys, Arg; and Phe, Tyr. Such conservatively substituted variations of each explicitly disclosed sequence are included within the mosaic polypeptides provided herein.

Substitution, Insertion, and Deletion Variants

[00210] In some embodiments, antibody variants having one or more amino acid substitutions are provided. Sites of interest for substitutional mutagenesis include the HVRs and FRs.

Conservative substitutions are defined herein. Amino acid substitutions may be introduced into an antibody of interest and the products screened for a desired activity, e.g., retained/improved antigen-binding, decreased immunogenicity, or improved antibody-dependent cell-mediated cytotoxicity (ADCC) and complement-dependent cytotoxicity (CDC).

[00211] Accordingly, an antibody of the invention can comprise one or more conservative modifications of the CDRs, heavy chain variable region, or light variable regions described herein. A conservative modification or functional equivalent of a peptide, polypeptide, or protein disclosed in this invention refers to a polypeptide derivative of the peptide, polypeptide, or protein, e.g., a protein having one or more point mutations, insertions, deletions, truncations, a fusion protein, or a combination thereof. It substantially retains the activity to of the parent peptide, polypeptide, or protein (such as those disclosed in this invention). In general, a conservative modification or functional equivalent is at least 60% (e.g., any number between 60% and 100%, inclusive, e.g., 60%, 70%, 75%, 80%, 85%, 90%, 95%, 96%, 97%, 98%, and 99%) identical to a parent. Accordingly, within the scope of this invention are heavy chain variable region or light variable regions having one or more point mutations, insertions, deletions, truncations, a fusion protein, or a combination thereof, as well as antibodies having the variant regions.

[00212] As used herein, the percent homology between two amino acid sequences is equivalent to the percent identity between the two sequences. The percent identity between the two sequences is a function of the number of identical positions shared by the sequences (i.e., % homology=# of identical positions/total # of positions x 100), taking into account the number of gaps, and the length of each gap, which need to be introduced for optimal alignment of the two sequences. The comparison of sequences and determination of percent identity between two sequences can be accomplished using a mathematical algorithm, as described in the non-limiting examples below.

[00213] The percent identity between two amino acid sequences can be determined using the algorithm of E. Meyers and W. Miller (Comput. Appl. Biosci., 4:11-17 (1988)) which has been incorporated into the ALIGN program (version 2.0), using a PAM120 weight residue table, a gap length penalty of 12 and a gap penalty of 4. In addition, the percent identity between two amino acid sequences can be determined using the Needleman and Wunsch (J. Mol. Biol. 48:444-453 (1970)) algorithm, which has been incorporated into the GAP program in the GCG software package (available at gcg.com), using either a Blossum 62 matrix or a PAM250 matrix, and a gap weight of 16, 14, 12, 10, 8, 6, or 4 and a length weight of 1, 2, 3, 4, 5, or 6.

[00214] Additionally or alternatively, the protein sequences of the present invention can further be used as a "query sequence" to perform a search against public databases to, for example, identify related sequences. Such searches can be performed using the XBLAST program (version 2.0) of Altschul, et al. (1990) J. Mol. Biol. 215:403-10. BLAST protein searches can be performed with the XBLAST program, score=50, wordlength=3 to obtain amino acid sequences homologous to the antibody molecules of the invention. To obtain gapped alignments for comparison purposes, Gapped BLAST can be utilized as described in Altschul et al., (1997) Nucleic Acids Res. 25(17):3389-3402. When utilizing BLAST and Gapped BLAST programs, the default parameters of the respective programs (e.g., XBLAST and NBLAST) can be used. (See ncbi.nlm.nih.gov).

[00215] As used herein, the term "conservative modifications" refers to amino acid modifications that do not significantly affect or alter the binding characteristics of the antibody containing the amino acid sequence. Such conservative modifications include amino acid substitutions, additions, and deletions. Modifications can be introduced into an antibody of the invention by standard techniques known in the art, such as site-directed mutagenesis and PCR-mediated mutagenesis. Conservative amino acid substitutions are ones in which the amino acid residue is replaced with an amino acid residue having a similar side chain. Families of amino acid residues having similar side chains have been defined in the art. These families include: (i) amino acids with basic side chains (e.g., lysine, arginine, histidine), (ii) acidic side chains (e.g., aspartic acid, glutamic acid), (iii) uncharged polar side chains (e.g., glycine, asparagine, glutamine, serine, threonine, tyrosine, cysteine, tryptophan), (iv) nonpolar side chains (e.g., alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine), (v) beta-branched side chains (e.g., threonine, valine, isoleucine), and (vi) aromatic side chains (e.g., tyrosine, phenylalanine, tryptophan, histidine).

[00216] Non-conservative substitutions will entail exchanging a member of one of these classes for another class.

[00217] An exemplary substitutional variant is an affinity matured antibody, which may be conveniently generated, e.g., using phage display-based affinity maturation techniques such as those described in, e.g., Hoogenboom et al., in Methods in Molecular Biology 178:1-37 (O'Brien et al., ed., Human Press, Totowa, N.J., (2001). Amino acid sequence insertions include amino- and/or carboxyl-terminal fusions ranging in length from one residue to polypeptides containing a hundred or more residues, as well as intrasequence insertions of single or multiple amino acid

residues. Examples of terminal insertions include an antibody with an N-terminal methionyl residue. Other insertional variants of the antibody molecule include the fusion to the N- or C-terminus of the antibody to an enzyme (e.g., for ADEPT) or a polypeptide which increases the serum half-life of the antibody.

Glycosylation Variants

[00218] In some embodiments, an antibody provided herein is altered to increase or decrease the extent to which the antibody is glycosylated. Addition or deletion of glycosylation sites to an antibody may be conveniently accomplished by altering the amino acid sequence such that one or more glycosylation sites are created or removed.

[00219] For example, an aglycoslated antibody can be made (i.e., the antibody lacks glycosylation). Glycosylation can be altered to, for example, increase the affinity of the antibody for antigen. Such carbohydrate modifications can be accomplished by, for example, altering one or more sites of glycosylation within the antibody sequence. For example, one or more amino acid substitutions can be made that result in elimination of one or more variable region framework glycosylation sites to thereby eliminate glycosylation at that site. Such aglycosylation may increase the affinity of the antibody for antigen. Such an approach is described in further detail in U.S. Patent Nos. 5,714,350 and 6,350,861 by Co et al.

[00220] Glycosylation of the constant region on N297 may be prevented by mutating the N297 residue to another residue, e.g., N297A, and/or by mutating an adjacent amino acid, e.g., 298 to thereby reduce glycosylation on N297.

[00221] Additionally or alternatively, an antibody can be made that has an altered type of glycosylation, such as a hypofucosylated antibody having reduced amounts of fucosyl residues or an antibody having increased bisecting GlcNac structures. Such altered glycosylation patterns have been demonstrated to increase the ADCC ability of antibodies. Such carbohydrate modifications can be accomplished by, for example, expressing the antibody in a host cell with altered glycosylation machinery. Cells with altered glycosylation machinery have been described in the art and can be used as host cells in which to express recombinant antibodies described herein to thereby produce an antibody with altered glycosylation. For example, EP 1,176,195 by Hanai et al. describes a cell line with a functionally disrupted FUT8 gene, which encodes a fucosyltransferase, such that antibodies expressed in such a cell line exhibit hypofucosylation. PCT Publication WO 03/035835 by Presta describes a variant Chinese Hamster Ovary cell line,

Led 3 cells, with reduced ability to attach fucose to Asn(297)-linked carbohydrates, also resulting in hypofucosylation of antibodies expressed in that host cell (see also Shields, R.L. et al. (2002) J. Biol. Chem. 277:26733-26740). PCT Publication WO 99/54342 by Umana et al. describes cell lines engineered to express glycoprotein-modifying glycosyltransferases (e.g., beta(1,4)-N-acetylglucosaminyltransferase III (GnTIII)) such that antibodies expressed in the engineered cell lines exhibit increased bisecting GlcNac structures which result in increased ADCC activity of the antibodies (see also Umana et al. (1999) Nat. Biotech. 17: 176-180).

Fc Region Variants

[00222] The variable regions of the antibody described herein can be linked (e.g., covalently linked or fused) to an Fc, e.g., an IgGl, IgG2, IgG3 or IgG4 Fc, which may be of any allotype or isoallotype, e.g., for IgGl: Glm, Glml(a), Glm2(x), Glm3(f), Glml7(z); for IgG2: G2m, G2m23(n); for IgG3: G3m, G3m21(gl), G3m28(g5), G3ml l(b0), G3m5(bl), G3ml3(b3), G3ml4(b4), G3ml0(b5), G3ml5(s), G3ml6(t), G3m6(c3), G3m24(c5), G3m26(u), G3m27(v); and for K: Km, Kml, Km2, Km3 (see, e.g., Jefferies et al. (2009) mAbs 1: 1). In some embodiments, the antibodies variable regions described herein are linked to an Fc that binds to one or more activating Fc receptors (FcγI, Fcγlla, or FcγIIIa), and thereby stimulate ADCC and may cause T cell depletion. In some embodiments, the antibody variable regions described herein are linked to an Fc that causes depletion.

[00223] In some embodiments, the antibody variable regions described herein may be linked to an Fc comprising one or more modifications, typically to alter one or more functional properties of the antibody, such as serum half-life, complement fixation, Fc receptor binding, and/or antigen-dependent cellular cytotoxicity. Furthermore, an antibody described herein may be chemically modified (e.g., one or more chemical moieties can be attached to the antibody) or be modified to alter its glycosylation, to alter one or more functional properties of the antibody. The numbering of residues in the Fc region is that of the EU index of Kabat.

[00224] The Fc region encompasses domains derived from the constant region of an immunoglobulin, preferably a human immunoglobulin, including a fragment, analog, variant, mutant, or derivative of the constant region. Suitable immunoglobulins include IgGl, IgG2, IgG3, IgG4, and other classes such as IgA, IgD, IgE, and IgM. The constant region of an immunoglobulin is defined as a naturally- occurring or synthetically-produced polypeptide homologous to the immunoglobulin C-terminal region, and can include a CH1 domain, a hinge, a CH2 domain, a CH3

domain, or a CH4 domain, separately or in combination. In some embodiments, an antibody of this invention has an Fc region other than that of a wild-type IgA1. The antibody can have an Fc region from that of IgG (e.g., IgG1, IgG2, IgG3, and IgG4) or other classes such as IgA2, IgD, IgE, and IgM. The Fc can be a mutant form of IgA1.

[00225] The constant region of an immunoglobulin is responsible for many important antibody functions, including Fc receptor (FcR) binding and complement fixation. There are five major classes of heavy chain constant region, classified as IgA, IgG, IgD, IgE, IgM, each with characteristic effector functions designated by isotype. For example, IgG is separated into four subclasses known as IgGl, IgG2, IgG3, and IgG4.

[00226] Ig molecules interact with multiple classes of cellular receptors. For example, IgG molecules interact with three classes of Fcγ receptors (FcγR) specific for the IgG class of antibody, namely FcγRI, FcγRII, and FcγRIIL. The important sequences for the binding of IgG to the FcγR receptors have been reported to be located in the CH2 and CH3 domains. The serum half-life of an antibody is influenced by the ability of that antibody to bind to an FcR.

[00227] In some embodiments, the Fc region is a variant Fc region, e.g., an Fc sequence that has been modified (e.g., by amino acid substitution, deletion and/or insertion) relative to a parent Fc sequence (e.g., an unmodified Fc polypeptide that is subsequently modified to generate a variant), to provide desirable structural features and/or biological activity. For example, one may make modifications in the Fc region in order to generate an Fc variant that (a) has increased or decreased ADCC, (b) increased or decreased CDC, (c) has increased or decreased affinity for Clq and/or (d) has increased or decreased affinity for an Fc receptor relative to the parent Fc. Such Fc region variants will generally comprise at least one amino acid modification in the Fc region. Combining amino acid modifications is thought to be particularly desirable. For example, the variant Fc region may include two, three, four, five, etc., substitutions therein, e.g., of the specific Fc region positions identified herein.

[00228] A variant Fc region may also comprise a sequence alteration wherein amino acids involved in disulfide bond formation are removed or replaced with other amino acids. Such removal may avoid reaction with other cysteine-containing proteins present in the host cell used to produce the antibodies described herein. Even when cysteine residues are removed, single chain Fc domains can still form a dimeric Fc domain that is held together non-covalently. In other embodiments, the Fc region may be modified to make it more compatible with a selected host cell.

For example, one may remove the PA sequence near the N-terminus of a typical native Fc region, which may be recognized by a digestive enzyme in E. coli, such as proline iminopeptidase. In other embodiments, one or more glycosylation sites within the Fc domain may be removed. Residues that are typically glycosylated (e.g., asparagine) may confer cytolytic response. Such residues may be deleted or substituted with unglycosylated residues (e.g., alanine). In other embodiments, sites involved in interaction with complement, such as the Clq binding site, may be removed from the Fc region. For example, one may delete or substitute the EKK sequence of human IgGl. In some embodiments, sites that affect binding to Fc receptors may be removed, preferably sites other than salvage receptor binding sites. In other embodiments, an Fc region may be modified to remove an ADCC site. ADCC sites are known in the art; see, for example, Molec. Immunol. 29 (5): 633-9 (1992) with regard to ADCC sites in IgGl. Specific examples of variant Fc domains are disclosed, for example, in WO 97/34631 and WO 96/32478.

[00229] In one embodiment, the hinge region of Fc is modified such that the number of cysteine residues in the hinge region is altered, e.g., increased or decreased. This approach is described further in U.S. Patent No. 5,677,425 by Bodmer et al. The number of cysteine residues in the hinge region of Fc is altered to, for example, facilitate assembly of the light and heavy chains or to increase or decrease the stability of the antibody. In one embodiment, the Fc hinge region of an antibody is mutated to decrease the biological half-life of the antibody. More specifically, one or more amino acid mutations are introduced into the CH2-CH3 domain interface region of the Fc-hinge fragment such that the antibody has impaired Staphylococcal protein A (SpA) binding relative to native Fc-hinge domain SpA binding. This approach is described in further detail in U.S. Patent No. 6,165,745 by Ward et al.

[00230] In yet other embodiments, the Fc region is altered by replacing at least one amino acid residue with a different amino acid residue to alter the effector function(s) of the antibody. For example, one or more amino acids selected from amino acid residues 234, 235, 236, 237, 297, 318, 320, and 322 can be replaced with a different amino acid residue such that the antibody has an altered affinity for an effector ligand but retains the antigen-binding ability of the parent antibody. The effector ligand to which affinity is altered can be, for example, an Fc receptor or the Cl component of complement. This approach is described in further detail in U.S. Patent Nos. 5,624,821 and 5,648,260, both by Winter et al.

[00231] In another example, one or more amino acids selected from amino acid residues 329, 331, and 322 can be replaced with a different amino acid residue such that the antibody has altered Clq binding and/or reduced or abolished CDC. This approach is described in further detail in U.S. Patent Nos. 6,194,551 by Idusogie et al.

[00232] In another example, one or more amino acid residues within amino acid positions 231 and 239 are altered to thereby alter the ability of the antibody to fix complement. This approach is described further in PCT Publication WO 94/29351 by Bodmer et al.

[00233] In yet another example, the Fc region may be modified to increase ADCC and/or to increase the affinity for an Fcγ receptor by modifying one or more amino acids at the following positions: 234, 235, 236, 238, 239, 240, 241 , 243, 244, 245, 247, 248, 249, 252, 254, 255, 256, 258, 262, 263, 264, 265, 267, 268, 269, 270, 272, 276, 278, 280, 283, 285, 286, 289, 290, 292, 293, 294, 295, 296, 298, 299, 301, 303, 305, 307, 309, 312, 313, 315, 320, 322, 324, 325, 326, 327, 329, 330, 331, 332, 333, 334, 335, 337, 338, 340, 360, 373, 376, 378, 382, 388, 389, 398, 414, 416, 419, 430, 433, 434, 435, 436, 437, 438 or 439. Exemplary substitutions include 236A, 239D, 239E, 268D, 267E, 268E, 268F, 324T, 332D, and 332E. Exemplary variants include 239D/332E, 236A/332E, 236A/239D/332E, 268F/324T, 267E/268F, 267E/324T, and 267E/268F7324T. Other modifications for enhancing FcγR and complement interactions include but are not limited to substitutions 298A, 333A, 334A, 326A, 247I, 339D, 339Q, 280H, 290S, 298D, 298V, 243L, 292P, 300L, 396L, 305I, and 396L. These and other modifications are reviewed in Strohl, 2009, Current Opinion in Biotechnology 20:685-691.

[00234] Fc modifications that increase binding to an Fcγ receptor include amino acid modifications at any one or more of amino acid positions 238, 239, 248, 249, 252, 254, 255, 256, 258, 265, 267, 268, 269, 270, 272, 279, 280, 283, 285, 298, 289, 290, 292, 293, 294, 295, 296, 298, 301, 303, 305, 307, 312, 315, 324, 327, 329, 330, 335, 337, 3338, 340, 360, 373, 376, 379, 382, 388, 389, 398, 414, 416, 419, 430, 434, 435, 437, 438 or 439 of the Fc region, wherein the numbering of the residues in the Fc region is that of the EU index as in Kabat (WO00/42072).

[00235] Other Fc modifications that can be made to Fcs are those for reducing or ablating binding to FcγR and/or complement proteins, thereby reducing or ablating Fc-mediated effector functions such as ADCC, antibody-dependent cellular phagocytosis (ADCP), and CDC. Exemplary modifications include but are not limited to substitutions, insertions, and deletions at positions 234, 235, 236, 237, 267, 269, 325, and 328, wherein numbering is according to the EU

index. Exemplary substitutions include but are not limited to 234G, 235G, 236R, 237K, 267R, 269R, 325L, and 328R, wherein numbering is according to the EU index. An Fc variant may comprise 236R/328R. Other modifications for reducing FcγR and complement interactions include substitutions 297A, 234A, 235A, 237A, 318A, 228P, 236E, 268Q, 309L, 330S, 331S, 220S, 226S, 229S, 238S, 233P, and 234V, as well as removal of the glycosylation at position 297 by mutational or enzymatic means or by production in organisms such as bacteria that do not glycosylate proteins. These and other modifications are reviewed in Strohl, 2009, Current Opinion in Biotechnology 20:685-691.

[00236] Optionally, the Fc region may comprise a non-naturally occurring amino acid residue at additional and/or alternative positions known to one skilled in the art (see, e.g., U.S. Pat. Nos. 5,624,821; 6,277,375; 6,737,056; 6,194,551; 7,317,091; 8,101,720; WO00/42072; WO01/58957; WO02/06919; WO04/016750; WO04/029207; WO04/035752; WO04/074455; WO04/099249; WO04/063351; WO05/070963; WO05/040217, WO05/092925 and WO06/020114).

[00237] Fc variants that enhance affinity for an inhibitory receptor FcγRIIb may also be used. Such variants may provide an Fc fusion protein with immune-modulatory activities related to FcγRIIb cells, including, for example, B cells and monocytes. In one embodiment, the Fc variants provide selectively enhanced affinity to FcγRIIb relative to one or more activating receptors. Modifications for altering binding to FcγRIIb include one or more modifications at a position selected from the group consisting of 234, 235, 236, 237, 239, 266, 267, 268, 325, 326, 327, 328, and 332, according to the EU index. Exemplary substitutions for enhancing FcγRIIb affinity include but are not limited to 234D, 234E, 234F, 234W, 235D, 235F, 235R, 235Y, 236D, 236N, 237D, 237N, 239D, 239E, 266M, 267D, 267E, 268D, 268E, 327D, 327E, 328F, 328W, 328Y, and 332E. Exemplary substitutions include 235Y, 236D, 239D, 266M, 267E, 268D, 268E, 328F, 328W, and 328Y. Other Fc variants for enhancing binding to FcγRIIb include 235Y/267E, 236D/267E, 239D/268D, 239D/267E, 267E/268D, 267E/268E, and 267E/328F.

[00238] The affinities and binding properties of an Fc region for its ligand may be determined by a variety of *in vitro* assay methods (biochemical or immunological based assays) known in the art, including but not limited to equilibrium methods (e.g., ELISA, or radioimmunoassay), or kinetics (e.g., BIACORE™ analysis), and other methods such as indirect binding assays, competitive inhibition assays, fluorescence resonance energy transfer (FRET), gel electrophoresis and chromatography (e.g., gel filtration). These and other methods may utilize a label on one or

more of the components being examined and/or employ a variety of detection methods, including but not limited to chromogenic, fluorescent, luminescent, or isotopic labels. A detailed description of binding affinities and kinetics can be found in Paul, W. E., ed., Fundamental Immunology, 4th Ed., Lippincott-Raven, Philadelphia (1999), which focuses on antibody-immunogen interactions.

[00239] In some embodiments, the antibody is modified to increase its biological half-life. Various approaches are possible. For example, this may be done by increasing the binding affinity of the Fc region for FcRn. For example, one or more of the following residues can be mutated: 252, 254, 256, 433, 435, 436, as described in U.S. Pat. No. 6,277,375. Specific exemplary substitutions include one or more of the following: T252L, T254S, and/or T256F. Alternatively, to increase the biological half-life, the antibody can be altered within the CH1 or CL region to contain a salvage receptor binding epitope taken from two loops of a CH2 domain of an Fc region of an IgG, as described in U.S. Patent Nos. 5,869,046 and 6,121,022 by Presta et al. Other exemplary variants that increase binding to FcRn and/or improve pharmacokinetic properties include substitutions at positions 259, 308, 428, and 434, including for example 259I, 308F, 428L, 428M, 434S, 434H, 434F, 434Y, and 434M. Other variants that increase Fc binding to FcRn include: 250E, 250Q, 428L, 428F, 250Q/428L (Hinton et al,, 2004, J. Biol. Chem. 279(8): 6213-6216, Hinton et al. 2006 Journal of Immunology 176:346-356), 256A, 272A, 286A, 305A, 307A, 307Q, 311A, 312A, 376A, 378Q, 380A, 382A, 434A (Shields et al, Journal of Biological Chemistry, 2001, 276(9):6591-6604), 252F, 252T, 252Y, 252W, 254T, 256S, 256R, 256Q, 256E, 256D, 256T, 309P, 311S, 433R, 433S, 433I, 433P, 433Q, 434H, 434F, 434Y, 252Y/254T/256E, 433K/434F/436H, 308T/309P/311S (Dall Acqua et al. Journal of Immunology, 2002, 169:5171-5180, Dall'Acqua et al., 2006, Journal of Biological Chemistry 281:23514-23524). Other modifications for modulating FcRn binding are described in Yeung et al., 2010, J Immunol, 182:7663-7671. In some embodiments, hybrid IgG isotypes with particular biological characteristics may be used. For example, an IgG1/IgG3 hybrid variant may be constructed by substituting IgG 1 positions in the CH2 and/or CH3 region with the amino acids from IgG3 at positions where the two isotypes differ. Thus, a hybrid variant IgG antibody may be constructed that comprises one or more substitutions, e.g., 274Q, 276K, 300F, 339T, 356E, 358M, 384S, 392N, 397M, 422I, 435R, and 436F. In other embodiments described herein, an IgG1/IgG2 hybrid variant may be constructed by substituting IgG2 positions in the CH2 and/or CH3 region with amino acids from IgG1 at positions where the two isotypes differ. Thus, a hybrid variant IgG antibody may be

constructed chat comprises one or more substitutions, e.g., one or more of the following amino acid substitutions: 233E, 234L, 235L, 236G (referring to an insertion of a glycine at position 236), and 321 h.

[00240] Moreover, the binding sites on human IgGl for FcγRl, FcγRII, FcγRIII, and FcRn have been mapped, and variants with improved binding have been described (see Shields, R.L. et al. (2001) J. Biol. Chem. 276:6591-6604). Specific mutations at positions 256, 290, 298, 333, 334, and 339 were shown to improve binding to FcγRIII. Additionally, the following combination mutants were shown to improve FcγRIII binding: T256A/S298A, S298A/E333A, S298A/K224A, and S298A/E333A/K334A, which has been shown to exhibit enhanced FcγRIIIa binding and ADCC activity (Shields et al., 2001). Other IgGl variants with strongly enhanced binding to FcγRIIIa have been identified, including variants with S239D/I332E and S239D/I332E/A330L mutations which showed the greatest increase in affinity for FcγRIIIa, a decrease in FcγRIIb binding, and strong cytotoxic activity in cynomolgus monkeys (Lazar et al., 2006). Introduction of the triple mutations into antibodies such as alemtuzumab (CD52- specific), trastuzumab (HER2/neu- specific), rituximab (CD20- specific), and cetuximab (EGFR- specific) translated into greatly enhanced ADCC activity *in vitro*, and the S239D/I332E variant showed an enhanced capacity to deplete B cells in monkeys (Lazar et al., 2006). In addition, IgGl mutants containing L235V, F243L, R292P, Y300L, and P396L mutations which exhibited enhanced binding to FcγRIIIa and concomitantly enhanced ADCC activity in transgenic mice expressing human FcγRIIIa in models of B cell malignancies and breast cancer have been identified (Stavenhagen et al., 2007; Nordstrom et al., 2011). Other Fc mutants that may be used include S298A/E333A/L334A, S239D/I332E, S239D/I332E/A330L, L235V/F243L/R292P/Y300L/ P396L, and M428L/N434S.

[00241] In some embodiments, an Fc is chosen that has reduced binding to FcγRs. An exemplary Fc, e.g., IgGl Fc, with reduced FcγR binding, comprises the following three amino acid substitutions: L234A, L235E, and G237A.

[00242] In some embodiments, an Fc is chosen that has reduced complement fixation. An exemplary Fc, e.g., IgGl Fc, with reduced complement fixation, has the following two amino acid substitutions: A330S and P331S.

[00243] In some embodiments, an Fc is chosen that has essentially no effector function, i.e., it has reduced binding to FcγRs and reduced complement fixation. An exemplary Fc, e.g., IgGl Fc,

that is effectorless, comprises the following five mutations: L234A, L235E, G237A, A330S, and P331S.

[00244] When using an IgG4 constant domain, it is usually preferable to include the substitution S228P, which mimics the hinge sequence in IgGl and thereby stabilizes IgG4 molecules.

Multivalent Antibodies

[00245] In one embodiment, the antibodies of the invention may be monovalent or multivalent (e.g., bivalent, trivalent, etc.). As used herein, the term "valency" refers to the number of potential target binding sites associated with an antibody. Each target binding site specifically binds one target molecule or specific position or locus on a target molecule. When an antibody is monovalent, each binding site of the molecule will specifically bind to a single antigen position or epitope. When an antibody comprises more than one target binding site (multivalent), each target binding site may specifically bind to the same or different molecules (e.g., may bind to different ligands or different antigens, or different epitopes or positions on the same antigen). See, for example, U.S.P.N. 2009/0130105.

[00246] In one embodiment, the antibodies are bispecific antibodies in which the two chains have different specificities, as described in Millstein et al., 1983, Nature, 305:537-539. Other embodiments include antibodies with additional specificities, such as trispecific antibodies. Other more sophisticated compatible multispecific constructs and methods of their fabrication are set forth in U.S.P.N. 2009/0155255, as well as WO 94/04690; Suresh et al., 1986, Methods in Enzymology, 121:210; and WO96/27011.

[00247] As stated above, multivalent antibodies may immunospecifically bind to different epitopes of the desired target molecule or may immunospecifically bind to both the target molecule as well as a heterologous epitope, such as a heterologous polypeptide or solid support material. In some embodiments, the multivalent antibodies may include bispecific antibodies or trispecific antibodies. Bispecific antibodies also include cross-linked or "heteroconjugate" antibodies. For example, one of the antibodies in the heteroconjugate can be coupled to avidin, the other to biotin. Such antibodies have, for example, been proposed to target immune system cells to unwanted cells (U.S. Pat. No. 4,676,980), and for treatment of HIV infection (WO 91/00360, WO 92/200373, and EP 03089). Heteroconjugate antibodies may be made using any convenient cross-linking methods. Suitable cross-linking agents are well known in the art and are disclosed in U.S. Pat. No. 4,676,980, along with a number of cross-linking techniques.

[00248] In some embodiments, antibody variable domains with the desired binding specificities (antibody-antigen combining sites) are fused to immunoglobulin constant domain sequences, such as an immunoglobulin heavy chain constant domain comprising at least part of the hinge, CH2, and/or CH3 regions, using methods well known to those of ordinary skill in the art.

Antibody Derivatives

[00249] An antibody provided herein may be further modified to contain additional nonproteinaceous moieties that are known in the art and readily available. The moieties suitable for derivatization of the antibody include but are not limited to water-soluble polymers.

[00250] Non-limiting examples of water-soluble polymers include, but are not limited to, PEG, copolymers of ethylene glycol/propylene glycol, carboxymethylcellulose, dextran, polyvinyl alcohol, polyvinyl pyrrolidone, poly-1,3-dioxolane, poly-1,3,6-trioxane, ethylene/maleic anhydride copolymer, polyaminoacids (either homopolymers or random copolymers), and dextran or poly(n-vinyl pyrrolidone)polyethylene glycol, propropylene glycol homopolymers, polypropylene oxide/ethylene oxide co-polymers, polyoxyethylated polyols (e.g., glycerol), polyvinyl alcohol, and mixtures thereof. Polyethylene glycol propionaldehyde may have advantages in manufacturing due to its stability in water. The polymer may be of any molecular weight and may be branched or unbranched. The number of polymers attached to the antibody may vary, and if more than one polymer is attached, they can be the same or different molecules. In general, the number and/or type of polymers used for derivatization can be determined based on considerations including, but not limited to, the particular properties or functions of the antibody to be improved, whether the antibody derivative will be used in a therapy under defined conditions, etc.

[00251] In another embodiment, conjugates of an antibody and nonproteinaceous moiety that may be selectively heated by exposure to radiation are provided. In one embodiment, the nonproteinaceous moiety is a carbon nanotube (Kam et al., Proc. Natl. Acad. Sci. USA 102: 11600-11605 (2005)). The radiation may be of any wavelength and includes, but is not limited to, wavelengths that do not harm ordinary cells, but which heat the nonproteinaceous moiety to a temperature at which cells proximal to the antibody-nonproteinaceous moiety are killed.

[00252] Another modification of the antibodies described herein is pegylation. An antibody can be pegylated to, for example, increase the biological (e.g., serum) half-life of the antibody. To pegylate an antibody, the antibody, or fragment thereof, typically is reacted with PEG, such as a

reactive ester or aldehyde derivative of PEG, under conditions in which one or more PEG groups become attached to the antibody or antibody fragment. Preferably, the pegylation is carried out via an acylation reaction or an alkylation reaction with a reactive PEG molecule (or an analogous reactive water-soluble polymer). As used herein, the term "polyethylene glycol" is intended to encompass any of the forms of PEG that have been used to derivatize other proteins, such as mono (CI -CIO) alkoxy- or aryloxy-polyethylene glycol or polyethylene glycol-maleimide. In some embodiments, the antibody to be pegylated is an aglycosylated antibody. Methods for pegylating proteins are known in the art and can be applied to the antibodies described herein. See, for example, EP0154316 by Nishimura et al. and EP0401384 by Ishikawa et al.

[00253] The present invention also encompasses a human monoclonal antibody described herein conjugated to a therapeutic agent, a polymer, a detectable label, or enzyme. In one embodiment, the therapeutic agent is a cytotoxic agent. In one embodiment, the polymer is PEG.

1.3. Nucleic Acids, Expression Cassettes, and Vectors

[00254] The present invention provides isolated nucleic acid segments that encode the polypeptides, peptide fragments, and coupled proteins of the invention. The nucleic acid segments of the invention also include segments that encode for the same amino acids due to the degeneracy of the genetic code. For example, the amino acid threonine is encoded by ACU, ACC, ACA, and ACG and is therefore degenerate. It is intended that the invention includes all variations of the polynucleotide segments that encode for the same amino acids. Such mutations are known in the art (Watson et al., Molecular Biology of the Gene, Benjamin Cummings 1987). Mutations also include alteration of a nucleic acid segment to encode for conservative amino acid changes, for example, the substitution of leucine for isoleucine and so forth. Such mutations are also known in the art. Thus, the genes and nucleotide sequences of the invention include both the naturally occurring sequences as well as mutant forms.

[00255] The nucleic acid segments of the invention may be contained within a vector. A vector may include, but is not limited to, any plasmid, phagemid, F-factor, virus, cosmid, or phage in a double- or single-stranded linear or circular form which may or may not be self transmissible or mobilizable. The vector can also transform a prokaryotic or eukaryotic host either by integration into the cellular genome or exist extra-chromosomally (e.g., autonomous replicating plasmid with an origin of replication).

[00256] The nucleic acid segment in the vector can be under the control of, and operably linked to, an appropriate promoter or other regulatory elements for transcription *in vitro* or in a host cell, such as a eukaryotic cell, or a microbe, e.g., bacteria. The vector may be a shuttle vector that functions in multiple hosts. The vector may also be a cloning vector that typically contains one or a small number of restriction endonuclease recognition sites at which foreign DNA sequences can be inserted in a determinable fashion. Such insertion can occur without loss of essential biological function of the cloning vector. A cloning vector may also contain a marker gene that is suitable for use in the identification and selection of cells transformed with the cloning vector. Examples of marker genes are tetracycline resistance or ampicillin resistance. Many cloning vectors are commercially available (Stratagene, New England Biolabs, Clonetech).

[00257] The nucleic acid segments of the invention may also be inserted into an expression vector. Typically, an expression vector contains prokaryotic DNA elements coding for a bacterial replication origin and an antibiotic resistance gene to provide for the amplification and selection of the expression vector in a bacterial host; regulatory elements that control initiation of transcription such as a promoter; and DNA elements that control the processing of transcripts such as introns, or a transcription termination/polyadenylation sequence.

[00258] Methods to introduce nucleic acid segment into a vector are available in the art (Sambrook et al., Molecular Cloning: A Laboratory Manual, 3rd edition, Cold Spring Harbor Press, Cold Spring Harbor, N.Y. (2001)). Briefly, a vector into which a nucleic acid segment is to be inserted is treated with one or more restriction enzymes (restriction endonuclease) to produce a linearized vector having a blunt end, a "sticky" end with a 5' or a 3' overhang, or any combination of the above. The vector may also be treated with a restriction enzyme and subsequently treated with another modifying enzyme, such as a polymerase, an exonuclease, a phosphatase or a kinase, to create a linearized vector that has characteristics useful for ligation of a nucleic acid segment into the vector. The nucleic acid segment that is to be inserted into the vector is treated with one or more restriction enzymes to create a linearized segment having a blunt end, a "sticky" end with a 5' or a 3' overhang, or any combination of the above. The nucleic acid segment may also be treated with a restriction enzyme and subsequently treated with another DNA modifying enzyme. Such DNA modifying enzymes include, but are not limited to, polymerase, exonuclease, phosphatase or a kinase, to create a nucleic acid segment that has characteristics useful for ligation of a nucleic acid segment into the vector.

[00259] The treated vector and nucleic acid segment are then ligated together to form a construct containing a nucleic acid segment according to methods available in the art (Sambrook et al., Molecular Cloning: A Laboratory Manual, 3rd edition, Cold Spring Harbor Press, Cold Spring Harbor, N.Y. (2001)). Briefly, the treated nucleic acid fragment, and the treated vector are combined in the presence of a suitable buffer and ligase. The mixture is then incubated under appropriate conditions to allow the ligase to ligate the nucleic acid fragment into the vector.

[00260] The invention also provides an expression cassette that contains a nucleic acid sequence capable of directing expression of a particular nucleic acid segment of the invention, either *in vitro* or in a host cell. Also, a nucleic acid segment of the invention may be inserted into the expression cassette such that an anti-sense message is produced. The expression cassette is an isolatable unit such that the expression cassette may be in linear form and functional for *in vitro* transcription and translation assays. The materials and procedures to conduct these assays are commercially available from Promega Corp. (Madison, Wis.). For example, an *in vitro* transcript may be produced by placing a nucleic acid sequence under the control of a T7 promoter and then using T7 RNA polymerase to produce an *in vitro* transcript. This transcript may then be translated *in vitro* through use of a rabbit reticulocyte lysate. Alternatively, the expression cassette can be incorporated into a vector allowing for replication and amplification of the expression cassette within a host cell or also *in vitro* transcription and translation of a nucleic acid segment.

[00261] Such an expression cassette may contain one or a plurality of restriction sites allowing for placement of the nucleic acid segment under the regulation of a regulatory sequence. The expression cassette can also contain a termination signal operably linked to the nucleic acid segment as well as regulatory sequences required for proper translation of the nucleic acid segment. The expression cassette containing the nucleic acid segment may be chimeric, meaning that at least one of its components is heterologous with respect to at least one of its other components. The expression cassette may also be one that is naturally occurring but has been obtained in a recombinant form useful for heterologous expression. Expression of the nucleic acid segment in the expression cassette may be under the control of a constitutive promoter or an inducible promoter, which initiates transcription only when the host cell is exposed to some particular external stimulus.

[00262] The expression cassette may include in the 5'-3' direction of transcription, a transcriptional and translational initiation region, a nucleic acid segment and a transcriptional and

translational termination region functional *in vivo* and/or *in vitro*. The termination region may be native with the transcriptional initiation region, may be native with the nucleic acid segment, or may be derived from another source.

[00263] The regulatory sequence can be a polynucleotide sequence located upstream (5' non-coding sequences), within, or downstream (3' non-coding sequences) of a coding sequence, and which influences the transcription, RNA processing or stability, or translation of the associated coding sequence. Regulatory sequences can include, but are not limited to, enhancers, promoters, repressor binding sites, translation leader sequences, introns, and polyadenylation signal sequences. They may include natural and synthetic sequences as well as sequences which may be a combination of synthetic and natural sequences. While regulatory sequences are not limited to promoters, some useful regulatory sequences include constitutive promoters, inducible promoters, regulated promoters, tissue-specific promoters, viral promoters, and synthetic promoters.

[00264] A promoter is a nucleotide sequence that controls the expression of the coding sequence by providing the recognition for RNA polymerase and other factors required for proper transcription. A promoter includes a minimal promoter, consisting only of all basal elements needed for transcription initiation, such as a TATA-box and/or initiator that is a short DNA sequence comprised of a TATA-box and other sequences that serve to specify the site of transcription initiation, to which regulatory elements are added for control of expression. A promoter may be derived entirely from a native gene, or be composed of different elements derived from different promoters found in nature, or even be comprised of synthetic DNA segments. A promoter may contain DNA sequences that are involved in the binding of protein factors that control the effectiveness of transcription initiation in response to physiological or developmental conditions.

[00265] The invention also provides a construct containing a vector and an expression cassette. The vector may be selected from, but not limited to, any vector previously described. Into this vector may be inserted an expression cassette through methods known in the art and previously described (Sambrook et al., Molecular Cloning: A Laboratory Manual, 3rd edition, Cold Spring Harbor Press, Cold Spring Harbor, N.Y. (2001)). In one embodiment, the regulatory sequences of the expression cassette may be derived from a source other than the vector into which the expression cassette is inserted. In another embodiment, a construct containing a vector and an expression cassette is formed upon insertion of a nucleic acid segment of the invention into a vector

that itself contains regulatory sequences. Thus, an expression cassette is formed upon insertion of the nucleic acid segment into the vector. Vectors containing regulatory sequences are available commercially, and methods for their use are known in the art (Clonetech, Promega, Stratagene).

[00266] Provided herein are vectors comprising the polynucleotides or nucleic acid molecules disclosed herein.

[00267] The host cell may be co-transfected with two vectors provided herein, the first vector encoding a heavy chain derived polypeptide and the second vector encoding a light chain derived polypeptide. The two vectors may contain identical selectable markers which enable equal expression of heavy and light chain polypeptides. Alternatively, a single vector may be used which encodes, and is capable of expressing, both heavy and light chain polypeptides. In such situations, the light chain should be placed before the heavy chain to avoid an excess of toxic free heavy chain (Proudfoot, Nature, 1986, 322:52; and Kohler, Proc. Natl. Acad. Sci. USA , 1980, 77:2197-9).

[00268] In some embodiments, vectors include, without limitation, plasmids, phagemids, cosmids, transposons, artificial chromosomes such as yeast artificial chromosome (YAC), bacterial artificial chromosome (BAC), or P1-derived artificial chromosome (PAC), bacteriophages such as lambda phage or M13 phage, and animal viruses. In some embodiments, the coding sequences of the antibody or antigen-binding fragment thereof disclosed herein can be ligated into such vectors for expression in mammalian cells.

[00269] In some embodiments, non-viral vectors are used to deliver one or more polynucleotides contemplated herein. In some embodiments, the recombinant vector comprising a polynucleotide encoding the antibody or antigen-binding fragment thereof described herein is a plasmid. Numerous suitable plasmid expression vectors are known to those of skill in the art, and many are commercially available. The following vectors are provided by way of example; for eukaryotic host cells: pXT1, pSG5 (Stratagene), pSVK3, pBPV, pMSG, and pSVLSV40 (Pharmacia). However, any other plasmid vector may be used so long as it is compatible with the host cell.

[00270] In some embodiments, viral vectors are used to deliver one or more polynucleotides contemplated herein. Suitable viral vectors include, but are not limited to, viral vectors based on adenovirus (see, e.g., Li et al., Invest Opthalmol Vis Sci 35:2543 2549, 1994; Borras et al., Gene Ther 6:515 524, 1999; Li and Davidson, PNAS 92:7700 7704, 1995; Sakamoto et al., H Gene Ther 5:1088 1097, 1999; WO 94/12649, WO 93/03769; WO 93/19191 ; WO 94/28938; WO 95/11984 and WO 95/00655); adeno-associated virus (see, e.g., U.S. Patent No. 7,078,387; Ali et al., Hum

Gene Ther 9:81 86, 1998, Flannery et al,, PNAS 94:6916 6921 , 1997; Bennett et al., Invest Opthalmol Vis Sci 38:2857 2863, 1997; Jomary et al., Gene Ther 4:683 690, 1997, Rolling et al., Hum Gene Ther 10:641 648, 1999; Ali et al., Hum Mol Genet 5:591 594, 1996; Srivastava in WO 93/09239, Samulski et al., J. Vir. (1989) 63:3822-3828; Mendelson et al,, Virol. (1988) 166:154-165; and Flotte et al., PNAS (1993) 90:10613-10617); alphaviruses; arenaviruses; baculovirus; herpes simplex virus; human immunodeficiency virus (see, e.g., Miyoshi et al., PNAS 94:10319 23, 1997; Takahashi et al., J Virol 73:7812 7816, 1999); poliovirus; poxvirus; retrovirus (e.g., Murine Leukemia Virus, spleen necrosis virus, and vectors derived from retroviruses such as Rous Sarcoma Virus, Harvey Sarcoma Virus, avian leukosis virus, a lentivirus, human immunodeficiency virus, myeloproliferative sarcoma virus, and mammary tumor virus); SV40; vaccinia virus; and the like. Examples of vectors are pClneo vectors (Promega) for expression in mammalian cells; pLenti4/V5-DEST™, pLenti6/V5-DEST™, and pLenti6.2/V5-GW/lacZ (Invitrogen) for lentivirus-mediated gene transfer and expression in mammalian cells.

[00271] In some embodiments, the vector is a non-integrating vector, including but not limited to, an episomal vector or a vector that is maintained extrachromosomally. As used herein, the term "episomal" refers to a vector that is able to replicate without integration into host's chromosomal DNA and without gradual loss from a dividing host cell also meaning that said vector replicates extrachromosomally or episomally. The vector is engineered to harbor the sequence coding for the origin of DNA replication or "ori" from a lymphotrophic herpes virus or a gamma herpesvirus, an adenovirus, SV40, a bovine papilloma virus, or a yeast, specifically a replication origin of a lymphotrophic herpes virus or a gamma herpesvirus corresponding to oriP of EBV. In some embodiments, the lymphotrophic herpes virus may be Epstein Barr virus (EBV), Kaposi's sarcoma herpes virus (KSHV), Herpes virus saimiri (HS), or Marek's disease virus (MDV). Epstein Barr virus (EBV) and Kaposi's sarcoma herpes virus (KSHV) are also examples of a gamma herpesvirus. A viral vector delivered by such viruses or viral particles may be referred to by the type of virus to deliver the viral vector (e.g., a lentiviral vector is a viral vector that is to be delivered by a lentivirus). A viral vector can contain viral elements (e.g., nucleotide sequences) necessary for packaging of the viral vector into the virus or viral particle, replicating the virus, or other desired viral activities. A virus containing a viral vector may be replication competent, replication deficient or replication defective.

[00272] In some embodiments, the vector is an integrating vector. In some embodiments, a polynucleotide is introduced into a target or host cell using a transposon vector system. In some embodiments, the transposon vector system comprises a vector comprising transposable elements and a polynucleotide contemplated herein; and a transposase. In some embodiments, the transposon vector system is a single transposase vector system, see, e.g., WO 2008/027384. Exemplary transposases include, but are not limited to: piggyBac, Sleeping Beauty, Mos1, Tc1/mariner, Tol2, mini-Tol2, Tc3, MuA, Himar I, Frog Prince, and derivatives thereof. The piggyBac transposon and transposase are described, for example, in U.S. Patent 6,962,810, which is incorporated herein by reference in its entirety. The Sleeping Beauty transposon and transposase are described, for example, in Izsvak et al., J. Mol. Biol. 302: 93-102 (2000), which is incorporated herein by reference in its entirety. The Tol2 transposon which was first isolated from the medaka fish Oryzias latipes and belongs to the hAT family of transposons is described in Kawakami et al. (2000). Mini-Tol2 is a variant of Tol2 and is described in Balciunas et al. (2006). The Tol2 and Mini-Tol2 transposons facilitate integration of a transgene into the genome of an organism when co-acting with the Tol2 transposase. The Frog Prince transposon and transposase are described, for example, in Miskey et al., Nucleic Acids Res. 31:6873-6881 (2003).

[00273] In some embodiments, a polynucleotide sequence encoding the antibody or antigen-binding fragment thereof disclosed herein is operably linked to one or more control elements that allow expression of the polynucleotide in both prokaryotic and eukaryotic cells. "Control elements" refer those non-translated regions of the vector which interact with host cellular proteins to carry out transcription and translation. Non-limiting examples of control elements include origin of replication, selection cassettes, constitutive and inducible promoters, enhancers, translation initiation signals (Shine Dalgarno sequence or Kozak sequence) introns, transcription terminators, 5' and 3' untranslated regions. See e.g., Bitter et al. (1987) Methods in Enzymology, 153:516-544) Such elements may vary in their strength and specificity. The transcriptional control element may be functional in either a eukaryotic cell (e.g., a mammalian cell) or a prokaryotic cell (e.g., bacterial or archaeal cell).

[00274] In some embodiments, polynucleotides encoding the antibody or antigen-binding fragment thereof described herein are operably linked to a promoter and/or an enhancer. The term "promoter" as used herein refers to a recognition site of a polynucleotide (DNA or RNA) to which an RNA polymerase binds. An RNA polymerase initiates and transcribes polynucleotides operably

linked to the promoter. In some embodiments, promoters operative in mammalian cells comprise an AT-rich region located approximately 25 to 30 bases upstream from the site where transcription is initiated and/or another sequence found 70 to 80 bases upstream from the start of transcription, a CNCAAT region where N may be any nucleotide. The term "enhancer" refers to a segment of DNA which contains sequences capable of providing enhanced transcription and in some instances can function independent of their orientation relative to another control sequence. An enhancer can function cooperatively or additively with promoters and/or other enhancer elements.

[00275] Non-limiting examples of suitable eukaryotic promoters (promoters functional in a eukaryotic cell) include those from cytomegalovirus (CMV) immediate early, herpes simplex virus (HSV) thymidine kinase, a viral simian virus 40 (SV40) (e.g., early and late SV40), a spleen focus forming virus (SFFV) promoter, long terminal repeats (LTRs) from retrovirus (e.g., a Moloney murine leukemia virus (MoMLV) LTR promoter or a Rous sarcoma virus (RSV) LTR), a herpes simplex virus (HSV) (thymidine kinase) promoter, H5, P7.5, and P11 promoters from vaccinia virus, an elongation factor 1-alpha (EF1α) promoter, early growth response 1 (EGR1) promoter, a ferritin H (FerH) promoter, a ferritin L (FerL) promoter, a Glyceraldehyde 3-phosphate dehydrogenase (GAPDH) promoter, a eukaryotic translation initiation factor 4A1 (EIF4A1) promoter, a heat shock 70kDa protein 5 (HSPA5) promoter, a heat shock protein 90kDa beta, member 1 (HSP90B1) promoter, a heat shock protein 70kDa (HSP70) promoter, a β-kinesin (β-KIN) promoter, the human ROSA 26 locus (Irions et al., Nature Biotechnology 25, 1477-1482 (2007)), a Ubiquitin C (UBC) promoter, a phosphoglycerate kinase-1 (PGK) promoter, a cytomegalovirus enhancer/chicken β-actin (CAG) promoter, a β-actin promoter and a myeloproliferative sarcoma virus enhancer, negative control region deleted, dl587rev primer-binding site substituted (MND) promoter, and mouse metallothionein-l. Selection of the appropriate vector and promoter is well within the level of ordinary skill in the art.

[00276] In some embodiments, a polynucleotide sequence encoding the antibody or antigen-binding fragment thereof described herein is operably linked to a constitutive promoter. In such embodiments, the polynucleotides encoding the antibody or antigen-binding fragment thereof described herein are constitutively and/or ubiquitously expressed in a cell.

[00277] In some embodiments, a polynucleotide sequence encoding the antibody or antigen-binding fragment thereof described herein is operably linked to an inducible promoter. In such embodiments, polynucleotides encoding the antibody or antigen-binding fragment thereof

described herein are conditionally expressed. As used herein, "conditional expression" may refer to any type of conditional expression including, but not limited to, inducible expression; repressible expression; expression in cells or tissues having a particular physiological, biological, or disease state (e.g., cell type or tissue specific expression) etc. Illustrative examples of inducible promoters/systems include, but are not limited to, steroid-inducible promoters such as promoters for genes encoding glucocorticoid or estrogen receptors (inducible by treatment with the corresponding hormone), metallothionine promoter (inducible by treatment with various heavy metals), MX-1 promoter (inducible by interferon), the "GeneSwitch" mifepristone-regulatable system (Sirin et al., 2003, Gene, 323:67), the cumate inducible gene switch (WO 2002/088346), tetracycline-dependent regulatory systems, etc.

[00278] In some embodiments, the vectors described herein further comprise a transcription termination signal. Elements directing the efficient termination and polyadenylation of the heterologous nucleic acid transcripts increases heterologous gene expression. Transcription termination signals are generally found downstream of the polyadenylation signal. In some embodiments, vectors comprise a polyadenylation sequence 3' of a polynucleotide encoding a polypeptide to be expressed. The term "polyA site" or "polyA sequence" as used herein denotes a DNA sequence which directs both the termination and polyadenylation of the nascent RNA transcript by RNA polymerase II. Polyadenylation sequences can promote mRNA stability by addition of a polyA tail to the 3' end of the coding sequence and thus, contribute to increased translational efficiency. Cleavage and polyadenylation is directed by a poly(A) sequence in the RNA. The core poly(A) sequence for mammalian pre-mRNAs has two recognition elements flanking a cleavage-polyadenylation site. Typically, an almost invariant AAUAAA hexamer lies 20-50 nucleotides upstream of a more variable element rich in U or GU residues. Cleavage of the nascent transcript occurs between these two elements and is coupled to the addition of up to 250 adenosines to the 5' cleavage product. In some embodiments, the core poly(A) sequence is an ideal polyA sequence (e.g., AATAAA, ATTAAA, AGTAAA). In some embodiments, the poly(A) sequence is an SV40 polyA sequence, a bovine growth hormone polyA sequence (BGHpA), a rabbit β-globin polyA sequence (rβgpA), variants thereof, or another suitable heterologous or endogenous polyA sequence known in the art.

[00279] The expression vector may also include nucleotide sequences encoding protein tags (e.g., 6xHis tag, hemagglutinin tag, green fluorescent protein, etc.) that are fused to the site-directed modifying polypeptide, thus resulting in a chimeric polypeptide.

[00280] Methods of introducing polynucleotides and recombinant vectors into a host cell are known in the art. Suitable methods include e.g., viral or bacteriophage infection, transfection, conjugation, protoplast fusion, lipofection, electroporation, calcium phosphate precipitation, polyethyleneimine (PEI)-mediated transfection, DEAE-dextran mediated transfection, liposome-mediated transfection, particle gun technology, calcium phosphate precipitation, direct micro injection, nanoparticle-mediated nucleic acid delivery (see, e.g., Panyam et al., Adv Drug Deliv Rev. 2012 Sep 13. pii: S0169-409X(12)00283-9), microfluidics delivery methods (See e.g., International PCT Publication No. WO 2013/059343), and the like.

[00281] In some embodiments, delivery via electroporation comprises mixing the cells with the polynucleotides encoding the antibody or antigen-binding fragment thereof in a cartridge, chamber, or cuvette and applying one or more electrical impulses of defined duration and amplitude. In some embodiments, cells are mixed with polynucleotides encoding the antibody or antigen-binding fragment thereof in a vessel connected to a device (e.g., a pump) which feeds the mixture into a cartridge, chamber, or cuvette wherein one or more electrical impulses of defined duration and amplitude are applied, after which the cells are delivered to a second vessel. Illustrative examples of polynucleotide delivery systems suitable for use in particular embodiments contemplated include, but are not limited to, those provided by Amaxa Biosystems, Maxcyte, Inc., BTX Molecular Delivery Systems, Neon® Transfection Systems, and Copernicus Therapeutics Inc. Lipofection reagents are sold commercially (e.g., Transfectam™ and Lipofectin™). Cationic and neutral lipids that are suitable for efficient lipofection of polynucleotides have been described in the literature. See e.g., Liu et al. (2003) Gene Therapy. 10:180–187; and Balazs et al. (2011) Journal of Drug Delivery. 2011:1-12.

[00282] In some embodiments, polynucleotides encoding the antibody or antigen-binding fragment thereof described herein are introduced to a cell in a non-viral delivery vehicle, such as a transposon, a nanoparticle (e.g., a lipid nanoparticle), a liposome, an exosome, an attenuated bacterium, or a virus-like particle. In some embodiments, the vehicle is an attenuated bacterium (e.g., naturally or artificially engineered to be invasive but attenuated to prevent pathogenesis including Listeria monocytogenes, certain Salmonella strains, Bifidobacterium longum, and

modified Escherichia coli), bacteria having nutritional and tissue-specific tropism to target specific cells, and bacteria having modified surface proteins to alter target cell specificity. In some embodiments, the vehicle is a genetically modified bacteriophage (e.g., engineered phages having large packaging capacity, less immunogenicity, containing mammalian plasmid maintenance sequences and having incorporated targeting ligands). . In some embodiments, the vehicle is a biological liposome. For example, the biological liposome is a phospholipid-based particle derived from human cells (e.g., erythrocyte ghosts, which are red blood cells broken down into spherical structures derived from the subject and wherein tissue targeting can be achieved by attachment of various tissue or cell-specific ligands), secretory exosomes, or subject-derived membrane-bound nanovesicles (30-100 nm) of endocytic origin (e.g., can be produced from various cell types and can therefore be taken up by cells without the need for targeting ligands).

[00283] In some embodiments, vectors comprising polynucleotides encoding the antibody or antigen-binding fragment thereof described herein are introduced to cells by viral delivery methods, e.g., by viral transduction. A number of viral based systems have been developed for gene transfer into mammalian cells. For example, retroviruses provide a convenient platform for gene delivery systems. The heterologous nucleic acid can be inserted into a vector and packaged in retroviral particles using techniques known in the art. The recombinant virus can then be isolated and delivered to the engineered mammalian cell *in vitro* or *ex vivo*. A number of retroviral systems are known in the art. In some embodiments, adenovirus vectors are used. A number of adenovirus vectors are known in the art. In some embodiments, lentivirus vectors are used. In some embodiments, self-inactivating lentiviral vectors are used. For example, self-inactivating lentiviral vectors carrying the immunomodulator (such as immune checkpoint inhibitor) coding sequence and/or self-inactivating lentiviral vectors carrying chimeric antigen receptors can be packaged with protocols known in the art. The resulting lentiviral vectors can be used to transduce a mammalian cell (such as primary human T cells) using methods known in the art. Vectors derived from retroviruses such as lentivirus are suitable tools to achieve long-term gene transfer, because they allow long-term, stable integration of a transgene and its propagation in progeny cells. Lentiviral vectors also have low immunogenicity, and can transduce nonproliferating cells.

[00284] In some embodiments, the vehicle is a mammalian virus-like particle. For example, modified viral particles can be generated (e.g., by purification of the "empty" particles followed by *ex vivo* assembly of the virus with the desired cargo).

[00285] In another aspect, this disclosure also provides (i) a nucleic acid molecule encoding a polypeptide chain of the antibody or antigen-binding fragment thereof described herein; (ii) a vector comprising the nucleic acid molecule as described; and (iii) a cultured host cell comprising the vector as described. Also provided is a method for producing a polypeptide, comprising: (a) obtaining the cultured host cell as described; (b) culturing the cultured host cell in a medium under conditions permitting expression of a polypeptide encoded by the vector and assembling of an antibody or fragment thereof; and (c) purifying the antibody or fragment from the cultured cell or the medium of the cell.

[00286] Provided herein are polynucleotides encoding the antibody or antigen-binding fragment thereof that binds to the S polypeptide of a Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) disclosed herein.

[00287] Polynucleotides disclosed herein can be at least about 5, at least about 10, at least about 15, at least about 20, at least about 25, at least about 30, at least about 40, at least about 50, at least about 100, at least about 200, at least about 300, at least about 400, at least about 500, at least about 1000, at least about 5000, at least about 10000, or at least about 15000 or more nucleotides in length, as well as all intermediate lengths. It will be readily understood that "intermediate lengths," in this context, means any length between the quoted values, such as 6, 7, 8, 9, etc., 101, 102, 103, etc.; 151, 152, 153, etc.; 201, 202, 203, etc.

[00288] The present disclosure further relates to variants of the polynucleotides disclosed herein. The polynucleotide variants can contain alterations in the coding regions, non-coding regions, or both.

[00289] In some embodiments, a polynucleotide variant comprising a nucleotide sequence that is at least about 75 %, about 80 %, about 85 %, about 90 %, about 91 %, about 92 %, about 93 %, about 94 %, about 95 %, about 96 %, about 97 %, about 98%, or about 99 % identical to the nucleotide sequence of a polynucleotide disclosed herein.

[00290] In some embodiments, a polynucleotide variant contains substitutions, additions, or deletions that alter the properties or activities of the encoded polypeptide. In some embodiments, a polynucleotide variant contains silent substitutions, additions, or deletions that does not alter the properties or activities of the encoded polypeptide. In some embodiments, a polynucleotide variant is produced to modulate or alter expression (or expression levels) of the encoded polypeptide. In some embodiments, a polynucleotide variant is produced to increase expression of the encoded

polypeptide. In some embodiments, a polynucleotide variant is produced to decrease expression of the encoded polypeptide. In some embodiments, a polynucleotide variant has increased expression of the encoded polypeptide as compared to a parental polynucleotide sequence. In some embodiments, a polynucleotide variant has decreased expression of the encoded polypeptide as compared to a parental polynucleotide sequence.

[00291] In some embodiments, polynucleotides are codon-optimized. As used herein, the term "codon-optimized" refers to substituting codons in a polynucleotide encoding a polypeptide in order to increase the expression, stability and/or activity of the polypeptide. Factors that influence codon optimization include, but are not limited to one or more of: (i) variation of codon biases between two or more organisms or genes or synthetically constructed bias tables, (ii) variation in the degree of codon bias within an organism, gene, or set of genes, (iii) systematic variation of codons including context, (iv) variation of codons according to their decoding tRNAs, (v) variation of codons according to GC %, either overall or in one position of the triplet, (vi) variation in degree of similarity to a reference sequence for example a naturally occurring sequence, (vii) variation in the codon frequency cutoff, (viii) structural properties of mRNAs transcribed from the DNA sequence, (ix) prior knowledge about the function of the DNA sequences upon which design of the codon substitution set is to be based, (x) systematic variation of codon sets for each amino acid, (xi) isolated removal of spurious translation initiation sites and/or (xii) elimination of fortuitous polyadenylation sites otherwise leading to truncated RNA transcripts.

[00292] It will be appreciated by those of ordinary skill in the art that, as a result of the degeneracy of the genetic code, there are many nucleotide sequences that encode a polypeptide, or fragment of variant thereof, as described herein. Some of these polynucleotides bear minimal homology to the nucleotide sequence of any native gene. Nonetheless, polynucleotides that vary due to differences in codon usage are specifically contemplated in particular embodiments, for example polynucleotides that are optimized for human and/or primate codon selection. Further, alleles of the genes comprising the polynucleotide sequences provided herein may also be used. Alleles are endogenous genes that are altered as a result of one or more mutations, such as deletions, additions and/or substitutions of nucleotides.

[00293] The polynucleotides contemplated herein, regardless of the length of the coding sequence itself, may be combined with other DNA sequences, such as promoters and/or enhancers, untranslated regions (UTRs), signal sequences, Kozak sequences, polyadenylation signals,

additional restriction enzyme sites, multiple cloning sites, internal ribosomal entry sites (IRES), recombinase recognition sites (e.g., LoxP, FRT, and Att sites), termination codons, transcriptional termination signals, and polynucleotides encoding self-cleaving polypeptides, epitope tags, as disclosed elsewhere herein or as known in the art, such that their overall length may vary considerably. It is therefore contemplated that a polynucleotide fragment of almost any length may be employed in particular embodiments, with the total length preferably being limited by the ease of preparation and use in the intended recombinant DNA protocol.

[00294] Polynucleotides can be prepared, isolated, purified, manipulated, and/or expressed using any of a variety of well-established techniques known and available in the art.

1.4. Methods of Production

[00295] Antibodies may be produced using recombinant methods and compositions, e.g., as described in U.S. Pat. No. 4,816,567. In one embodiment, an isolated nucleic acid encoding an antibody described herein is provided. Such nucleic acid may encode an amino acid sequence comprising the VL and/or an amino acid sequence comprising the VH of the antibody (e.g., the light and/or heavy chains of the antibody). In a further embodiment, one or more vectors (e.g., expression vectors) comprising such nucleic acid are provided. In a further embodiment, a host cell comprising such nucleic acid is provided. In one such embodiment, a host cell comprises (e.g., has been transformed with): (1) a vector comprising a nucleic acid that encodes an amino acid sequence comprising the VL of the antibody and an amino acid sequence comprising the VH of the antibody, or (2) a first vector comprising a nucleic acid that encodes an amino acid sequence comprising the VL of the antibody and a second vector comprising a nucleic acid that encodes an amino acid sequence comprising the VH of the antibody. In one embodiment, the host cell is eukaryotic, e.g., a Chinese Hamster Ovary (CHO) cell or lymphoid cell (e.g., Y0, NS0, Sp20 cell). In one embodiment, a method of making an antibody is provided, wherein the method comprises culturing a host cell comprising a nucleic acid encoding the antibody, as provided above, under conditions suitable for expression of the antibody, and optionally recovering the antibody from the host cell (or host cell culture medium).

[00296] For recombinant production of an antibody, a nucleic acid encoding an antibody, e.g., as described herein, is isolated and inserted into one or more vectors for further cloning and/or expression in a host cell. Such nucleic acid may be readily isolated and sequenced using

conventional procedures (e.g., by using oligonucleotide probes that are capable of binding specifically to genes encoding the heavy and light chains of the antibody).

[00297] Suitable host cells for cloning or expression of antibody-encoding vectors include prokaryotic or eukaryotic cells described herein. For example, antibodies may be produced in bacteria, in particular when glycosylation and Fc effector function are not needed. For expression of antibody fragments and polypeptides in bacteria, see, e.g., U.S. Pat. Nos. 5,648,237, 5,789,199, and 5,840,523. (See also Charlton, Methods in Molecular Biology, Vol. 248 (B.K.C. Lo, ed., Humana Press, Totowa, N.J., 2003), pp. 245-254, describing expression of antibody fragments in E. coli.) After expression, the antibody may be isolated from the bacterial cell paste in a soluble fraction and can be further purified.

[00298] In addition to prokaryotes, eukaryotic microbes such as filamentous fungi or yeast are suitable cloning or expression hosts for antibody-encoding vectors, including fungi and yeast strains whose glycosylation pathways have been "humanized," resulting in the production of an antibody with a partially or fully human glycosylation pattern. See Gerngross, Nat. Biotech. 22:1409-1414 (2004), and Li et al., Nat. Biotech. 24:210-215 (2006).

[00299] Suitable host cells for the expression of glycosylated antibodies are also derived from multicellular organisms (invertebrates and vertebrates). Examples of invertebrate cells include plant and insect cells. Numerous baculoviral strains have been identified, which may be used in conjunction with insect cells, particularly for transfection of Spodoptera frugiperda cells.

[00300] Plant cell cultures can also be utilized as hosts. See, e.g., U.S. Pat. Nos. 5,959,177, 6,040,498, 6,420,548, 7,125,978, and 6,417,429 (describing PLANTIBODIES technology for producing antibodies in transgenic plants).

[00301] Vertebrate cells may also be used as hosts. For example, mammalian cell lines that are adapted to grow in suspension may be useful. Other examples of useful mammalian host cell lines are monkey kidney CV1 line transformed by SV40 (COS-7); human embryonic kidney line (293 or 293 cells as described, e.g., in Graham et al., J. Gen Virol. 36:59 (1977)); baby hamster kidney cells (BHK); mouse sertoli cells (TM4 cells as described, e.g., in Mather, Biol. Reprod. 23:243-251 (1980)); monkey kidney cells (CV1); African green monkey kidney cells (VERO-76); human cervical carcinoma cells (HELA); canine kidney cells (MDCK; buffalo rat liver cells (BRL 3A); human lung cells (W138); human liver cells (Hep G2); mouse mammary tumor (MMT 060562); TRI cells, as described, e.g., in Mather et al., Annals N.Y. Acad. Sci. 383:44-68 (1982); MRC 5

cells; and FS4 cells. Other useful mammalian host cell lines include CHO cells, including DHFR-CHO cells (Urlaub et al., Proc. Natl. Acad. Sci. USA 77:4216 (1980)); and myeloma cell lines such as Y0, NS0, and Sp2/0. For a review of certain mammalian host cell lines suitable for antibody production, see, e.g., Yazaki and Wu, Methods in Molecular Biology, Vol. 248 (B.K.C. Lo, ed., Humana Press, Totowa, N.J.), pp. 255-268 (2003).

[00302] Monoclonal antibodies or functional fragments thereof (e.g., antigen-binding fragment thereof) may be made using, for example, the hybridoma method or the phage display method.

[00303] In the hybridoma method (see, e.g., described in Kohler, et al., Nature, 1975, 256:495-7), a mouse or other appropriate host animal, such as a hamster, is immunized as described above to elicit lymphocytes that produce or are capable of producing antibodies that will specifically bind to the protein used for immunization. Alternatively, lymphocytes may be immunized *in vitro*. After immunization, lymphocytes are isolated and then fused with a myeloma cell line using a suitable fusing agent, such as polyethylene glycol, to form a hybridoma cell (Goding, Monoclonal Antibodies: Principles and Practice 59-103 (1986)).

[00304] The hybridoma cells thus prepared are seeded and grown in a suitable culture medium, which, in some embodiments, contains one or more substances that inhibit the growth or survival of the unfused, parental myeloma cells (also referred to as fusion partner). For example, if the parental myeloma cells lack the enzyme hypoxanthine guanine phosphoribosyl transferase (HGPRT or HPRT), the selective culture medium for the hybridomas typically will include hypoxanthine, aminopterin, and thymidine (HAT medium), which prevent the growth of HGPRT-deficient cells.

[00305] Exemplary parental myeloma cells are those that fuse efficiently, support stable high-level production of antibody by the selected antibody-producing cells, and are sensitive to a selective medium that selects against the unfused parental cells. Exemplary myeloma cell lines are murine myeloma lines, such as SP-2 and derivatives, for example, X63-Ag8-653 cells available from the American Type Culture Collection (Manassas, VA), and those derived from MOPC-21 and MPC-11 mouse tumors available from the Salk Institute Cell Distribution Center (San Diego, CA). Human myeloma and mouse-human heteromyeloma cell lines also have been described for the production of human monoclonal antibodies (Kozbor, Immunol. 1984, 133:3001-05; and Brodeur, et al., Monoclonal Antibody Production Techniques and Applications, 1987, 51-63).

[00306] Culture medium in which hybridoma cells are growing is assayed for production of monoclonal antibodies directed against the antigen. The binding specificity of monoclonal antibodies produced by hybridoma cells is determined by immunoprecipitation or by an *in vitro* binding assay, such as RIA or ELISA. The binding affinity of the monoclonal antibody can, for example, be determined by the Scatchard analysis described in Munson et al., Anal. Biochem., 1980, 107:220-39.

[00307] Once hybridoma cells that produce antibodies of the desired specificity, affinity, and/or activity are identified, the clones may be subcloned by limiting dilution procedures and grown by standard methods (Goding, supra). Suitable culture media for this purpose include, for example, DMEM or RPMI-1640 medium. In addition, the hybridoma cells may be grown *in vivo* as ascites tumors in an animal, for example, by i.p. injection of the cells into mice.

[00308] The monoclonal antibodies secreted by the subclones are suitably separated from the culture medium, ascites fluid, or serum by conventional antibody purification procedures such as, for example, affinity chromatography (e.g., using protein A or protein G-Sepharose) or ion-exchange chromatography, hydroxyapatite chromatography, gel electrophoresis, dialysis, etc.

[00309] In the phage display method, synthetic antibody clones are selected by screening phage libraries containing phages that display various fragments of antibody variable region (Fv) fused to phage coat protein. Such phage libraries are screened against the desired antigen. Clones expressing Fv fragments capable of binding to the desired antigen are adsorbed to the antigen and thus separated from the non-binding clones in the library. The binding clones are then eluted from the antigen and can be further enriched by additional cycles of antigen absorption/elution.

[00310] Variable domains can be displayed functionally on phage, either as single-chain Fv (scFv) fragments, in which VH and VL are covalently linked through a short, flexible peptide, or as Fab fragments, in which they are each fused to a constant domain and interact non-covalently, as described, for example, in Winter et al., 1994, Ann. Rev. Immunol. 12:433-55.

[00311] Repertoires of VH and VL genes can be separately cloned by PCR and recombined randomly in phage libraries, which can then be searched for antigen-binding clones as described in Winter et al, supra. Libraries from immunized sources provide high-affinity antibodies to the antigen without the requirement of constructing hybridomas. Alternatively, naive libraries can be cloned to provide a single source of human antibodies to a wide range of non-self and self-antigens without any immunization as described by Griffiths et al., EMBO J, 1993, 12:725-34. Finally,

naive libraries can also be made synthetically by cloning the unrearranged V-gene segments from stem cells, and using PCR primers containing random sequence to encode the highly variable CDR3 regions and to accomplish rearrangement *in vitro* as described, for example, by Hoogenboom and Winter, J. Mol. Biol., 1992, 227:381-88.

[00312] Screening of the libraries can be accomplished by various techniques known in the art. For example, the antigen can be used to coat the wells of adsorption plates, expressed on host cells affixed to adsorption plates or used in cell sorting, conjugated to biotin for capture with streptavidin-coated beads, or used in any other method for panning display libraries. The selection of antibodies with slow dissociation kinetics (e.g., good binding affinities) can be promoted by use of long washes and monovalent phage display as described in Bass, et al, Proteins, 1990, 8:309-14 and WO 92/09690, and by use of a low coating density of antigen as described in Marks et al, BiotechnoL, 1992, 10:779-83.

[00313] Exemplary phage display methods that can be used herein include those disclosed in Antibody Phage Display: Methods and Protocols (O'Brien and Aitken, eds., 2002); Brinkman, et al, J. Immunol. Methods, 1995, 182:41-50; Ames, et al., Immunol. Methods, 1995, 184:177-86; Kettleborough, et al., Eur. J. Immunol., 1994, 24:952-8; Persic, et al., Gene, 1997, 187:9-18; Burton et al., Advances in Immunology, 1994, 57:191-280; PCT Application No. PCT/GB91/01134; International Publication Nos. WO 90/02809, WO 91/10737, WO 92/01047, WO 92/18619, WO 93/1 1236, WO 95/15982, WO 95/20401, and W097/13844; and U.S. Patent Nos. 5,698,426, 5,223,409, 5,403,484, 5,580,717, 5,427,908, 5,750,753, 5,821,047, 5,571,698, 5,427,908, 5,516,637, 5,780,225, 5,658,727, 5,733,743 and 5,969,108.

[00314] DNA encoding the monoclonal antibodies is readily isolated from the hybridoma cells and the screened libraries. Such DNA can be sequenced using conventional procedures (e.g., by using oligonucleotide probes that are capable of binding specifically to genes encoding the heavy and light chains of murine antibodies). Once isolated, the DNA may be placed into expression vectors, which are then transfected into host cells, such as *E. coli* cells, simian COS cells, Chinese Hamster Ovary (CHO) cells, or myeloma cells that do not otherwise produce antibody protein, to obtain the synthesis of monoclonal antibodies in the recombinant host cells. Review articles on recombinant expression in bacteria of DNA encoding the antibody include Skerra, et al., Curr. Opinion in Immunol., 1993, 5:256-62 and Pluckthun, Immunol. Revs., 1992, 130:151-88.

[00315] Once an antibody molecule provided herein has been produced by recombinant expression, it may be purified by any method known in the art for purification of an immunoglobulin molecule, for example, by chromatography (e.g., ion exchange, affinity, particularly by affinity for the specific antigen after Protein A, and sizing column chromatography), centrifugation, differential solubility, or by any other standard technique for the purification of proteins. Further, the antibodies provided herein can be fused to heterologous polypeptide sequences described herein or otherwise known in the art to facilitate purification.

Humanized, Human, and Recombinant Antibodies

[00316] The antibodies disclosed herein can comprise "chimeric" sequences in which a portion of the heavy and/or light chain is identical with or homologous to corresponding sequences in antibodies derived from a particular species or belonging to a particular antibody class or subclass, while the remainder of the chain(s) is identical with or homologous to corresponding sequences in antibodies derived from another species or belonging to another antibody class or subclass, so long as they exhibit the desired biological activity (see U S. Pat. No. 4,816,567; and Morrison, et al. , Proc. Natl. Acad. Sci. USA , 1984, 81:6851-55).

[00317] The antibodies disclosed herein can be humanized antibodies. A humanized antibody can comprise human framework region and human constant region sequences. In some embodiments, one or more FR region residues of the human immunoglobulin are replaced by corresponding nonhuman residues. In some embodiments, humanized antibodies comprise residues that are not found in the recipient antibody or in the donor antibody. These modifications are made to further refine antibody performance.

[00318] Humanized antibodies can be produced using a variety of techniques known in the art, including but not limited to, CDR-grafting (European Patent No. EP 239,400; International publication No. WO 91/09967; and U S. Patent Nos. 5,225,539, 5,530,101, and 5,585,089), veneering or resurfacing (European Patent Nos. EP 592,106 and EP 519,596; Padlan, Molecular Immunology, 1991, 28(4/5):489-498; Studnicka, et al., Protein Engineering, 1994, 7(6):805-814; and Roguska, et al., Proc. Natl. Acad. Sci. USA, 1994, 91:969-73), chain shuffling (U.S. Patent No. 5,565,332), and techniques disclosed in, e.g., U.S. Pat. No. 6,407,213, U.S. Pat. No. 5,766,886, WO 93/17105; Tan, et al., J. Immunol., 2002, 169:1119-25; Caldas, et al., Protein Eng., 2000, 13(5):353-60; Morea et al., Methods, 2000, 20(3):267-79, Baca, et al., J. Biol. Chem., 1997, 272(16): 10678-84; Roguska, et al., Protein Eng., 1996, 9(10):895 904; Couto, et al., Cancer Res.,

1995, 55 (23 Supp):5973s-5977s; Couto, et al., Cancer Res., 1995, 55(8): 1717-22; Sandhu, J.S., Gene, 1994, 150(2):409-10 and Pedersen, et al., J. Mol. Biol., 1994, 235(3):959-73. See also U.S. Patent Pub. No. US 2005/0042664 Al (Feb. 24, 2005), each of which is incorporated by reference herein in its entirety. In some embodiments, the humanized antibodies are constructed by CDR grafting, in which the amino acid sequences of the six CDRs of the parent non-human antibody (e.g., rodent) are grafted onto a human antibody framework. For example, Padlan, et al. determined that only about one third of the residues in the CDRs actually contact the antigen, and termed these the "specificity determining residues," or SDRs (Padlan, et al, FASEB J., 1995, 9: 133-9). In the technique of SDR grafting, only the SDR residues are grafted onto the human antibody framework (see, e.g., Kashmiri, et al, Methods, 2005, 36:25-34).

[00319] The choice of human variable domains, both light and heavy, to be used in making the humanized antibodies can be important to reduce antigenicity. For example, according to the so-called "best-fit" method, the sequence of the variable domain of a non-human (e.g., rodent) antibody is screened against the entire library of known human variable-domain sequences. The human sequence that is closest to that of the rodent may be selected as the human framework for the humanized antibody (Sims et al., J. Immunol., 1993, 151:2296-308; and Chothia et al., J. Mol. Biol., 1987, 196:901-17).

[00320] Another method uses a particular framework derived from the consensus sequence of all human antibodies of a particular subgroup of light or heavy chains. The same framework may be used for several different humanized antibodies (Carter et al., Proc. Natl. Acad. Sci. USA, 1992, 89:4285-89; and Presta et al., J Immunol., 1993, 151:2623-32). In some embodiments, the framework is derived from the consensus sequences of the most abundant human subclasses, VL6 subgroup I (VL6I) and VH subgroup III (VHIII).

[00321] In an alternative method based on comparison of CDRs, called superhumanization, FR homology is irrelevant. The method consists of comparison of the non-human sequence with the functional human germline gene repertoire. Those genes encoding the same or closely related canonical structures to the murine sequences are then selected. Next, within the genes sharing the canonical structures with the non-human antibody, those with highest homology within the CDRs are chosen as FR donors. Finally, the non-human CDRs are grafted onto these FRs (see, e.g., Tan et al., J. Immunol., 2002, 169:1119-25).

[00322] Another method for antibody humanization is based on a metric of antibody humanness termed Human String Content (HSC). This method compares the mouse sequence with the repertoire of human germline genes, and the differences are scored as HSC. The target sequence is then humanized by maximizing its HSC rather than using a global identity measure to generate multiple diverse humanized variants (Lazar et al.,Mol. Immunol., 2007, 44:1986-98).

[00323] In addition to the methods described above, empirical methods may be used to generate and select humanized antibodies. These methods include those that are based upon the generation of large libraries of humanized variants and selection of the best clones using enrichment technologies or high throughput screening techniques. Antibody variants may be isolated from phage, ribosome, and yeast display libraries as well as by bacterial colony screening (see, e.g., Hoogenboom, Nat. Biotechnol., 2005, 23:1105-16; Dufner, et al., Trends Biotechnol., 2006, 24:523-9; Feldhaus, et al., Nat. Biotechnol, 2003, 21:163-70; and Schlapschy et al., Protein Eng. Des. Sel, 2004, 17:847-60).

[00324] In the FR library approach, a collection of residue variants are introduced at specific positions in the FR followed by screening of the library to select the FR that best supports the grafted CDR. The residues to be substituted may include some or all of the "Vernier" residues identified as potentially contributing to CDR structure (see, e.g., Foote and Winter, J. Mol. Biol., 1992, 224:487-99), or from the more limited set of target residues identified by Baca, et al, J. Biol. Chem., 1997, 272:10678-84.

[00325] In FR shuffling, whole FRs are combined with the non-human CDRs instead of creating combinatorial libraries of selected residue variants (see, e.g., DalTAcqua et al., Methods, 2005, 36:43-60). The libraries may be screened for binding in a two-step process, first humanizing VL, followed by VH. Alternatively, a one-step FR shuffling process may be used. Such a process has been shown to be more efficient than the two-step screening, as the resulting antibodies exhibited improved biochemical and physicochemical properties including enhanced expression, increased affinity, and thermal stability (see, e.g., Damschroder, et al.,Mol. Immunol., 2007, 44:3049-60).

[00326] The "Humaneering™" method is based on experimental identification of essential minimum specificity determinants (MSDs) and is based on sequential replacement of non-human fragments into libraries of human FRs and assessment of binding. It begins with regions of the CDR3 of non-human VH and VL chains and progressively replaces other regions of the non-human antibody into the human FRs, including the CDR1 and CDR2 of both VH and VL. This

methodology typically results in epitope retention and identification of antibodies from multiple subclasses with distinct human V-segment CDRs. Humaneering™ allows for isolation of antibodies that are 91-96% homologous to human germline gene antibodies (see, e.g., Alfenito, Cambridge Healthtech Institute's Third Annual PEGS, The Protein Engineering Summit, 2007).

[00327] The "human engineering" method involves altering a non-human antibody or antibody fragment, such as a mouse or chimeric antibody or antibody fragment, by making specific changes to the amino acid sequence of the antibody so as to produce a modified antibody with reduced immunogenicity in a human that nonetheless retains the desirable binding properties of the original non-human antibodies. Generally, the technique involves classifying amino acid residues of a non-human (e.g., mouse) antibody as "low risk," "moderate risk," or "high risk" residues. The classification is performed using a global risk/reward calculation that evaluates the predicted benefits of making particular substitution (e.g., for immunogenicity in humans) against the risk that the substitution will affect the resulting antibody's folding. The particular human amino acid residue to be substituted at a given position (e.g., low or moderate risk) of a non-human (e.g., mouse) antibody sequence can be selected by aligning an amino acid sequence from the non-human antibody's variable regions with the corresponding region of a specific or consensus human antibody sequence. The amino acid residues at low or moderate risk positions in the non-human sequence can be substituted for the corresponding residues in the human antibody sequence according to the alignment. Techniques for making human engineered proteins are described in greater detail in Studnicka et al., Protein Engineering, 1994, 7:805-14; U.S. Pat. Nos. 5,766,886; 5,770,196; 5,821,123; and 5,869,619; and PCT Publication WO 93/11794.

[00328] The antibodies disclosed herein can be composite human antibodies. A composite human antibody can be generated using, for example, Composite Human Antibody™ technology (Antitope Ltd., Cambridge, United Kingdom). To generate composite human antibodies, variable region sequences are designed from fragments of multiple human antibody variable region sequences in a manner that avoids T cell epitopes, thereby minimizing the immunogenicity of the resulting antibody. Such antibodies can comprise human constant region sequences, e.g., human light chain and/or heavy chain constant regions.

[00329] The antibodies disclosed herein can be deimmunized antibodies. A deimmunized antibody is an antibody in which T-cell epitopes have been removed. Methods for making deimmunized antibodies have been described (see, e.g., Jones, et al., Methods Mol Biol., 2009,

525:405-23; and De Groot, et al., Cell. Immunol., 2006, 244:148-153). Deimmunized antibodies comprise T-cell epitope-depleted variable regions and human constant regions. Briefly, VH and VL of an antibody are cloned and T-cell epitopes are subsequently identified by testing overlapping peptides derived from the VH and VL of the antibody in a T cell proliferation assay. T cell epitopes are identified via in silico methods to identify peptide binding to human MHC class II. Mutations are introduced in the VH and VL to abrogate binding to human MHC class II. Mutated VH and VL are then utilized to generate the deimmunized antibody.

[00330] It is further generally desirable that antibodies be humanized with retention of their affinity for the antigen and other favorable biological properties. To achieve this goal, according to one method, humanized antibodies are prepared by a process of analysis of the parental sequences and various conceptual humanized products using three-dimensional models of the parental and humanized sequences. Three-dimensional immunoglobulin models are commonly available and are familiar to those skilled in the art. Computer programs are available which illustrate and display probable three-dimensional conformational structures of selected candidate immunoglobulin sequences. These include, for example, WAM (Whitelegg and Rees, Protein Eng., 2000, 13:819-24), Modeller (Sali and Blundell, J. Mol. Biol., 1993, 234:779-815), and Swiss PDB Viewer (Guex and Peitsch, Electrophoresis, 1997, 18:2714-23). Inspection of these displays permits analysis of the likely role of the residues in the functioning of the candidate immunoglobulin sequence, e.g., the analysis of residues that influence the ability of the candidate immunoglobulin to bind its antigen. In this way, FR residues can be selected and combined from the recipient and import sequences so that the desired antibody characteristic, such as increased affinity for the target antigen(s), is achieved. In general, the CDR residues are directly and most substantially involved in influencing antigen-binding.

[00331] The antibodies disclosed herein can be fully human antibodies, which possesses an amino acid sequence corresponding to that of an antibody produced by a human. This definition of a human antibody specifically excludes a humanized antibody comprising non-human antigen-binding residues. Human antibodies can be produced using various techniques known in the art, including phage-display libraries (Hoogenboom and Winter, J. Mol. Biol, 1991, 227:381; Marks, et al., 1991, J. Mol. Biol., 1991, 222:581) and yeast display libraries (Chao, et al., Nature Protocols , 2006, 1: 755-68). Also available for the preparation of human monoclonal antibodies are methods described in Cole, et al., Monoclonal Antibodies and Cancer Therapy 77 (1985): Boerner, et al., J.

Immunol., 1991, 147(1):86-95; and van Dijk and van de Winkel, Curr. Opin. Pharmacol, 2001, 5: 368-74. Human antibodies can also be prepared by administering the antigen to a transgenic animal that has been modified to produce such antibodies in response to antigenic challenge, but whose endogenous loci have been disabled, e.g., mice (see, e.g., Jakobovits, Curr. Opin. Biotechnol., 1995, 6(5):561-66; Bruggemann and Taussing, Curr. Opin. Biotechnol., 1997, 8(4):455-58; and U.S. Pat. Nos. 6,075,181 and 6,150,584 regarding XENOMOUSE™ technology). See also, for example, Li, et al., Proc. Natl. Acad. Sci. USA , 2006, 103:3557-62, regarding human antibodies generated via a human B-cell hybridoma technology.

[00332] The antibodies disclosed herein can be recombinant human antibodies, which are human antibodies prepared, expressed, created or isolated by recombinant means, such as antibodies expressed using a recombinant expression vector transfected into a host cell, antibodies isolated from a recombinant, combinatorial human antibody library, antibodies isolated from an animal (e.g., a mouse or cow) that is transgenic and/or transchromosomal for human immunoglobulin genes (see e.g., Taylor, L. D., et al., Nucl. Acids Res., 199220:6287-6295) or antibodies prepared, expressed, created or isolated by any other means that involves splicing of human immunoglobulin gene sequences to other DNA sequences. In some embodiments, such recombinant human antibodies can have variable and constant regions derived from human germline immunoglobulin sequences (See Kabat, E. A., et al. (1991) Sequences of Proteins of Immunological Interest Fifth Edition, U.S. Department of Health and Human Services, NIH Publication No. 91-3242). In some embodiments, such recombinant human antibodies are subjected to *in vitro* mutagenesis (or, when an animal transgenic for human Ig sequences is used, *in vivo* somatic mutagenesis) and thus the amino acid sequences of the VH and VL regions of the recombinant antibodies are sequences that, while derived from and related to human germline VH and VL sequences, may not naturally exist within the human antibody germline repertoire *in vivo*.

Modifications, Variations, and Derivatives

[00333] Amino acid sequence modification(s) of the antibody or antigen-binding fragment thereof provided herein are contemplated. For example, it may be desirable to improve the binding affinity between the antibody or antigen-binding fragment thereof and the S polypeptide of a SARS-CoV-2; it may also be desirable to improve other biological properties of the antibody or antigen-binding fragment thereof, including but not limited to specificity, thermostability,

expression level, or solubility. Thus, in addition to the antibody or antigen-binding fragment thereof described herein, it is contemplated that variants can be prepared.

[00334] In some embodiments, the antibody or antigen-binding fragment thereof provided herein are chemically modified, for example, by the covalent attachment of any type of molecule to the antibody or antigen-binding fragment thereof. Exemplary non-limiting modifications include glycosylation, acetylation, pegylation, phosphorylation, amidation, derivatization by known protecting/blocking groups, proteolytic cleavage, linkage to a cellular ligand or other protein, etc. Additionally, the antibody or antigen-binding fragment thereof may contain one or more non-classical amino acids.

[00335] In some embodiments, variations may be a substitution, deletion, or insertion of one or more codons encoding the antibody or antigen-binding fragment thereof that results in a change in the amino acid sequence as compared with the original sequence. The variation allowed may be determined by systematically making insertions, deletions, or substitutions of amino acids in the sequence and testing the resulting variants for activity exhibited by the full-length or mature native sequence.

[00336] Amino acid substitutions can be the result of replacing one amino acid with another amino acid having similar structural and/or chemical properties, such as the replacement of a leucine with a serine, e.g., conservative amino acid replacements. Standard techniques known to those of skill in the art can be used to introduce mutations in the nucleotide sequence encoding a molecule provided herein, including, for example, site-directed mutagenesis and PCR-mediated mutagenesis which results in amino acid substitutions.

[00337] A "conservative amino acid substitution" is one in which the amino acid residue is replaced with an amino acid residue having a side chain with a similar charge. Families of amino acid residues having side chains with similar charges have been defined in the art. These families include amino acids with basic side chains (e.g., lysine, arginine, histidine), acidic side chains (e.g., aspartic acid, glutamic acid), uncharged polar side chains (e.g., glycine, asparagine, glutamine, serine, threonine, tyrosine, cysteine), nonpolar side chains (e.g., alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine, tryptophan), beta-branched side chains (e.g., threonine, valine, isoleucine) and aromatic side chains (e.g., tyrosine, phenylalanine, tryptophan, histidine). Alternatively, mutations can be introduced randomly along all or part of the coding sequence, such as by saturation mutagenesis, and the resultant mutants can be screened for biological activity to

identify mutants that retain activity. Following mutagenesis, the encoded protein can be expressed and the activity of the protein can be determined.

[00338] Substantial modifications in the biological properties of the antibody are accomplished by selecting substitutions that differ significantly in their effect on maintaining (a) the structure of the polypeptide backbone in the area of the substitution, for example, as a sheet or helical conformation, (b) the charge or hydrophobicity of the molecule at the target site, or (c) the bulk of the side chain.

[00339] Substitutions may be in the range of about 1 to 100 amino acids. In some embodiments, the substitution includes fewer than about 100 amino acid substitutions, fewer than about 95 amino acid substitutions, fewer than about 90 amino acid substitutions, fewer than about 85 amino acid substitutions, fewer than about 80 amino acid substitutions, fewer than about 75 amino acid substitutions, fewer than about 70 amino acid substitutions, fewer than about 65 amino acid substitutions, fewer than about 50 amino acid substitutions, fewer than about 45 amino acid substitutions, fewer than about 40 amino acid substitutions, fewer than about 35 amino acid substitutions, fewer than about 30 amino acid substitutions, fewer than about 25 amino acid substitutions, fewer than about 20 amino acid substitutions, fewer than about 15 amino acid substitutions, fewer than about 10 amino acid substitutions, fewer than about 5 amino acid substitutions, fewer than about 4 amino acid substitutions, fewer than about 3 amino acid substitutions, or fewer than about 2 amino acid substitutions relative to the original molecule.

[00340] Amino acid sequence insertions include amino- and/or carboxyl-terminal fusions ranging in length from 1 residue to polypeptides containing 100 or more residues, as well as intrasequence insertions of single or multiple amino acid residues. Examples of terminal insertions include an antibody with an N-terminal methionyl residue. Other insertional variants of the antibody molecule include the fusion to the N or C terminus of the antibody to an enzyme (e.g., for antibody-directed enzyme prodrug therapy) or a polypeptide which increases the serum half-life of the antibody.

[00341] In some embodiments, the insertion is about 1 amino acid to about 100 amino acids. In some embodiments, the insertion is at least about 1 amino acid. In some embodiments, the insertion is at most about 100 amino acids. In some embodiments, the insertion is about 1 amino acid to about 5 amino acids, about 1 amino acid to about 10 amino acids, about 1 amino acid to about 20 amino acids, about 1 amino acid to about 30 amino acids, about 1 amino acid to about 40 amino

acids, about 1 amino acid to about 50 amino acids, about 1 amino acid to about 60 amino acids, about 1 amino acid to about 70 amino acids, about 1 amino acid to about 80 amino acids, about 1 amino acid to about 90 amino acids, about 1 amino acid to about 100 amino acids, about 5 amino acids to about 10 amino acids, about 5 amino acids to about 20 amino acids, about 5 amino acids to about 30 amino acids, about 5 amino acids to about 40 amino acids, about 5 amino acids to about 50 amino acids, about 5 amino acids to about 60 amino acids, about 5 amino acids to about 70 amino acids, about 5 amino acids to about 80 amino acids, about 5 amino acids to about 90 amino acids, about 5 amino acids to about 100 amino acids, about 10 amino acids to about 20 amino acids, about 10 amino acids to about 30 amino acids, about 10 amino acids to about 40 amino acids, about 10 amino acids to about 50 amino acids, about 10 amino acids to about 60 amino acids, about 10 amino acids to about 70 amino acids, about 10 amino acids to about 80 amino acids, about 10 amino acids to about 90 amino acids, about 10 amino acids to about 100 amino acids, about 20 amino acids to about 30 amino acids, about 20 amino acids to about 40 amino acids, about 20 amino acids to about 50 amino acids, about 20 amino acids to about 60 amino acids, about 20 amino acids to about 70 amino acids, about 20 amino acids to about 80 amino acids, about 20 amino acids to about 90 amino acids, about 20 amino acids to about 100 amino acids, about 30 amino acids to about 40 amino acids, about 30 amino acids to about 50 amino acids, about 30 amino acids to about 60 amino acids, about 30 amino acids to about 70 amino acids, about 30 amino acids to about 80 amino acids, about 30 amino acids to about 90 amino acids, about 30 amino acids to about 100 amino acids, about 40 amino acids to about 50 amino acids, about 40 amino acids to about 60 amino acids, about 40 amino acids to about 70 amino acids, about 40 amino acids to about 80 amino acids, about 40 amino acids to about 90 amino acids, about 40 amino acids to about 100 amino acids, about 50 amino acids to about 60 amino acids, about 50 amino acids to about 70 amino acids, about 50 amino acids to about 80 amino acids, about 50 amino acids to about 90 amino acids, about 50 amino acids to about 100 amino acids, about 60 amino acids to about 70 amino acids, about 60 amino acids to about 80 amino acids, about 60 amino acids to about 90 amino acids, about 60 amino acids to about 100 amino acids, about 70 amino acids to about 80 amino acids, about 70 amino acids to about 90 amino acids, about 70 amino acids to about 100 amino acids, about 80 amino acids to about 90 amino acids, about 80 amino acids to about 100 amino acids, or about 90 amino acids to about 100 amino acids. In some embodiments, the insertion is about 1 amino acid, about 5 amino acids, about

10 amino acids, about 20 amino acids, about 30 amino acids, about 40 amino acids, about 50 amino acids, about 60 amino acids, about 70 amino acids, about 80 amino acids, about 90 amino acids, or about 100 amino acids.

[00342] Amino acid sequence deletions include amino- and/or carboxyl-terminal deletions ranging in length from one residue to polypeptides containing a hundred or more residues, as well as intrasequence deletions of single or multiple amino acid residues.

[00343] In some embodiments, the deletion is about 1 amino acid to about 100 amino acids. In some embodiments, the deletion is at least about 1 amino acid. In some embodiments, the deletion is at most about 100 amino acids. In some embodiments, the deletion is about 1 amino acid to about 5 amino acids, about 1 amino acid to about 10 amino acids, about 1 amino acid to about 20 amino acids, about 1 amino acid to about 30 amino acids, about 1 amino acid to about 40 amino acids, about 1 amino acid to about 50 amino acids, about 1 amino acid to about 60 amino acids, about 1 amino acid to about 70 amino acids, about 1 amino acid to about 80 amino acids, about 1 amino acid to about 90 amino acids, about 1 amino acid to about 100 amino acids, about 5 amino acids to about 10 amino acids, about 5 amino acids to about 20 amino acids, about 5 amino acids to about 30 amino acids, about 5 amino acids to about 40 amino acids, about 5 amino acids to about 50 amino acids, about 5 amino acids to about 60 amino acids, about 5 amino acids to about 70 amino acids, about 5 amino acids to about 80 amino acids, about 5 amino acids to about 90 amino acids, about 5 amino acids to about 100 amino acids, about 10 amino acids to about 20 amino acids, about 10 amino acids to about 30 amino acids, about 10 amino acids to about 40 amino acids, about 10 amino acids to about 50 amino acids, about 10 amino acids to about 60 amino acids, about 10 amino acids to about 70 amino acids, about 10 amino acids to about 80 amino acids, about 10 amino acids to about 90 amino acids, about 10 amino acids to about 100 amino acids, about 20 amino acids to about 30 amino acids, about 20 amino acids to about 40 amino acids, about 20 amino acids to about 50 amino acids, about 20 amino acids to about 60 amino acids, about 20 amino acids to about 70 amino acids, about 20 amino acids to about 80 amino acids, about 20 amino acids to about 90 amino acids, about 20 amino acids to about 100 amino acids, about 30 amino acids to about 40 amino acids, about 30 amino acids to about 50 amino acids, about 30 amino acids to about 60 amino acids, about 30 amino acids to about 70 amino acids, about 30 amino acids to about 80 amino acids, about 30 amino acids to about 90 amino acids, about 30 amino acids to about 100 amino acids, about 40 amino acids to about 50

amino acids, about 40 amino acids to about 60 amino acids, about 40 amino acids to about 70 amino acids, about 40 amino acids to about 80 amino acids, about 40 amino acids to about 90 amino acids, about 40 amino acids to about 100 amino acids, about 50 amino acids to about 60 amino acids, about 50 amino acids to about 70 amino acids, about 50 amino acids to about 80 amino acids, about 50 amino acids to about 90 amino acids, about 50 amino acids to about 100 amino acids, about 60 amino acids to about 70 amino acids, about 60 amino acids to about 80 amino acids, about 60 amino acids to about 90 amino acids, about 60 amino acids to about 100 amino acids, about 70 amino acids to about 80 amino acids, about 70 amino acids to about 90 amino acids, about 70 amino acids to about 100 amino acids, about 80 amino acids to about 90 amino acids, about 80 amino acids to about 100 amino acids, or about 90 amino acids to about 100 amino acids. In some embodiments, the deletion is about 1 amino acid, about 5 amino acids, about 10 amino acids, about 20 amino acids, about 30 amino acids, about 40 amino acids, about 50 amino acids, about 60 amino acids, about 70 amino acids, about 80 amino acids, about 90 amino acids, or about 100 amino acids.

[00344] In some embodiments, a polypeptide variant comprising an amino acid sequence that is at least about 75 %, about 80 %, about 85 %, about 90 %, about 91 %, about 92 %, about 93 %, about 94 %, about 95 %, about 96 %, about 97 %, about 98%, or about 99 % identical to the amino acid sequence of a polypeptide disclosed herein.

[00345] Molecule derived from antibodies disclosed herein are contemplated. A "molecule derived from an antibody" refers to a functional antigen-binding fragment of an antibody. It is a portion of an antibody heavy and/or light chain polypeptide that retains some or all of the binding activity of the antibody from which the fragment was derived. Non-limiting examples of functional fragments include single-chain Fvs (scFv), Fab fragments, F(ab') fragments, F(ab)2 fragments, F(ab')2 fragments, disulfide-linked Fvs (dsFv), Fd fragments, Fv fragments, diabody, triabody, tetrabody, and minibody. Such functional antigen-binding fragment can be found in, for example, Harlow and Lane, Antibodies: A Laboratory Manual (1989); Mol. Biology and Biotechnology: A Comprehensive Desk Reference (Myers, ed., 1995); Huston, et al, 1993, Cell Biophysics 22:189-224; Pliickthun and Skerra, 1989, Meth. Enzymol. 178:497-515; and Day, Advanced Immunochemistrv (2d ed. 1990).

1.5. Compositions and Kits

[00346] The antibodies of this invention represent an excellent way for the development of antiviral therapies either alone or in antibody cocktails with additional anti-SARS-CoV-2 virus antibodies for the treatment of human SARS-CoV-2 infections in humans.

[00347] In some embodiments, the present invention provides a pharmaceutical composition comprising the antibodies of the present invention described herein formulated together with a pharmaceutically acceptable carrier. The composition may optionally contain one or more additional pharmaceutically active ingredients, such as another antibody or a therapeutic agent.

[00348] In some embodiments, the pharmaceutical comprises two or more of the antibody or antigen-binding fragment thereof described herein, such as any combinations of the antibody or antigen-binding fragment thereof comprising a heavy chain and a light chain that comprise the respective amino acid sequences described herein. In some embodiments, the present disclosure provides compositions comprising two or more monoclonal antibodies, or antigen- binding fragments thereof, described herein. In some embodiments, the present disclosure provides compositions comprising 2, 3, or 4 monoclonal antibodies, or antigen-binding fragments thereof, described herein. For example, in some embodiments, the present disclosure provides a composition comprising one of the following combinations of monoclonal antibodies or antigen-binding fragments thereof:

B2014	B1030	B1032	B2058	B2117
X	X			
X		X		
X			X	
X				X
	X	X		
	X		X	
	X			X
		X	X	
		X		X
X	X	X		
X	X		X	
X	X			X
X		X	X	
X		X		X
X			X	X
	X	X	X	

B2014	B1030	B1032	B2058	B2117
	X	X		X
	X		X	X
		X	X	X
X	X	X	X	
X	X	X		X
X	X		X	X
X		X	X	X
	X	X	X	X
X	X	X	X	X

[00349] In some embodiments, the pharmaceutical compositions disclosed herein are for use in treating a SARS-CoV-2 infection in a subject. In some embodiments, the pharmaceutical compositions disclosed herein are for use in the prevention of a SARS-CoV-2 infection in a subject.

[00350] The pharmaceutical compositions of the invention also can be administered in a combination therapy with, for example, another immune-stimulatory agent, an antiviral agent, a vaccine, etc. In some embodiments, a composition comprises an antibody of this invention at a concentration of at least 1 mg/ml, 5 mg/ml, 10 mg/ml, 50 mg/ml, 100 mg/ml, 150 mg/ml, 200 mg/ml, 1-300 mg/ml, or 100-300 mg/ml.

[00351] In some embodiments, the second therapeutic agent comprises an anti-inflammatory drug or an antiviral compound. In some embodiments, the antiviral compound comprises: a nucleoside analog, a peptoid, an oligopeptide, a polypeptide, a protease inhibitor, a 3C-like protease inhibitor, a papain-like protease inhibitor, or an inhibitor of an RNA dependent RNA polymerase. In some embodiments, the antiviral compound may include: acyclovir, ganciclovir, vidarabine, foscarnet, cidofovir, amantadine, ribavirin, trifluorothymidine, zidovudine, didanosine, zalcitabine, or an interferon. In some embodiments, the interferon is an interferon-α or an interferon-β.

[00352] Also within the scope of this disclosure is use of the pharmaceutical composition in the preparation of a medicament for the diagnosis, prophylaxis, treatment, or combination thereof of a condition resulting from a SARS-CoV-2.

[00353] The pharmaceutical composition can comprise any number of excipients. Excipients that can be used include carriers, surface-active agents, thickening or emulsifying agents, solid binders, dispersion or suspension aids, solubilizers, colorants, flavoring agents, coatings, disintegrating agents, lubricants, sweeteners, preservatives, isotonic agents, and combinations

thereof. The selection and use of suitable excipients is taught in Gennaro, ed., Remington: The Science and Practice of Pharmacy, 20th Ed. (Lippincott Williams & Wilkins 2003), the disclosure of which is incorporated herein by reference.

[00354] Preferably, a pharmaceutical composition is suitable for intravenous, intramuscular, subcutaneous, parenteral, spinal, or epidermal administration (e.g., by injection or infusion). Depending on the route of administration, the active compound can be coated in a material to protect it from the action of acids and other natural conditions that may inactivate it. The phrase "parenteral administration" as used herein means modes of administration other than enteral and topical administration, usually by injection, and includes, without limitation, intravenous, intramuscular, intraarterial, intrathecal, intracapsular, intraorbital, intracardiac, intradermal, intraperitoneal, transtracheal, subcutaneous, subcuticular, intraarticular, subcapsular, subarachnoid, intraspinal, epidural and intrasternal injection and infusion. Alternatively, an antibody of the present invention described herein can be administered via a non-parenteral route, such as a topical, epidermal, or mucosal route of administration, e.g., intranasally, orally, vaginally, rectally, sublingually, or topically.

[00355] The pharmaceutical compositions of the invention may be prepared in many forms that include tablets, hard or soft gelatin capsules, aqueous solutions, suspensions, liposomes, and other slow-release formulations, such as shaped polymeric gels. An oral dosage form may be formulated such that the antibody is released into the intestine after passing through the stomach. Such formulations are described in U.S. Pat. No. 6,306,434 and in the references contained therein.

[00356] Oral liquid pharmaceutical compositions may be in the form of, for example, aqueous or oily suspensions, solutions, emulsions, syrups, or elixirs, or may be presented as a dry product for constitution with water or other suitable vehicle before use. Such liquid pharmaceutical compositions may contain conventional additives such as suspending agents, emulsifying agents, non-aqueous vehicles (which may include edible oils), or preservatives.

[00357] An antibody can be formulated for parenteral administration (e.g., by injection, for example, bolus injection or continuous infusion) and may be presented in unit dosage form in ampules, prefilled syringes, small volume infusion containers, or multi-dose containers with an added preservative. The pharmaceutical compositions may take such forms as suspensions, solutions, or emulsions in oily or aqueous vehicles, and may contain formulatory agents such as suspending, stabilizing and/or dispersing agents. Pharmaceutical compositions suitable for rectal

administration can be prepared as unit dose suppositories. Suitable carriers include saline solution and other materials commonly used in the art.

[00358] For administration by inhalation, an antibody can be conveniently delivered from an insufflator, nebulizer, a pressurized pack, or other convenient means of delivering an aerosol spray. Pressurized packs may comprise a suitable propellant such as dichlorodifluoromethane, trichlorofluoromethane, dichlorotetrafluoroethane, carbon dioxide, or other suitable gas. In the case of a pressurized aerosol, the dosage unit may be determined by providing a valve to deliver a metered amount.

[00359] Alternatively, for administration by inhalation or insufflation, an antibody may take the form of a dry powder composition, for example, a powder mix of a modulator and a suitable powder base such as lactose or starch. The powder composition may be presented in a unit dosage form in, for example, capsules or cartridges or, e.g., gelatin or blister packs from which the powder may be administered with the aid of an inhalator or insufflator. For intra-nasal administration, an antibody may be administered via a liquid spray, such as via a plastic bottle atomizer.

[00360] Pharmaceutical compositions of the invention may also contain other ingredients such as flavorings, colorings, anti-microbial agents, or preservatives. It will be appreciated that the amount of an antibody required for use in treatment will vary not only with the particular carrier selected but also with the route of administration, the nature of the condition being treated, and the age and condition of the patient. Ultimately the attendant health care provider may determine a proper dosage. In addition, a pharmaceutical composition may be formulated as a single unit dosage form.

[00361] The pharmaceutical composition of the present invention can be in the form of sterile aqueous solutions or dispersions. It can also be formulated in a microemulsion, liposome, or other ordered structure suitable to high drug concentration.

[00362] An antibody of the present invention described herein can be administered as a sustained release formulation, in which case less frequent administration is required. Dosage and frequency vary depending on the half-life of the antibody in the patient. In general, human antibodies show the longest half-life, followed by humanized antibodies, chimeric antibodies, and nonhuman antibodies. The dosage and frequency of administration can vary depending on whether the treatment is prophylactic or therapeutic. In prophylactic applications, a relatively low dosage is administered at relatively infrequent intervals over a long period of time. Some patients continue

to receive treatment for the rest of their lives. In therapeutic applications, a relatively high dosage at relatively short intervals is sometimes required until progression of the disease is reduced or terminated, and preferably until the patient shows partial or complete amelioration of symptoms of disease. Thereafter, the patient can be administered a prophylactic regime.

[00363] The amount of active ingredient that can be combined with a carrier material to produce a single dosage form will vary depending upon the subject being treated and the particular mode of administration and will generally be that amount of the composition, which produces a therapeutic effect. Generally, out of one hundred percent, this amount will range from about 0.01% to about 99% of active ingredient, preferably from about 0.1% to about 70%, most preferably from about 1% to about 30% of active ingredient in combination with a pharmaceutically acceptable carrier.

[00364] Dosage regimens can be adjusted to provide the optimum desired response (e.g., a therapeutic response). For example, a single bolus can be administered, several divided doses can be administered over time, or the dose can be proportionally reduced or increased as indicated by the exigencies of the therapeutic situation. It is especially advantageous to formulate parenteral compositions in dosage unit form for ease of administration and uniformity of dosage. Dosage unit form as used herein refers to physically discrete units suited as unitary dosages for the subjects to be treated; each unit contains a predetermined quantity of active compound calculated to produce the desired therapeutic effect in association with the required pharmaceutical carrier. Alternatively, the antibody can be administered as a sustained release formulation, in which case less frequent administration is required. For administration of the antibody, the dosage ranges from about 0.0001 to 800 mg/kg, and more usually 0.01 to 5 mg/kg, of the host body weight. For example, dosages can be 0.3 mg/kg body weight, 1 mg/kg body weight, 3 mg/kg body weight, 5 mg/kg body weight or 10 mg/kg body weight or within the range of 1-10 mg/kg. An exemplary treatment regime entails administration once per week, once every two weeks, once every three weeks, once every four weeks, once a month, once every 3 months or once every three to 6 months. Preferred dosage regimens for an antibody of the invention include 1 mg/kg body weight or 3 mg/kg body weight via intravenous administration, with the antibody being given using one of the following dosing schedules: (i) every four weeks for six dosages, then every three months; (ii) every three weeks; (iii) 3 mg/kg body weight once followed by 1 mg/kg body weight every three weeks. In some methods, dosage is adjusted to achieve a plasma antibody concentration of about

1-1000 μg /ml, and in some methods, about 25-300 μg /ml. A "therapeutically effective dosage" of an antibody of the invention preferably results in a decrease in severity of disease symptoms, an increase in frequency and duration of disease symptom-free periods, or a prevention of impairment or disability due to the disease affliction. For example, for the treatment of SARS-CoV-2 infection in a subject, a "therapeutically effective dosage" preferably inhibits SARS-CoV-2 virus replication or uptake by host cells by at least about 20%, more preferably by at least about 40%, even more preferably by at least about 60%, and still more preferably by at least about 80% relative to untreated subjects. A therapeutically effective amount of a therapeutic compound can neutralize SARS-CoV-2 virus, or otherwise ameliorate symptoms in a subject, which is typically a human or can be another mammal.

[00365] The pharmaceutical composition can be a controlled release formulation, including implants, transdermal patches, and microencapsulated delivery systems. Biodegradable, biocompatible polymers can be used, such as ethylene-vinyl acetate, polyanhydrides, polyglycolic acid, collagen, polyorthoesters, and polylactic acid. See, e.g., Sustained and Controlled Release Drug Delivery Systems, J. R. Robinson, ed., Marcel Dekker, Inc., New York, 1978.

[00366] Therapeutic compositions can be administered via medical devices such as (1) needleless hypodermic injection devices (e.g., US 5,399,163; 5,383,851; 5,312,335; 5,064,413; 4,941,880; 4,790,824; and 4,596,556); (2) micro-infusion pumps (US 4,487,603); (3) transdermal devices (US 4,486,194); (4) infusion apparati (US 4,447,233 and 4,447,224); and (5) osmotic devices (US 4,439,196 and 4,475,196); the disclosures of which are incorporated herein by reference.

[00367] In some embodiments, the human monoclonal antibodies of the invention described herein can be formulated to ensure proper distribution *in vivo*. For example, to ensure that the therapeutic compounds of the invention cross the blood-brain barrier, they can be formulated in liposomes, which may additionally comprise targeting moieties to enhance selective transport to specific cells or organs. See, e.g., US 4,522,811; 5,374,548; 5,416,016; and 5,399,331; V.V. Ranade (1989) Clin. Pharmacol. 29:685; Umezawa et al., (1988) Biochem. Biophys. Res. Commun. 153:1038; Bloeman et al., (1995) FEBS Lett. 357:140; M. Owais et al., (1995) Antimicrob. Agents Chemother. 39:180; Briscoe et al. (1995) Am. Physiol. 1233:134; Schreier et al., (1994). Biol. Chem. 269:9090; Keinanen and Laukkanen (1994) FEBS Lett. 346:123; and Killion and Fidler (1994) Immunomethods 4:273.

[00368] In some embodiments, the initial dose may be followed by administration of a second or a plurality of subsequent doses of the antibody or antigen-binding fragment thereof in an amount that can be approximately the same or less than that of the initial dose, wherein the subsequent doses are separated by at least 1 day to 3 days; at least one week, at least 2 weeks; at least 3 weeks; at least 4 weeks; at least 5 weeks; at least 6 weeks; at least 7 weeks; at least 8 weeks; at least 9 weeks; at least 10 weeks; at least 12 weeks; or at least 14 weeks.

[00369] Various delivery systems are known and can be used to administer the pharmaceutical composition of the invention, e.g., encapsulation in liposomes, microparticles, microcapsules, recombinant cells capable of expressing the mutant viruses, receptor-mediated endocytosis (see, e.g., Wu et al., (1987) J. Biol. Chem. 262:4429-4432). Methods of introduction include, but are not limited to, intradermal, transdermal, intramuscular, intraperitoneal, intravenous, subcutaneous, intranasal, epidural, and oral routes. The composition may be administered by any convenient route, for example by infusion or bolus injection, by absorption through epithelial or mucocutaneous linings (e.g., oral mucosa, rectal and intestinal mucosa, etc.) and may be administered together with other biologically active agents. Administration can be systemic or local. The pharmaceutical composition can also be delivered in a vesicle, in particular, a liposome (see, for example, Langer (1990) Science 249: 1527-1533).

[00370] The use of nanoparticles to deliver the antibodies of the present invention is also contemplated herein. Antibody-conjugated nanoparticles may be used both for therapeutic and diagnostic applications. Antibody-conjugated nanoparticles and methods of preparation and use are described in detail by Arruebo, M., et al., 2009 ("Antibody-conjugated nanoparticles for biomedical applications" in J. Nanomat. Volume 2009, Article ID 439389), incorporated herein by reference. Nanoparticles may be developed and conjugated to antibodies contained in pharmaceutical compositions to target cells. Nanoparticles for drug delivery have also been described in, for example, US 8257740, or US 8246995, each incorporated herein in its entirety.

[00371] In certain situations, the pharmaceutical composition can be delivered in a controlled release system. In one embodiment, a pump may be used. In another embodiment, polymeric materials can be used. In yet another embodiment, a controlled release system can be placed in proximity of the composition's target, thus requiring only a fraction of the systemic dose.

[00372] The injectable preparations may include dosage forms for intravenous, subcutaneous, intracutaneous, intracranial, intraperitoneal, intramuscular injections, drip infusions, etc. These

injectable preparations may be prepared by methods publicly known. For example, the injectable preparations may be prepared, e.g., by dissolving, suspending, or emulsifying the antibody or its salt described herein in a sterile aqueous medium or an oily medium conventionally used for injections. As the aqueous medium for injections, there are, for example, physiological saline, an isotonic solution containing glucose and other auxiliary agents, etc., which may be used in combination with an appropriate solubilizing agent such as an alcohol (e.g., ethanol), a polyalcohol (e.g., propylene glycol, polyethylene glycol), a nonionic surfactant [e.g., polysorbate 80, HCO-50 (polyoxyethylene (50 mol) adduct of hydrogenated castor oil)], etc. As the oily medium, there are employed, e.g., sesame oil, soybean oil, etc., which may be used in combination with a solubilizing agent such as benzyl benzoate, benzyl alcohol, etc. The injection thus prepared is preferably filled in an appropriate ampoule.

[00373] A pharmaceutical composition of the present invention can be delivered subcutaneously or intravenously with a standard needle and syringe. In addition, with respect to subcutaneous delivery, a pen delivery device readily has applications in delivering a pharmaceutical composition of the present invention. Such a pen delivery device can be reusable or disposable. A reusable pen delivery device generally utilizes a replaceable cartridge that contains a pharmaceutical composition. Once all of the pharmaceutical composition within the cartridge has been administered and the cartridge is empty, the empty cartridge can readily be discarded and replaced with a new cartridge that contains the pharmaceutical composition. The pen delivery device can then be reused. In a disposable pen delivery device, there is no replaceable cartridge. Rather, the disposable pen delivery device comes prefilled with the pharmaceutical composition held in a reservoir within the device. Once the reservoir is emptied of the pharmaceutical composition, the entire device is discarded.

[00374] Numerous reusable pens and autoinjector delivery devices have applications in the subcutaneous delivery of a pharmaceutical composition of the present invention. Examples include, but certainly are not limited to AUTOPEN™ (Owen Mumford, Inc., Woodstock, UK), DISETRONIC™ pen (Disetronic Medical Systems, Burghdorf, Switzerland), HUMALOG MIX 75/25™ pen, HUMALOG™ pen, HUMALIN 70/30™ pen (Eli Lilly and Co., Indianapolis, IN), NOVOPEN™ I, II and III (Novo Nordisk, Copenhagen, Denmark), NOVOPEN JUNIOR™ (Novo Nordisk, Copenhagen, Denmark), BD™ pen (Becton Dickinson, Franklin Lakes, NJ), OPTIPEN™, OPTIPEN PRO™, OPTIPEN STARLET™, and OPTICLIK™ (Sanofi-Aventis,

Frankfurt, Germany), to name only a few. Examples of disposable pen delivery devices having applications in subcutaneous delivery of a pharmaceutical composition of the present invention include, but certainly are not limited to, the SOLOSTAR™ pen (Sanofi- Aventis), the FLEXPEN™ (Novo Nordisk), and the KWIKPEN™ (Eli Lilly), the SURECLICK™ Autoinjector (Amgen, Thousand Oaks, CA), the PENLET™ (Haselmeier, Stuttgart, Germany), the EPIPEN® (Dey, L.P.) and the HUMIRA™ Pen (Abbott Labs, Abbott Park, IL), to name only a few.

[00375] Advantageously, the pharmaceutical compositions for oral or parenteral use described herein are prepared into dosage forms in a unit dose suited to fit a dose of the active ingredients. Such dosage forms in a unit dose include, for example, tablets, pills, capsules, injections (ampoules), suppositories, etc. The amount of the antibody contained is generally about 5 to about 500 mg per dosage form in a unit dose; especially in the form of injection, it is preferred that the antibody is contained in about 5 to about 300 mg and in about 10 to about 300 mg for the other dosage forms.

[00376] In another aspect, this disclosure provides a kit comprising a pharmaceutically acceptable dose unit of the antibody or antigen-binding fragment thereof or the pharmaceutical composition as described herein. Also within the scope of this disclosure is a kit for the diagnosis, prognosis, or monitoring of treatment of SARS-CoV-2 in a subject, comprising: the antibody or antigen-binding fragment thereof as described; and a least one detection reagent that binds specifically to the antibody or antigen-binding fragment thereof.

[00377] In some embodiments, the kit also includes a container that contains the composition and optionally informational material. The informational material can be descriptive, instructional, marketing, or other material that relates to the methods described herein and/or the use of the agents for therapeutic benefit. In an embodiment, the kit also includes an additional therapeutic agent, as described herein. For example, the kit includes a first container that contains the composition and a second container for the additional therapeutic agent.

[00378] The informational material of the kits is not limited in its form. In some embodiments, the informational material can include information about production of the composition, concentration, date of expiration, batch or production site information, and so forth. In one embodiment, the informational material relates to methods of administering the composition, e.g., in a suitable dose, dosage form, or mode of administration (e.g., a dose, dosage form, or mode of administration described herein), to treat a subject in need thereof. In one embodiment, the

instructions provide a dosing regimen, dosing schedule, and/or route of administration of the composition or the additional therapeutic agent. The information can be provided in a variety of formats, including printed text, computer-readable material, video recording, audio recording, or information that contains a link or address to substantive material.

[00379] The kit can include one or more containers for the composition. In some embodiments, the kit contains separate containers, dividers, or compartments for the composition and informational material. For example, the composition can be contained in a bottle or vial, and the informational material can be contained in a plastic sleeve or packet. In other embodiments, the separate elements of the kit are contained within a single, undivided container. For example, the composition is contained in a bottle or vial that has attached thereto the informational material in the form of a label. In some embodiments, the kit includes a plurality (e.g., a pack) of individual containers, each containing one or more unit dosage forms (e.g., a dosage form described herein) of the agents.

[00380] The kit optionally includes a device suitable for administration of the composition or other suitable delivery device. The device can be provided pre-loaded with one or both of the agents or can be empty, but suitable for loading. Such a kit may optionally contain a syringe to allow for injection of the antibody contained within the kit into an animal, such as a human.

1.6. Therapeutic Methods and Applications

Methods of Treatment

[00381] Provided herein are methods of treating a SARS-CoV-2 infection in a subject, comprising administering to the subject a therapeutically effective amount of the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein. Also provided herein are methods of preventing a SARS-CoV-2 infection in a subject, comprising administering to the subject a therapeutically effective amount of the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein. Also provided herein are methods of neutralizing a SARS-CoV-2 infection in a subject, comprising administering to the subject a therapeutically effective amount of the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein.

[00382] In some embodiments, the method described herein may be used in the treatment and/or prevention of SARS-CoV-2. Exemplary SARS-CoV-2 variants include WHO alpha variant, WHO beta variant, WHO gamma variant, WHO delta variant, WHO epsilon variant, WHO Eta variant,

WHO iota variant, WHO kappa variant, WHO omicron variant, WHO zeta variant, WHO mu variant, and B.1.617.3.

[00383] In some embodiments, the subject may be a neonate, a juvenile, or an adult. In some embodiments, the subject is human. In some embodiments, the subject is non-human primates (e.g., monkeys, baboons, and chimpanzees), mice, rats, bovines, horses, household cats, tigers and other large cats, dogs, pigs, rabbits, goats, deer, sheep, ferrets, gerbils, guinea pigs, hamsters, bats, and birds (e.g., chickens, turkeys, and ducks). A number of these household pets and farm animals are capable of carrying and transmitting SARS-CoV-2 viruses without themselves getting substantially sick or dying, thereby transmitting the disease to humans. Thus, in some embodiments, these animals are treated not because they are suffering from disease, but rather, because they can transmit virus to humans and cause human disease.

[00384] In some embodiments, the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof are administered to a subject in order to prevent infection with a SARS-CoV-2 virus. In some embodiments, the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein are administered to a subject prior to exposure to or infection with SARS-CoV-2 viruses. In some embodiments, the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein are administered to a subject after the exposure to or infection with SARS-CoV-2 viruses. The neutralizing of the SARS-CoV-2 virus can be done via (i) inhibiting SARS-CoV-2 virus binding to a target cell; (ii) inhibiting SARS-CoV-2 virus uptake by a target cell; (iii) inhibiting SARS-CoV-2 virus replication; and (iv) inhibiting SARS-CoV-2 virus particles release from infected cells. One skilled in the art possesses the ability to perform any assay to assess neutralization of SARS-CoV-2 virus.

[00385] Notably, the neutralizing properties of antibodies may be assessed by a variety of tests, which all may assess the consequences of (i) inhibition of SARS-CoV-2 virus binding to a target cell; (ii) inhibition of SARS-CoV-2 virus uptake by a target cell; (iii) inhibition of SARS-CoV-2 virus replication; and (iv) inhibition of SARS-CoV-2 virus particles release from infected cells. In other words, implementing different tests may lead to the observation of the same consequence, i.e., the loss of infectivity of the SARS-CoV-2 virus. Thus, in one embodiment, the present invention provides a method of neutralizing a SARS-CoV-2 virus in a subject comprising

administering to the subject a therapeutically effective amount of the antibody of the present invention described herein.

[00386] In some embodiments, the present disclosure provides methods of preventing infection with a SARS-CoV-2 virus in an immunocompromised subject. Immunocompromised subjects include subjects that suffer from an immune deficiency (e.g., a primary or acquired immune deficiency) or autoimmune disease, subjects that have undergone or are currently undergoing treatment with one or more immunosuppressive drugs (e.g., chemotherapy, glucocorticoids, protease inhibitors, immune cell depleting monoclonal antibodies, etc.), subjects that have recently received an organ transplant or hematopoietic stem cell transplant, subjects that have received a CAR-T therapy, and subjects that have undergone or are currently undergoing radiation treatment. Immunosuppressive drugs are known to those in the art. See e.g., Hussain Y, Khan H. Immunosuppressive Drugs. Encyclopedia of Infection and Immunity. 2022:726–40. Vaccines, including vaccines against SARS-CoV-2 infections, are less effective in immunocompromised subjects. Furthermore, some immunocompromised subjects may not be able to receive a SARS-CoV-2 vaccine. The antibodies and antigen-binding fragments thereof provided herein therefore provide a therapeutic option for subjects who cannot receive a SARS-CoV-2 vaccine or who demonstrate reduced efficacy of a SARS-CoV-2 vaccine.

[00387] Another aspect of the present invention provides a method of treating a SARS-CoV-2-related disease. Such a method includes therapeutic (following SARS-CoV-2 infection) and prophylactic (prior to SARS-CoV-2 exposure, infection, or pathology). For example, therapeutic and prophylactic methods of treating an individual for a SARS-CoV-2 infection include treatment of an individual having or at risk of having a SARS-CoV-2 infection or pathology, treating an individual with a SARS-CoV-2 infection, and methods of protecting an individual from a SARS-CoV-2 infection, to decrease or reduce the probability of a SARS-CoV-2 infection in an individual, to decrease or reduce susceptibility of an individual to a SARS-CoV-2 infection, or to inhibit or prevent a SARS-CoV-2 infection in an individual, and to decrease, reduce, inhibit or suppress transmission of a SARS-CoV-2 from an infected individual to an uninfected individual. Such methods include administering an antibody of the present invention or a composition comprising the antibody disclosed herein to therapeutically or prophylactically treat (vaccinate or immunize) an individual having or at risk of having a SARS-CoV-2 infection or pathology. Accordingly,

methods can treat the SARS-CoV-2 infection or pathology, or provide the individual with protection from infection (e.g., prophylactic protection).

[00388] In one embodiment, a method of treating a SARS-CoV-2-related disease comprises administering to an individual in need thereof an antibody or therapeutic composition disclosed herein in an amount sufficient to reduce one or more physiological conditions or symptoms associated with a SARS-CoV-2 infection or pathology, thereby treating the SARS-CoV-2 -related disease.

[00389] In one embodiment, an antibody or therapeutic composition disclosed herein is used to treat a SARS-CoV-2-related disease. Use of an antibody or therapeutic composition disclosed herein treats a SARS-CoV-2-related disease by reducing one or more physiological conditions or symptoms associated with a SARS-CoV-2 infection or pathology. In aspects of this embodiment, administration of an antibody or therapeutic composition disclosed herein is in an amount sufficient to reduce one or more physiological conditions or symptoms associated with a SARS-CoV-2 infection or pathology, thereby treating the SARS-CoV-2-based disease. In other aspects of this embodiment, administration of an antibody or therapeutic composition disclosed herein is in an amount sufficient to increase, induce, enhance, augment, promote or stimulate SARS-CoV-2 clearance or removal; or decrease, reduce, inhibit, suppress, prevent, control, or limit transmission of SARS-CoV-2 to another individual.

[00390] In some embodiments, treating refers to the treatment of a disease in a mammal, *e.g.*, in a human, including (a) inhibiting the disease, i.e., arresting disease development or preventing disease progression; (b) relieving the disease, i.e., causing regression of the disease state or relieving one or more symptoms of the disease; and (c) curing the disease, *i.e.*, remission of one or more disease symptoms. In some embodiments, treatment results in an improvement or remediation of the symptoms of the disease. In some embodiments, treatment may refer to a short-term (e.g., temporary and/or acute) and/or a long-term (e.g., sustained) improvement or remediation in one or more disease symptoms. In some embodiments, the improvement is an observable or measurable improvement. In some embodiments, the improvement is an improvement in the general feeling of well-being of the subject. In some embodiments, administration of the pharmaceutical compositions disclosed herein may reduce one or more symptoms of the SARS-COV-2 infection, including but not limited to, death, incidence of emphysema, incidence of pneumonia, shortness of breath, racing heart, fever, cough, sore throat,

congestion, muscle or body aches, headaches, fatigue, vomiting, diarrhea, loss of taste or smell, cognitive issues like "brain fog", memory or attention problems, and Postural Orthostatic Tachycardia Syndrome (POTS).

[00391] One or more physiological conditions or symptoms associated with a SARS-CoV-2 infection or pathology will respond to a method of treatment disclosed herein. The symptoms of SARS-CoV-2 infection or pathology vary, depending on the phase of infection.

[00392] In some embodiments, the method of neutralizing SARS-CoV-2 in a subject comprises administering to a subject in need thereof a therapeutically effective amount of a first antibody or antigen-binding fragment thereof and a second antibody or antigen-binding fragment thereof of the antibody or antigen-binding fragment, as described herein, wherein the first antibody or antigen-binding fragment thereof and the second antibody or antigen-binding fragment thereof exhibit synergistic activity or a therapeutically effective amount of the pharmaceutical composition described herein.

[00393] In some embodiments, the method of preventing or treating a SARS-CoV-2 infection, comprising administering to a subject in need thereof a therapeutically effective amount of a first antibody or antigen-binding fragment thereof and a second antibody or antigen-binding fragment thereof of the antibody or antigen-binding fragment, as described herein, wherein the first antibody or antigen-binding fragment thereof and the second antibody or antigen-binding fragment thereof exhibit synergistic activity or a therapeutically effective amount of the pharmaceutical composition described herein. In some embodiments, the first antibody or antigen-binding fragment thereof is administered before, after, or concurrently with the second antibody or antigen-binding fragment thereof.

[00394] In some embodiments, the first antibody or antigen-binding fragment thereof and the second antibody or antigen-binding fragment thereof can be any combinations of the antibody or antigen-binding fragment thereof comprising a heavy chain and a light chain that comprise the respective amino acid sequences described herein.

[00395] In some embodiments, the first antibody or antigen-binding fragment thereof comprises a heavy chain variable region and a light chain variable region comprising a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22, 23-24, 25-26, 27-28, 29-30, 31-32, 33-34, 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 47-48, 49-50, 51-52, 53-54, 55-56, 57-58, 59-60, 61-62, 63-64, 65-66, 67-68, 69-70, 71-72, 73-74, 75-76,

77-78, 79-80, 81-82, 83-84, 85-86, 87-88, 89-90, 91-92, 93-94, 95-96, 97-98, 99-100, 101-102, 103-104, 105-106, 107-108, 109-110, 111-112, 113-114, 115-116, 117-118, 119-120, 121-122, 123-124, 125-126, 127-128, 129-130, 131-132, 133-134, 135-136, 137-138, 139-140, 141-142, 143-144, 145-146, 147-148, 149-150, 151-152, 153-154, 155-156, 157-158, 159-160, 161-162, 163-164, 165-166, 167-168, 169-170, 171-172, 173-174, 175-176, 177-178, 179-180, 181-182, 183-184, 185-186, 187-188, 189-190, 191-192, 193-194, 195-196, 197-198, 199-200, 201-202, 203-204, 205-206, 207-208, 209-210, 211-212, 213-214, 215-216, 217-218, 219-220, 221-222, 223-224, 225-226, 227-228, 229-230, 231-232, 233-234, 235-236, 237-238, 239-240, 241-242, 243-244, 245-246, 247-248, 249-250, 251-252, 253-254, 255-256, 257-258, 259-260, 261-262, 263-264, 265-266, 267-268, 269-270, 271-272, 273-274, 275-276, 277-278, 279-280, 281-282, 283-284, 285-286, 287-288, 289-290, 291-292, 293-294, 295-296, 297-298, 299-300, 301-302, 303-304, 305-306, 307-308, 309-310, 311-312, 313-314, 315-316, 317-318, 319-320, 321-322, 323-324, 325-326, 327-328, 329-330, 331-332, 333-334, 335-336, 337-338, 339-340, 341-342, 343-344, 345-346, 347-348, 349-350, 351-352, 353-354, 355-356, 357-358, 359-360, 361-362, 363-364, 365-366, 367-368, 369-370, 371-372, 373-374, 375-376, 377-378, 379-380, 381-382, 383-384, 385-386, 387-388, 389-390, 391-392, 393-394, 395-396, 397-398, 399-400, 401-402, 403-404, 405-406, 407-408, 409-410, 411-412, 413-414, 415-416, 417-418, 419-420, 421-422, 423-424, 425-426, 427-428, 429-430, 431-432, 433-434, 435-436, 437-438, 439-440, 441-442, 443-444, 445-446, 447-448, 449-450, 451-452, 453-454, 455-456, 457-458, 459-460, 461-462, 463-464, 465-466, 467-468, 469-470, 471-472, 473-474, 475-476, 477-478, 479-480, 481-482, 483-484, 485-486, 487-488, 489-490, 491-492, 493-494, 495-496, 497-498, 499-500, 501-502, 503-504, 505-506, 507-508, 509-510, 511-512, 513-514, 515-516, 517-518, 519-520, 521-522, 523-524, 525-526, 527-528, 529-530, 531-532, 533-534, 535-536, 537-538, 539-540, 541-542, 543-544, 545-546, 547-548, 549-550, 551-552, 553-554, 555-556, 557-558, 559-560, 561-562, 563-564, 565-566, 567-568, 569-570, 571-572, 573-574, 575-576, 577-578, 579-580, 581-582, 583-584, 585-586, 587-588, 589-590, 591-592, 593-594, 595-596, 597-598, 599-600, 601-602, 603-604, 605-606, 607-608, 609-610, 611-612, 613-614, 615-616, 617-618, 619-620, 621-622, 623-624, 625-626, 627-628, 629-630, 631-632, 633-634, 635-636, 637-638, 639-640, 641-642, 643-644, 645-646, 647-648, 649-650, 651-652, 653-654, 655-656, 657-658, 659-660, 661-662, 663-664, 665-666, 667-668, 669-670, 671-672, 673-674, or 675-676.

[00396] In some embodiments, the first antibody or antigen-binding fragment thereof comprises a heavy chain variable region and a light chain variable region comprising a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398.

[00397] In some embodiments, the second antibody or antigen-binding fragment thereof comprising a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16, 17-18, 19-20, 21-22, 23-24, 25-26, 27-28, 29-30, 31-32, 33-34, 35-36, 37-38, 39-40, 41-42, 43-44, 45-46, 47-48, 49-50, 51-52, 53-54, 55-56, 57-58, 59-60, 61-62, 63-64, 65-66, 67-68, 69-70, 71-72, 73-74, 75-76, 77-78, 79-80, 81-82, 83-84, 85-86, 87-88, 89-90, 91-92, 93-94, 95-96, 97-98, 99-100, 101-102, 103-104, 105-106, 107-108, 109-110, 111-112, 113-114, 115-116, 117-118, 119-120, 121-122, 123-124, 125-126, 127-128, 129-130, 131-132, 133-134, 135-136, 137-138, 139-140, 141-142, 143-144, 145-146, 147-148, 149-150, 151-152, 153-154, 155-156, 157-158, 159-160, 161-162, 163-164, 165-166, 167-168, 169-170, 171-172, 173-174, 175-176, 177-178, 179-180, 181-182, 183-184, 185-186, 187-188, 189-190, 191-192, 193-194, 195-196, 197-198, 199-200, 201-202, 203-204, 205-206, 207-208, 209-210, 211-212, 213-214, 215-216, 217-218, 219-220, 221-222, 223-224, 225-226, 227-228, 229-230, 231-232, 233-234, 235-236, 237-238, 239-240, 241-242, 243-244, 245-246, 247-248, 249-250, 251-252, 253-254, 255-256, 257-258, 259-260, 261-262, 263-264, 265-266, 267-268, 269-270, 271-272, 273-274, 275-276, 277-278, 279-280, 281-282, 283-284, 285-286, 287-288, 289-290, 291-292, 293-294, 295-296, 297-298, 299-300, 301-302, 303-304, 305-306, 307-308, 309-310, 311-312, 313-314, 315-316, 317-318, 319-320, 321-322, 323-324, 325-326, 327-328, 329-330, 331-332, 333-334, 335-336, 337-338, 339-340, 341-342, 343-344, 345-346, 347-348, 349-350, 351-352, 353-354, 355-356, 357-358, 359-360, 361-362, 363-364, 365-366, 367-368, 369-370, 371-372, 373-374, 375-376, 377-378, 379-380, 381-382, 383-384, 385-386, 387-388, 389-390, 391-392, 393-394, 395-396, 397-398, 399-400, 401-402, 403-404, 405-406, 407-408, 409-410, 411-412, 413-414, 415-416, 417-418, 419-420, 421-422, 423-424, 425-426, 427-428, 429-430, 431-432, 433-434, 435-436, 437-438, 439-440, 441-442, 443-444, 445-446, 447-448, 449-450, 451-452, 453-454, 455-456, 457-458, 459-460, 461-462, 463-464, 465-466, 467-468, 469-470, 471-472, 473-474, 475-476, 477-478, 479-480, 481-482, 483-484, 485-486, 487-488, 489-490, 491-492, 493-494, 495-496, 497-498, 499-500, 501-502, 503-504, 505-506, 507-508, 509-510, 511-512, 513-514, 515-516, 517-518, 519-520, 521-522, 523-524, 525-526, 527-528, 529-530, 531-532, 533-534, 535-536, 537-538, 539-540, 541-542, 543-544, 545-546, 547-548, 549-550, 551-552, 553-554, 555-556,

557-558, 559-560, 561-562, 563-564, 565-566, 567-568, 569-570, 571-572, 573-574, 575-576, 577-578, 579-580, 581-582, 583-584, 585-586, 587-588, 589-590, 591-592, 593-594, 595-596, 597-598, 599-600, 601-602, 603-604, 605-606, 607-608, 609-610, 611-612, 613-614, 615-616, 617-618, 619-620, 621-622, 623-624, 625-626, 627-628, 629-630, 631-632, 633-634, 635-636, 637-638, 639-640, 641-642, 643-644, 645-646, 647-648, 649-650, 651-652, 653-654, 655-656, 657-658, 659-660, 661-662, 663-664, 665-666, 667-668, 669-670, 671-672, 673-674, or 675-676; wherein the first antibody or antigen-binding fragment thereof is different from the second antibody or antigen-binding fragment thereof.

[00398] In some embodiments, the second antibody or antigen-binding fragment thereof comprises a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398, wherein the first antibody or antigen-binding fragment thereof is different from the second antibody or antigen-binding fragment thereof.

[00399] In some embodiments, the second therapeutic agent comprises an anti-inflammatory drug or an antiviral compound. In some embodiments, the antiviral compound comprises: a nucleoside analog, a peptoid, an oligopeptide, a polypeptide, a protease inhibitor, a 3C-like protease inhibitor, a papain-like protease inhibitor, or an inhibitor of an RNA dependent RNA polymerase. In some embodiments, the antiviral compound may include: acyclovir, ganciclovir, vidarabine, foscarnet, cidofovir, amantadine, ribavirin, trifluorothymidine, zidovudine, didanosine, zalcitabine, or an interferon. In some embodiments, the interferon is an interferon-α or an interferon-β.

[00400] In some embodiments, the antibody or antigen-binding fragment thereof is administered before, after, or concurrently with the second therapeutic agent or therapy. In some embodiments, the antibody or antigen-binding fragment thereof is administered to the subject intravenously, subcutaneously, or intraperitoneally. In some embodiments, the antibody or antigen-binding fragment thereof is administered prophylactically or therapeutically.

[00401] The antibodies described herein can be used together with one or more of other anti-SARS-CoV-2 virus antibodies to neutralize SARS-CoV-2 virus, thereby treating SARS-CoV-2 infections.

[00402] Administration of the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof can occur by infusion (e.g., continuous or bolus), injection, irrigation,

inhalation, consumption, electro-osmosis, hemodialysis, iontophoresis, and other methods known in the art.

[00403] In some embodiments administration route is intraarterial, intracranial, intradermal, intraduodenal, intrammamary, intrameningeal, intraperitoneal, intrathecal, intratumoral, intravenous, intravitreal, ophthalmic, parenteral, spinal, subcutaneous, ureteral, urethral, vaginal, or intrauterine. In some embodiments, administration route is local or systemic.

[00404] The effective amount of the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof administered to a particular subject will depend on a variety of factors, several of which will differ from patient to patient including the disorder being treated and the severity of the disorder; activity of the specific agent(s) employed; the age, body weight, general health, sex and diet of the patient; the timing of administration, route of administration; the duration of the treatment; drugs used in combination; the judgment of the prescribing physician; and like factors known in the medical arts. Dosage amount and interval can be adjusted individually to provide plasma levels of the compound(s) which are sufficient to maintain therapeutic or prophylactic effect. In cases of local administration or selective uptake, such as local topical administration, the effective local concentration of active compound(s) cannot be related to plasma concentration. Skilled artisans will be able to optimize effective local dosages without undue experimentation.

[00405] Dosage amounts of the pharmaceutical compositions disclosed herein can typically be in the range of from about 0.0001 mg/kg/day to about 1000 mg/kg/day, but can be higher or lower, depending upon, among other factors, the activity of the compound, its bioavailability, and various factors discussed above. In some embodiments, the dose is from about 0.0001 mg/kg to about 1000 mg/kg of body weight per day. In some embodiments, the dose is from about 0.001 mg/kg to about 1000 mg/kg of body weight per day. In some embodiments, the dose is from about 0.01 mg/kg to about 1000 mg/kg of body weight per day. In some embodiments, the dose is from about 0.1 mg/kg to about 100 mg/kg of body weight per day. In some embodiments, the dose is from about 0.5 mg/kg to about 50 mg/kg of body weight per day. In some embodiments, the dose is from about 1 mg/kg to about 25 mg/kg of body weight per day. In some embodiments, the dose is from about 5 mg/kg to about 15 mg/kg of body weight per day. In some embodiments, the dose is about 1 mg/kg, about 5 mg/kg, about 10 mg/kg, about 15 mg/kg, about 20 mg/kg, about 25 mg/kg, about 30 mg/kg, about 35 mg/kg, about 40 mg/kg, about 45 mg/kg, about 50 mg/kg, about 55 mg/kg, about 60

mg/kg, about 65 mg/kg, about 70 mg/kg, about 75 mg/kg, about 80 mg/kg, about 85 mg/kg, about 90 mg/kg, about 95 mg/kg, or about 100 mg/kg.

[00406] The number of administrations of treatment to a subject may vary. In some embodiments, introducing the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof into the subject may be a one-time event. In some embodiments, such treatment may require an on-going series of repeated treatments (e.g., once per day, once per week, or multiple times per day or week). In some embodiments, multiple administrations of the pharmaceutical compositions may be required before an effect is observed. The exact protocols depend upon the disease or condition, the stage of the disease and parameters of the individual subject being treated.

Combination Therapies

[00407] In some embodiments, the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein are administered in combination with one or more additional therapeutic composition(s). In some embodiments, the additional therapeutic composition is an anti-viral drug. In some embodiments, the additional therapeutic composition is a viral entry inhibitor. In some embodiments, the additional therapeutic composition is a viral attachment inhibitor.

[00408] In some embodiments, the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein and the additional therapeutic composition(s) are administered simultaneously. In some embodiments, the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein is administered before the additional therapeutic composition(s). In some embodiments, the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein is administered after the additional therapeutic composition(s).

[00409] In some embodiments, administration of the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein in combination with the additional therapeutic composition(s) results in an enhanced therapeutic effect in a subject infected with SARS-CoV-2 viruses than is observed by treatment with either the antibodies, antigen-binding fragments thereof, or pharmaceutical compositions thereof disclosed herein or the additional therapeutic composition(s) alone.

[00410] Combination therapies may include an anti- SARS-CoV-2 antibody of the invention and any additional therapeutic agent that may be advantageously combined with an antibody of the

invention or with a biologically active fragment of an antibody of the invention. The antibodies of the present invention may be combined synergistically with one or more drugs or therapy used to treat a disease or disorder associated with a viral infection, such as a SARS-CoV-2 infection. In some embodiments, the antibodies of the invention may be combined with a second therapeutic agent to ameliorate one or more symptoms of said disease. In some embodiments, the antibodies of the invention may be combined with a second antibody to provide synergistic activity in ameliorating one or more symptoms of said disease. In some embodiments, the first antibody or antigen-binding fragment thereof is administered before, after, or concurrently with the second antibody or antigen-binding fragment thereof.

[00411] For example, the antibody described herein can be used in various detection methods for use in, e.g., monitoring the progression of a SARS-CoV-2 infection; monitoring patient response to treatment for such an infection, etc. The present disclosure provides methods of detecting a neuraminidase polypeptide in a biological sample obtained from an individual. The methods generally involve: a) contacting the biological sample with a subject anti- neuraminidase antibody; and b) detecting binding, if any, of the antibody to an epitope present in the sample. In some instances, the antibody comprises a detectable label. The level of neuraminidase polypeptide detected in the biological sample can provide an indication of the stage, degree, or severity of a SARS-CoV-2 infection. The level of the neuraminidase polypeptide detected in the biological sample can provide an indication of the individual's response to treatment for a SARS-CoV-2 infection.

[00412] In some embodiments, the second therapeutic agent is another antibody to a SARS-COV-2 protein or a fragment thereof. It is contemplated herein to use a combination ("cocktail") of antibodies with broad neutralization or inhibitory activity against SARS-COV-2. In some embodiments, non-competing antibodies may be combined and administered to a subject in need thereof. In some embodiments, the antibodies comprising the combination bind to distinct non-overlapping epitopes on the protein. In some embodiments, the second antibody may possess a longer half-life in human serum.

[00413] As used herein, the term "in combination with" means that additional therapeutically active component(s) may be administered prior to, concurrent with, or after the administration of the anti-SARS-COV-2 antibody of the present invention. The term "in combination with" also

includes sequential or concomitant administration of an anti-SARS-COV-2 antibody and a second therapeutic agent.

[00414] The additional therapeutically active component(s) may be administered to a subject prior to administration of an anti-SARS-COV-2 antibody of the present invention. For example, a first component may be deemed to be administered "prior to" a second component if the first component is administered 1 week before, 72 hours before, 60 hours before, 48 hours before, 36 hours before, 24 hours before, 12 hours before, 6 hours before, 5 hours before, 4 hours before, 3 hours before, 2 hours before, 1 hour before, 30 minutes before, 15 minutes before, 10 minutes before, 5 minutes before, or less than 1 minute before administration of the second component. In other embodiments, the additional therapeutically active component(s) may be administered to a subject after administration of an anti-SARS-COV-2 antibody of the present invention. For example, a first component may be deemed to be administered "after" a second component if the first component is administered 1 minute after, 5 minutes after, 10 minutes after, 15 minutes after, 30 minutes after, 1 hour after, 2 hours after, 3 hours after, 4 hours after, 5 hours after, 6 hours after, 12 hours after, 24 hours after, 36 hours after, 48 hours after, 60 hours after, 72 hours after administration of the second component. In yet other embodiments, the additional therapeutically active component(s) may be administered to a subject concurrent with administration of an anti-SARS-COV-2 antibody of the present invention. "Concurrent" administration, for purposes of the present invention, includes, e.g., administration of an anti-SARS-COV-2 antibody and an additional therapeutically active component to a subject in a single dosage form, or in separate dosage forms administered to the subject within about 30 minutes or less of each other. If administered in separate dosage forms, each dosage form may be administered via the same route (e.g., both the anti-SARS-COV-2 antibody and the additional therapeutically active component may be administered intravenously, etc.); alternatively, each dosage form may be administered via a different route (e.g., the anti-SARS-COV-2 antibody may be administered intravenously, and the additional therapeutically active component may be administered orally). In any event, administering the components in a single dosage form, in separate dosage forms by the same route, or in separate dosage forms by different routes are all considered "concurrent administration," for purposes of the present disclosure. For purposes of the present disclosure, administration of an anti-SARS-COV-2 antibody "prior to," "concurrent with," or "after" (as those terms are defined hereinabove) administration of an additional therapeutically active component is considered

administration of an anti-SARS-COV-2 antibody "in combination with" an additional therapeutically active component.

[00415] The present invention includes pharmaceutical compositions in which an anti-SARS-COV-2 antibody of the present invention is co-formulated with one or more of the additional therapeutically active component(s) as described elsewhere herein.

Administration Regimens

[00416] According to certain embodiments, a single dose of an anti-SARS-COV-2 antibody of the invention (or a pharmaceutical composition comprising a combination of an anti-SARS-COV-2 antibody and any of the additional therapeutically active agents mentioned herein) may be administered to a subject in need thereof. According to certain embodiments of the present invention, multiple doses of an anti-SARS-COV-2 antibody (or a pharmaceutical composition comprising a combination of an anti-SARS-COV-2 antibody and any of the additional therapeutically active agents mentioned herein) may be administered to a subject over a defined time course. The methods according to this aspect of the invention comprise sequentially administering to a subject multiple doses of an anti-SARS-COV-2 antibody of the invention. As used herein, "sequentially administering" means that each dose of anti- SARS-COV-2 antibody is administered to the subject at a different point in time, e.g., on different days separated by a predetermined interval (e.g., hours, days, weeks, or months). The present invention includes methods that comprise sequentially administering to the patient a single initial dose of an anti-SARS-COV-2 antibody, followed by one or more secondary doses of the anti-SARS-COV-2 antibody, and optionally followed by one or more tertiary doses of the anti-SARS-COV-2 antibody.

[00417] The terms "initial dose," "secondary doses," and "tertiary doses," refer to the temporal sequence of administration of the anti-SARS-COV-2 antibody of the invention. Thus, the "initial dose" is the dose, which is administered at the beginning of the treatment regimen (also referred to as the "baseline dose"); the "secondary doses" are the doses, which are administered after the initial dose; and the "tertiary doses" are the doses which are administered after the secondary doses. The initial, secondary, and tertiary doses may all contain the same amount of anti-SARS-COV-2 antibody, but generally may differ from one another in terms of frequency of administration. In some embodiments, however, the amount of anti-SARS-COV-2 antibody contained in the initial, secondary and/or tertiary doses varies from one another (e.g., adjusted up or down as appropriate) during the course of treatment. In some embodiments, two or more (e.g., 2, 3, 4, or 5) doses are

administered at the beginning of the treatment regimen as "loading doses" followed by subsequent doses that are administered on a less frequent basis (e.g., "maintenance doses").

[00418] In certain exemplary embodiments of the present invention, each secondary and/or tertiary dose is administered 1 to 48 hours (e.g., 1, 1 ½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11 ½, 12, 12½, 13, 13½, 14, 14½, 15, 15½, 16, 16½, 17, 17½, 18, 18½, 19, 19½, 20, 20½, 21, 21 ½, 22, 22½, 23, 23 ½, 24, 24½, 25, 25 ½, 26, 26½, or more) after the immediately preceding dose. The phrase "the immediately preceding dose," as used herein, means, in a sequence of multiple administrations, the dose of anti-SARS-COV-2 antibody, which is administered to a patient prior to the administration of the very next dose in the sequence with no intervening doses.

[00419] The methods, according to this aspect of the invention, may comprise administering to a patient any number of secondary and/or tertiary doses of an anti-SARS-COV-2 antibody. For example, In some embodiments, only a single secondary dose is administered to the patient. In other embodiments, two or more (e.g., 2, 3, 4, 5, 6, 7, 8, or more) secondary doses are administered to the patient. Likewise, In some embodiments, only a single tertiary dose is administered to the patient. In other embodiments, two or more (e.g., 2, 3, 4, 5, 6, 7, 8, or more) tertiary doses are administered to the patient.

[00420] In some embodiments of the invention, the frequency at which the secondary and/or tertiary doses are administered to a patient can vary over the course of the treatment regimen. The frequency of administration may also be adjusted during the course of treatment by a physician depending on the needs of the individual patient following clinical examination.

Diagnostic Uses of the Antibodies

[00421] The anti-SARS-COV-2 antibodies of the present invention may be used to detect and/or measure SARS-COV-2 in a sample, e.g., for diagnostic purposes. Some embodiments contemplate the use of one or more antibodies of the present invention in assays to detect a SARS-COV-2-associated disease or disorder. Exemplary diagnostic assays for SARS-COV-2 may comprise, e.g., contacting a sample obtained from a patient with an anti-SARS-COV-2 antibody of this disclosure, wherein the anti-SARS-COV-2 antibody is labeled with a detectable label or reporter molecule or used as a capture ligand to selectively isolate SARS-COV-2 from patient samples. Alternatively, an unlabeled anti-SARS-COV-2 antibody can be used in diagnostic applications in combination with a secondary antibody, which is itself detectably labeled. The detectable label or reporter

molecule can be a radioisotope, such as H, C, P, S, or I; a fluorescent or chemiluminescent moiety such as fluorescein isothiocyanate, or rhodamine; or an enzyme such as alkaline phosphatase, β-galactosidase, horseradish peroxidase, or luciferase. Specific exemplary assays that can be used to detect or measure SARS-COV-2 in a sample include enzyme-linked immunosorbent assay (ELISA), radioimmunoassay (RIA), and fluorescence-activated cell sorting (FACS).

[00422] In another aspect, this disclosure further provides a method for detecting the presence of SARS CoV-2 in a sample comprising the steps of: (i) contacting a sample with the antibody or antigen-binding fragment thereof described herein; and (ii) determining binding of the antibody or antigen-binding fragment to one or more SARS CoV-2 antigens, wherein binding of the antibody to the one or more SARS CoV-2 antigens is indicative of the presence of SARS CoV-2 in the sample.

[00423] In some embodiments, the SARS-CoV-2 antigen comprises the receptor binding domain (RBD) of the S polypeptide.

[00424] In some embodiments, the SARS-CoV-2 antigen comprises the N-terminal domain (NTD) of the S polypeptide. In some embodiments, the SARS-CoV-2 antigen comprises the supersite b-hairpin (residues 152-158), the β8-strand (residue 97-102), N4-loop (residues 178-188), and/or N-linked glycans at positions N122 and N149 of the S polypeptide. In some embodiments, the SARS-CoV-2 antigen comprises residues 27-32, 57-60, 210-218, and/or 286-303 of the S polypeptide. In some embodiments, the SARS-CoV-2 antigen comprises residues 600-606 of the S polypeptide.

[00425] In some embodiments, the antibody or antigen-binding fragment thereof is conjugated to a label. In some embodiments, the step of detecting comprises contacting a secondary antibody with the antibody or antigen-binding fragment thereof and wherein the secondary antibody comprises a label. In some embodiments, the label includes a fluorescent label, a chemiluminescent label, a radiolabel, and an enzyme.

[00426] In some embodiments, the step of detecting comprises detecting fluorescence or chemiluminescence. In some embodiments, the step of detecting comprises a competitive binding assay or ELISA.

[00427] In some embodiments, the method further comprises binding the sample to a solid support. In some embodiments, the solid support includes microparticles, microbeads, magnetic beads, and an affinity purification column.

[00428] Samples that can be used in SARS-COV-2 diagnostic assays according to the present invention include any tissue or fluid sample obtainable from a patient, which contains detectable quantities of either SARS-COV-2 protein, or fragments thereof, under normal or pathological conditions. Generally, levels of SARS-COV-2 protein in a particular sample obtained from a healthy patient (e.g., a patient not afflicted with a disease associated with SARS-COV-2) will be measured to initially establish a baseline, or standard, level of SARS-COV-2. This baseline level of SARS-COV-2 can then be compared against the levels of SARS-COV-2 measured in samples obtained from individuals suspected of having a SARS-COV-2-associated condition or symptoms associated with such condition.

[00429] The antibodies specific for SARS-COV-2 protein may contain no additional labels or moieties, or they may contain an N-terminal or C-terminal label or moiety. In one embodiment, the label or moiety is biotin. In a binding assay, the location of a label (if any) may determine the orientation of the peptide relative to the surface upon which the peptide is bound. For example, if a surface is coated with avidin, a peptide containing a N-terminal biotin will be oriented such that the C-terminal portion of the peptide will be distal to the surface.

2. FURTHER NUMBERED EMBODIMENTS

[00430] Further numbered embodiments of the present disclosure are as follows:

[00431] Embodiment 1. An isolated anti-SARS-CoV-2 antibody or antigen-binding fragment thereof that binds specifically to a SARS-CoV-2 antigen.

[00432] Embodiment 2. The antibody or antigen-binding fragment thereof of Embodiment 1, wherein the SARS-CoV-2 antigen comprises a spike polypeptide, and preferably wherein the SARS-CoV-2 antigen comprises a spike polypeptide of a human or an animal SARS-CoV-2.

[00433] Embodiment 3. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, wherein the SARS-CoV-2 antigen comprises the receptor binding domain (RBD) or the N-terminal domain (NTD) of the spike polypeptide.

[00434] Embodiment 4. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, wherein: (a) the SARS-CoV-2 antigen comprises the supersite b-hairpin (residues 152-158), the β8-strand (residue 97-102), N4-loop (residues 178-188), and/or N-linked glycans at positions N122 and N149 of the spike polypeptide; or (b) wherein the SARS-CoV-2

antigen comprises residues 27-32, 57-60, 210-218, and/or 286-303 of the spike polypeptide, and preferably wherein the SARS-CoV-2 antigen comprises residues 600-606 of the spike polypeptide.

[00435] Embodiment 5. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, comprising:

a. three heavy chain complementarity determining regions (HCDRs) (HCDR1, HCDR2, and HCDR3) of a heavy chain variable region (HCVR) having the amino acid sequence of SEQ ID NO: 25; and three light chain CDRs (LCDR1, LCDR2, and LCDR3) of a light chain variable region (LCVR) having the amino acid sequence of SEQ ID NO: 26;

b. HCDR1, HCDR2, and HCDR3 of a HCVR having the amino acid sequence of SEQ ID NO: 191; and LCDR1, LCDR2, and LCDR3 of a LCVR having the amino acid sequence of SEQ ID NO: 192;

c. HCDR1, HCDR2, and HCDR3 of a HCVR having the amino acid sequence of SEQ ID NO: 219; and LCDR1, LCDR2, and LCDR3 of a LCVR having the amino acid sequence of SEQ ID NO: 220;

d. HCDR1, HCDR2, and HCDR3 of a HCVR having the amino acid sequence of SEQ ID NO: 395; and LCDR1, LCDR2, and LCDR3 of a LCVR having the amino acid sequence of SEQ ID NO: 396; or

e. HCDR1, HCDR2, and HCDR3 of a HCVR having the amino acid sequence of SEQ ID NO: 397; and LCDR1, LCDR2, and LCDR3 of a LCVR having the amino acid sequence of SEQ ID NO: 398.

[00436] Embodiment 6. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, comprising:

a. a HCVR comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO: 25 or comprising the amino acid sequence of SEQ ID NO: 25; and a LCVR comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO: 26 or comprising the amino acid sequence of SEQ ID NO: 26;

b. a HCVR comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO: 191 or comprising the amino acid sequence of SEQ ID NO: 191; and a LCVR comprising an amino acid sequence with at least 75%

identity to the amino acid sequence of SEQ ID NO: 192 or comprising the amino acid sequence of SEQ ID NO: 192;

c. a HCVR comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO: 219 or comprising the amino acid sequence of SEQ ID NO: 219; and a LCVR comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO: 220 or comprising the amino acid sequence of SEQ ID NO: 220;

d. a HCVR comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO: 395 or comprising the amino acid sequence of SEQ ID NO: 395; and a LCVR comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO; 396 or comprising the amino acid sequence of SEQ ID NO: 396; or

e. a HCVR comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO: 397 or comprising the amino acid sequence of SEQ ID NO: 397; and a LCVR comprising an amino acid sequence with at least 75% identity to the amino acid sequence of SEQ ID NO; 398 or comprising the amino acid sequence of SEQ ID NO: 398.

[00437] Embodiment 7. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, comprising a HCVR and a LCVR that comprise a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398.

[00438] Embodiment 8. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, comprising a HCVR and a LCVR that comprise a HCVR/LCVR amino acid sequence pair with at least 75% identity to the amino acid sequence of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398.

[00439] Embodiment 9. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, wherein the antibody or antigen-binding fragment thereof is capable of neutralizing a plurality of SARS-CoV-2 strains.

[00440] Embodiment 10. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, wherein the antibody or antigen-binding fragment thereof is a multivalent antibody comprising (a) a first target binding site that specifically binds to an epitope

within the spike polypeptide, and (b) a second target binding site that binds to an epitope on a different epitope on the spike polypeptide or a different molecule.

[00441] Embodiment 11. The antibody or antigen-binding fragment thereof of Embodiment 10, wherein the multivalent antibody is a bivalent or bispecific antibody.

[00442] Embodiment 12. The antibody or the antigen-binding fragment thereof of any one of the preceding Embodiments, further comprising a variant Fc constant region.

[00443] Embodiment 13. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, wherein the antibody is a monoclonal antibody.

[00444] Embodiment 14. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, wherein the antibody or antigen-binding fragment thereof is a chimeric antibody, a humanized antibody, or humanized monoclonal antibody.

[00445] Embodiment 15. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, wherein the antibody or antigen-binding fragment thereof is a single-chain antibody, Fab or Fab2 fragment.

[00446] Embodiment 16. The antibody or antigen-binding fragment thereof of any one of the preceding Embodiments, wherein the antibody or antigen-binding fragment thereof is detectably labeled or conjugated to a toxin, a therapeutic agent, a polymer, a receptor, an enzyme, or a receptor ligand, preferably wherein the polymer is polyethylene glycol (PEG).

[00447] Embodiment 17. A pharmaceutical composition comprising the antibody or antigen-binding fragment thereof of any one of the preceding Embodiments and optionally a pharmaceutically acceptable carrier or excipient.

[00448] Embodiment 18. The pharmaceutical composition of Embodiment 16, wherein the pharmaceutical comprises two or more of the antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16.

[00449] Embodiment 19. The pharmaceutical composition of Embodiment 18, wherein the two or more of the antibody or antigen-binding fragment thereof comprise:

a. a first antibody or antigen-binding fragment thereof comprising a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398,

b. wherein the first antibody or antigen-binding fragment thereof is different from the second antibody or antigen-binding fragment thereof.

[00450] Embodiment 20. The pharmaceutical composition of Embodiment 18, wherein the two or more of the antibody or antigen-binding fragment thereof comprise:

a. a first antibody or antigen-binding fragment thereof comprising a HCVR/LCVR amino acid sequence pair with at least 75% identity to the amino acid sequence of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398,
b. wherein the first antibody or antigen-binding fragment thereof is different from the second antibody or antigen-binding fragment thereof.

[00451] Embodiment 21. The pharmaceutical composition of any one of Embodiments 17 to 20, further comprising a second therapeutic agent, preferably wherein the second therapeutic agent comprises an anti-inflammatory drug or an antiviral compound.

[00452] Embodiment 22. The pharmaceutical composition of Embodiment 21, wherein: (a) the antiviral compound comprises: a nucleoside analog, a peptoid, an oligopeptide, a polypeptide, a protease inhibitor, a 3C-like protease inhibitor, a papain-like protease inhibitor, or an inhibitor of an RNA dependent RNA polymerase; or (b) the antiviral compound is selected from: acyclovir, ganciclovir, vidarabine, foscarnet, cidofovir, amantadine, ribavirin, trifluorothymidine, zidovudine, didanosine, zalcitabine, and an interferon, and preferably wherein the interferon is an interferon-α or an interferon-β.

[00453] Embodiment 23. Use of the antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16 or the pharmaceutical composition of any one of Embodiments 17 to 22 in the manufacture of a medicament for the diagnosis, prophylaxis, treatment, or combination thereof of a condition resulting from a SARS-CoV-2.

[00454] Embodiment 24. A nucleic acid molecule encoding a polypeptide chain of the antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16.

[00455] Embodiment 25. A vector comprising the nucleic acid molecule of Embodiment 24.

[00456] Embodiment 26. A cultured host cell comprising the vector of Embodiment 25.

[00457] Embodiment 27. A method of preparing an antibody or antigen-binding fragment thereof, comprising:

a. obtaining the cultured host cell of Embodiment 26;
b. culturing the cultured host cell in a medium under conditions permitting expression of a polypeptide encoded by the vector and assembling of an antibody or fragment thereof; and

c. purifying the antibody or fragment from the cultured cell or the medium of the cell.

[00458] Embodiment 28. A kit comprising a pharmaceutically acceptable dose unit of the antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16 or the pharmaceutical composition of any one of Embodiments 17 to 22.

[00459] Embodiment 29. A kit for the diagnosis, prognosis or monitoring treatment of SARS-CoV-2 in a subject, comprising: the antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16; and a least one detection reagent that binds specifically to the antibody or antigen-binding fragment thereof.

[00460] Embodiment 30. A method of neutralizing SARS-CoV-2 in a subject, comprising administering to a subject in need thereof a therapeutically effective amount of the antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16 or a therapeutically effective amount of the pharmaceutical composition of any one of Embodiments 17 to 22.

[00461] Embodiment 31. A method of preventing or treating a SARS-CoV-2 infection, comprising administering to a subject in need thereof a therapeutically effective amount of the antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16 or a therapeutically effective amount of the pharmaceutical composition of any one of Embodiments 17 to 22.

[00462] Embodiment 32. A method of neutralizing SARS-CoV-2 in a subject, comprising administering to a subject in need thereof a therapeutically effective amount of a first antibody or antigen-binding fragment thereof and a second antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16 or a therapeutically effective amount of the pharmaceutical composition of any one of Embodiments 17 to 22, wherein the first antibody or antigen-binding fragment thereof and the second antibody or antigen-binding fragment thereof exhibit synergistic activity.

[00463] Embodiment 33. A method of preventing or treating a SARS-CoV-2 infection, comprising administering to a subject in need thereof a therapeutically effective amount of a first antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16 and a second antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16 or a therapeutically effective amount of the pharmaceutical composition of any one of Embodiments 17 to 22, wherein the first antibody or antigen-binding fragment thereof and the second antibody or antigen-binding fragment thereof exhibit synergistic activity.

[00464] Embodiment 34. The method of Embodiment 30 or 31, further comprising administering to the subject a therapeutically effective amount of a second therapeutic agent or therapy.

[00465] Embodiment 35. The method of Embodiment 34, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable region and a light chain variable region comprising a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398, wherein the antibody or antigen-binding fragment thereof is different from the second therapeutic agent or therapy.

[00466] Embodiment 36. The method of Embodiment 34, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable region and a light chain variable region comprising a HCVR/LCVR amino acid sequence pair with at least 75% identity to the amino acid sequence of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398, wherein the antibody or antigen-binding fragment thereof is different from the second therapeutic agent or therapy.

[00467] Embodiment 37. The method of Embodiment 34 or 35, wherein the antibody or antigen-binding fragment thereof is administered before, after, or concurrently with the second therapeutic agent or therapy.

[00468] Embodiment 38. The method of any one of Embodiments 34 to 37, wherein the second therapeutic agent comprises an anti-inflammatory drug or an antiviral compound.

[00469] Embodiment 39. The method of Embodiment 38, wherein: (a) the antiviral compound comprises: a nucleoside analog, a peptoid, an oligopeptide, a polypeptide, a protease inhibitor, a 3C-like protease inhibitor, a papain-like protease inhibitor, or an inhibitor of an RNA dependent RNA polymerase; or (b) the antiviral compound is selected from: acyclovir, ganciclovir, vidarabine, foscarnet, cidofovir, amantadine, ribavirin, trifluorothymidine, zidovudine, didanosine, zalcitabine, and an interferon, and preferably wherein the interferon is an interferon-α or an interferon-β.

[00470] Embodiment 40. The method of Embodiment 32 or 33, wherein the first antibody or antigen-binding fragment thereof comprises a heavy chain variable region and a light chain variable region comprising a HCVR/LCVR amino acid sequence pair of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398, wherein the first antibody or antigen-binding fragment thereof is different from the second antibody or antigen-binding fragment thereof.

[00471] Embodiment 41. The method of Embodiment 32 or 33, wherein the first antibody or antigen-binding fragment thereof comprises a heavy chain variable region and a light chain variable region comprising a HCVR/LCVR amino acid sequence pair with at least 75% identity to the amino acid sequence of SEQ ID NOs: 25-26, 191-192, 219-220, 395-396, or 397-398, wherein the first antibody or antigen-binding fragment thereof is different from the second antibody or antigen-binding fragment thereof.

[00472] Embodiment 42. The method of any one of Embodiments 32,33 and 40, wherein the first antibody or antigen-binding fragment thereof is administered before, after, or concurrently with the second antibody or antigen-binding fragment thereof.

[00473] Embodiment 43. The method of any one of Embodiments 30 to 42, wherein the antibody or antigen-binding fragment thereof is administered to the subject intravenously, subcutaneously, or intraperitoneally.

[00474] Embodiment 44. The method of Embodiment 32 or 33, wherein the antibody or antigen-binding fragment thereof is administered prophylactically or therapeutically.

[00475] Embodiment 45. A method for detecting the presence of SARS CoV-2 in a sample comprising the steps of:

a. contacting a sample with the antibody or antigen-binding fragment thereof of any one of Embodiments 1 to 16; and
b. determining binding of the antibody or antigen-binding fragment to one or more SARS CoV-2 antigens,
c. wherein binding of the antibody to the one or more SARS CoV-2 antigens is indicative of the presence of SARS CoV-2 in the sample.

[00476] Embodiment 46. The method of Embodiment 45, wherein the SARS-CoV-2 antigen comprises a spike polypeptide of a human or an animal SARS-CoV-2, and preferably wherein the SARS-CoV-2 antigen comprises the receptor binding domain (RBD) or the N-terminal domain (NTD) of the S polypeptide.

[00477] Embodiment 47. The method of any one of Embodiments 45 to 46, wherein the antibody or antigen-binding fragment thereof is conjugated to a label, preferably wherein the label is selected from a fluorescent label, a chemiluminescent label, a radiolabel, and an enzyme.

[00478] Embodiment 48. The method of any one of Embodiments 45 to 47, further comprising contacting a secondary antibody with the antibody or antigen-binding fragment thereof, wherein the secondary antibody comprises a label.

[00479] Embodiment 49. The method of Embodiment 48, further comprising detecting fluorescence or chemiluminescence of the label, preferably wherein the step of detecting comprises a competitive binding assay or ELISA.

[00480] Embodiment 50. The method of any one of Embodiments 45 to 49, wherein the sample is a blood sample.

[00481] Embodiment 51. The method of any one of Embodiment 45 to 50, further comprising binding the sample to a solid support, preferably wherein the solid support is selected from microparticles, microbeads, magnetic beads, and an affinity purification column.

EXAMPLES

[00482] The following is a description of various methods and materials used in the studies. They are put forth so as to provide those of ordinary skill in the art with a complete disclosure and description of how to make and use the present invention, and are not intended to limit the scope of what the inventors regard as their invention, nor are they intended to represent that the experiments below were performed and are all of the experiments that may be performed. It is to be understood that exemplary descriptions written in the present tense were not necessarily performed, but rather that the descriptions can be performed to generate the data and the like associated with the teachings of the present invention. Efforts have been made to ensure accuracy with respect to numbers used (e.g., amounts, percentages, etc.), but some experimental errors and deviations should be accounted for.

EXAMPLE 1

[00483] This example describes the materials, methods, and instrumentation used in EXAMPLE 2.

Study participants

[00484] Participants were healthy adults that had been vaccinated with 2 or 3 doses of an mRNA vaccine (mRNA-1273 (Moderna) or BNT162b2 (Pfizer)) and reported breakthrough SARS-CoV-2 infection diagnosed by PCR or antigen testing. Breakthrough infection with delta or omicron variants was deduced based on the prevalent variant circulating in New York City at the time of infection (Gaebler et al., 2022). All participants were provided written informed consent before

participating in the study, and the study was conducted in accordance with Good Clinical Practice. The study was performed in compliance with all relevant ethical regulations, and the protocol (DRO-1006) for studies with human participants was approved by the Institutional Review Board of the Rockefeller University. For detailed participant characteristics, see Table 1.

Blood samples processing and storage

[00485] Venous blood samples were collected into Heparin and Serum-gel monovette tubes by standard phlebotomy at the Rockefeller University. Peripheral Blood Mononuclear Cells (PBMCs) obtained from samples collected were further purified as previously reported by gradient centrifugation and stored in liquid nitrogen in the presence of Fetal Calf Serum (FCS) and Dimethylsulfoxide (DMSO) (Gaebler et al., 2021; Robbiani et al., 2020). Heparinized serum and plasma samples were aliquoted and stored at -20°C or less. Prior to experiments, aliquots of plasma samples were heat-inactivated (56°C for 1 hour) and then stored at 4°C.

ELISAs

[00486] Enzyme-Linked Immunosorbent Assays (ELISAs)(Amanat et al., 2020; Grifoni. et al., 2020) were performed to evaluate antibodies binding to SARS-CoV-2 wild-type (Wuhan-Hu-1) RBD, and variants of concern Delta (B.1.617.2) RBD, and Omicron (BA.1) spike protein by coating of high-binding 96-half-well plates (Corning 3690) with 50 µl per well of a 1 µg/ml indicated protein solution in Phosphate-buffered Saline (PBS) overnight at 4°C. Plates were washed 6 times with washing buffer (1× PBS with 0.05% Tween-20 (Sigma-Aldrich)) and incubated with 170 µl per well blocking buffer (1× PBS with 2% BSA and 0.05% Tween-20 (Sigma)) for 1 hour at room temperature. Immediately after blocking, plasma samples or monoclonal antibodies were added in PBS and incubated for 1 hour at room temperature. Plasma samples were assayed at a 1:66 starting dilution and 10 additional 3-fold serial dilutions.

[00487] 10 µg/ml starting concentration was used to test monoclonal antibodies, followed by 10 additional 4-fold serial dilutions. Plates were washed 6 times with washing buffer and then incubated with anti-human IgG secondary antibody conjugated to horseradish peroxidase (HRP) (Jackson Immuno Research 109-036-088 109-035-129 and Sigma A0295) in blocking buffer at a 1:5,000 dilution. Plates were developed by addition of the HRP substrate, 3,3',5,5'-Tetramethylbenzidine (TMB) (ThermoFisher) for 10 minutes (plasma samples and monoclonal antibodies). 50 µl of 1 M H2SO4 was used to stop the reaction, and absorbance was measured at 450 nm with an ELISA microplate reader (FluoStar Omega, BMG Labtech) with Omega and

Omega MARS software for analysis. A positive control (For anti-RBD ELISA, plasma from participant COV72, diluted 66.6-fold and ten additional threefold serial dilutions in PBS; for anti-Omicron spike ELISA, plasma from B039 was used as a control) was added to every assay plate for normalization for plasma samples. The average of its signal was used for normalization of all the other values on the same plate with Excel software before calculating the area under the curve using Prism V9.1(GraphPad). Negative controls of pre-pandemic plasma samples from healthy donors were used for validation (for more details, please see Robbiani et al., 2020). For monoclonal antibodies, the ELISA half-maximal concentration (EC50) was determined using four-parameter nonlinear regression (GraphPad Prism V9.1). EC50s above 1000 ng/mL were considered non-binders.

Proteins

[00488] The mammalian expression vector encoding the Receptor Binding-Domain (RBD) of SARS-CoV-2 (GenBank MN985325.1; Spike (S) protein residues 319-539) was previously described (Barnes et al., 2020b).

SARS-CoV-2 pseudotyped reporter virus

[00489] A panel of plasmids expressing RBD-mutant SARS-CoV-2 spike proteins in the context of pSARS-CoV-2-SΔ19 has been described (Cho et al., 2021; Muecksch et al., 2021; Wang et al., 2021c; Weisblum et al., 2020). Variant pseudoviruses resembling SARS-CoV-2 variants Delta (B.1.617.2) and Omicron BA.1 (B.1.1.529) have been described before (Cho et al., 2021; Schmidt et al., 2022; Wang et al., 2021b) and were generated by introduction of substitutions using synthetic gene fragments (IDT) or overlap extension PCR mediated mutagenesis and Gibson assembly. Specifically, the variant-specific deletions and substitutions introduced were:

[00490] Delta: T19R, Δ156-158, L452R, T478K, D614G, P681R, D950N

[00491] Omicron BA.1: A67V, Δ69-70, T95I, G142D, Δ143-145, Δ211, L212I, ins214EPE, G339D, S371L, S373P, S375F, K417N, N440K, G446S, S477N, T478K, E484A, Q493K, G496S, Q498R, N501Y, Y505H, T547K, D614G, H655Y, H679K, P681H, N764K, D796Y, N856K, Q954H, N969H, N969K, L981F

[00492] Omicron BA.2: T19I, L24S, del25-27, G142D, V213G, G339D, S371F, S373P, S375F, T376A, D405N, R408S, K417N, N440K, S477N, T478K, E484A, Q493R, Q498R, N501Y, Y505H, D614G, H655Y, N679K, P681H, N764K, D796Y, Q954H, N969K

[00493] Omicron BA.4/5: T19I, L24S, del25-27, del69-70, G142D, V213G, G339D, S371F, S373P, S375F, T376A, D405N, R408S, K417N, N440K, L452R, S477N, T478K, E484A, F486V, Q498R, N501Y, Y505H, D614G, H655Y, N679K, P681H, N764K, D796Y, Q954H, N969K

[00494] Deletions/substitutions corresponding to variants of concern listed above were incorporated into a spike protein that also includes the R683G substitution, which disrupts the furin cleavage site and increases particle infectivity. Neutralizing activity against mutant pseudoviruses was compared to a wild-type (WT) SARS-CoV-2 spike sequence (NC_045512), carrying R683G where appropriate.

[00495] SARS-CoV-2 pseudotyped particles were generated as previously described (Robbiani et al., 2020; Schmidt et al., 2020a). Briefly, 293T (CRL-11268) cells were obtained from ATCC, and the cells were transfected with pNL4-3ΔEnv-nanoluc and pSARS-CoV-2-SΔ19. Particles were harvested 48 hours post-transfection, filtered, and stored at -80°C.

Pseudotyped virus neutralization assay

[00496] Pre-pandemic negative control plasma from healthy donors, plasma from individuals who received mRNA vaccines and had Delta or Omicron BA.1 breakthrough infection, or monoclonal antibodies were five-fold serially diluted and incubated with SARS-CoV-2 pseudotyped virus for 1 hour at 37 °C. The mixture was subsequently incubated with 293TAce2 cells (Robbiani et al., 2020) (for all WT neutralization assays) or HT1080/Ace2 cl14 cells (for all variant neutralization assays) for 48 hours, after which cells were washed with PBS and lysed with Luciferase Cell Culture Lysis 5× reagent (Promega). Nanoluc Luciferase activity in lysates was measured using the Nano-Glo Luciferase Assay System (Promega) with the ClarioStar Microplate Multimode Reader (BMG). The relative luminescence units were normalized to those derived from cells infected with SARS-CoV-2 pseudotyped virus(Wang et al., 2021c) in the absence of plasma or monoclonal antibodies. The half-maximal neutralization titers for plasma (NT50) or half-maximal and 90% inhibitory concentrations for monoclonal antibodies (IC50 and IC90) were determined using four-parameter nonlinear regression (least squares regression method without weighting; constraints: top=1, bottom=0) (GraphPad Prism).

Biotinylation of viral protein for use in flow cytometry

[00497] Purified and Avi-tagged SARS-CoV-2 WT and Delta RBD were biotinylated using the Biotin-Protein Ligase-BIRA kit according to manufacturer's instructions (Avidity) as described before (Robbiani et al., 2020). Ovalbumin (Sigma, A5503-1G) was biotinylated using the EZ-Link

Sulfo-NHS-LC-Biotinylation kit according to the manufacturer's instructions (Thermo Scientific). Biotinylated ovalbumin was conjugated to streptavidin-BV711 for single-cell sorts (BD biosciences, 563262) or to streptavidin-BB515 for phenotyping panel (BD, 564453). WT RBD was conjugated to streptavidin-PE (BD Biosciences, 554061) and streptavidin-AF647 (Biolegend, 405237) for single-cell sorts, or streptavidin-BV421 (Biolegend, 405225) and streptavidin-BV711 (BD biosciences, 563262) for phenotyping. Delta RBD was conjugated to streptavidin-PE (BD Biosciences, 554061) and Omicron BA.1 RBD (ACROBiosystems, SPD-C82E4) was conjugated to streptavidin-AF647 (Biolegend, 405237).

Flow cytometry and single cell sorting

[00498] Single-cell sorting by flow cytometry was described previously (Robbiani et al., 2020). Simply, peripheral blood mononuclear cells (PBMC) were enriched for B cells by negative selection using a pan-B-cell isolation kit according to the manufacturer's instructions (Miltenyi Biotec, 130-101-638). The enriched B cells were incubated in Fluorescence-Activated Cell-sorting (FACS) buffer (1 x PBS, 2% FCS, 1 mM ethylenediaminetetraacetic acid (EDTA)) with the following anti-human antibodies (all at 1:200 dilution): anti-CD20-PECy7 (BD Biosciences, 335793), anti-CD3-APC-eFluro 780 (Invitrogen, 47-0037-41), anti-CD8-APC-eFluor 780 (Invitrogen, 47-0086-42), anti-CD16-APC-eFluor 780 (Invitrogen, 47-0168-41), anti-CD14-APC-eFluor 780 (Invitrogen, 47-0149-42), as well as Zombie NIR (BioLegend, 423105) and fluorophore-labeled RBD and ovalbumin (Ova) for 30 min on ice. Single CD3-CD8-CD14-CD16-CD20+Ova—WT RBD-PE+- WT RBD-AF647+ B cells were sorted into individual wells of 96-well plates containing 4 µl of lysis buffer (0.5 x PBS, 10 mM Dithiothreitol (DTT), 3,000 units/ml RNasin Ribonuclease Inhibitors (Promega, N2615) per well using a FACS Aria III and FACSDiva software (Becton Dickinson) for acquisition and FlowJo for analysis. The sorted cells were frozen on dry ice, and then stored at -80 °C or immediately used for subsequent RNA reverse transcription. For B cell phenotype analysis, in addition to the above antibodies, B cells were also stained with the following anti-human antibodies (all at 1:200 dilution): anti-IgD-BV650 (BD, 740594), anti-CD27-BV786 (BD biosciences, 563327), anti-CD19-BV605 (Biolegend, 302244), anti-CD71-PerCP-Cy5.5 (Biolegend, 334114), anti-IgG-PECF594 (BD, 562538), anti-IgM-AF700 (Biolegend, 314538), anti-IgA-Viogreen (Miltenyi Biotec, 130-113-481).

Antibody sequencing, cloning, and expression

[00499] Antibodies were identified and sequenced as described previously (Robbiani et al., 2020; Wang et al., 2021a). In brief, RNA from single cells was reverse-transcribed (SuperScript III Reverse Transcriptase, Invitrogen, 18080-044), and the cDNA was stored at −20 °C or used for subsequent amplification of the variable IGH, IGL, and IGK genes by nested PCR and Sanger sequencing. Sequence analysis was performed using MacVector. Amplicons from the first PCR reaction were used as templates for sequence- and ligation-independent cloning into antibody expression vectors. Recombinant monoclonal antibodies were produced and purified as previously described (Robbiani et al., 2020).

[00500] During this process, several non-native mutations were introduced into the heavy and light chain fragments. Principally, the kappa (light) chain fragments were amplified using primers that reached into the framework region of the antibodies. The kappa primer introduces non-native amino acids into the kappa chain. In addition, the heavy chain was truncated at the C-terminus for the purpose of antibody production, being one amino acid shorter than what usually is present in IgG heavy chain constant regions.

Biolayer interferometry

[00501] Biolayer interferometry assays were performed as previously described (Robbiani et al., 2020). In brief, the Octet Red instrument (ForteBio) was used at 30 °C with shaking at 1,000 r.p.m. Epitope binding assays were performed with protein A biosensor (ForteBio 18-5010), following the manufacturer's protocol "classical sandwich assay" as follows: (1) Sensor check: sensors immersed 30 sec in buffer alone (buffer ForteBio 18-1105), (2) Capture 1st Ab: sensors immersed 10 min with Ab1 at 10 µg/mL, (3) Baseline: sensors immersed 30 sec in buffer alone, (4) Blocking: sensors immersed 5 min with IgG isotype control at 10 µg/mL. (5) Baseline: sensors immersed 30 sec in buffer alone, (6) Antigen association: sensors immersed 5 min with RBD at 10 µg/mL. (7) Baseline: sensors immersed 30 sec in buffer alone. (8) Association Ab2: sensors immersed 5 min with Ab2 at 10 µg/mL. Curve fitting was performed using the Fortebio Octet Data analysis software (ForteBio). Affinity measurements of anti-SARS-CoV-2 IgGs binding were corrected by subtracting the signal obtained from traces performed with IgGs in the absence of WT RBD. The kinetic analysis using protein A biosensor (as above) was performed as follows: (1) baseline: 60 sec immersion in buffer. (2) loading: 200 sec immersion in a solution with IgGs 10 µg/ml. (3) baseline: 200 sec immersion in buffer. (4) Association: 300 sec immersion in solution with WT RBD at 20, 10 or 5 µg/ml (5) dissociation: 600 sec immersion in buffer. Curve fitting was

performed using a fast 1:1 binding model and the Data analysis software (ForteBio). Mean KD values were determined by averaging all binding curves that matched the theoretical fit with an R2 value $\geqslant$ 0.8.

Computational analyses of antibody sequences

[00502] Antibody sequences were trimmed based on quality and annotated using Igblastn v.1.14. with IMGT domain delineation system. Annotation was performed systematically using Change-O toolkit v.0.4.540 (Gupta et al., 2015). Clonality of heavy and light chains was determined using DefineClones.py implemented by Change-O v0.4.5 (Gupta et al., 2015). The script calculates the Hamming distance between each sequence in the data set and its nearest neighbor. Distances are subsequently normalized and to account for differences in junction sequence length, and clonality is determined based on a cut-off threshold of 0.15. Heavy and light chains derived from the same cell were subsequently paired, and clonotypes were assigned based on their V and J genes using in-house R and Perl scripts. All scripts and the data used to process antibody sequences are publicly available on GitHub (github.com/stratust/igpipeline/tree/igpipeline2_timepoint_v2).

[00503] The frequency distributions of human V genes in anti-SARS-CoV-2 antibodies from this study were compared to 131,284,220 IgH and IgL sequences generated by (Soto et al., 2019) and downloaded from cAb-Rep (Guo et al., 2019), a database of human shared BCR clonotypes available at cab-rep.c2b2.columbia.edu/. The IgH and IgL sequences were selected from the database that are partially coded by the same V genes and counted them according to the constant region. The frequencies shown in FIG. 8 are relative to the source and isotype analyzed. The two-sided binomial test was used to check whether the number of sequences belonging to a specific IGHV or IGLV gene in the repertoire is different according to the frequency of the same IgV gene in the database. Adjusted p-values were calculated using the false discovery rate (FDR) correction. Significant differences are denoted with stars.

[00504] Nucleotide somatic hypermutation and Complementarity-Determining Region (CDR3) length were determined using in-house R and Perl scripts. For somatic hypermutations, IGHV and IGLV nucleotide sequences were aligned against their closest germlines using Igblastn, and the number of differences was considered to correspond to nucleotide mutations. The average number of mutations for V genes was calculated by dividing the sum of all nucleotide mutations across all participants by the number of sequences used for the analysis.

Code availability statement:

[00505] Computer code to process the antibody sequences is available at GitHub (github.com/stratust/igpipeline/tree/igpipeline2_time- point_v2).

EXAMPLE 2

Plasma binding and neutralization

[00506] Plasma IgG antibody titers against SARS-CoV-2 Wuhan-Hu-1-(wild-type, WT), or Delta-receptor binding domain (RBD), and Omicron BA.1-Spike were measured by enzyme-linked immunosorbent assays (ELISA) (Wang et al., 2021c). Anti-WT-RBD IgG titers were significantly increased after Delta breakthrough infection in individuals who received 2 doses of mRNA vaccine (Delta BT), compared to vaccinated individuals who did not experience infection (5m-Vax2) ($p<0.0001$, Vax2 (Cho et al., 2021) vs. Delta, FIG. 1b and Table 1). Similarly, there was a 2-fold increase in geometric mean IgG-binding titers against WT-RBD after Omicron BA.1 breakthrough infection (Omicron BT) in individuals who received 3 doses of mRNA vaccine, compared to vaccinated individuals who were not infected after the 3rd vaccine dose (1m-Vax3) ($p=0.033$, Vax3 (Muecksch et al., 2022) vs. Omicron, FIG. 1b and Table 1). Individuals who experienced Omicron BA.1 infection exhibited higher anti-Delta-RBD and anti-Omicron BA.1-Spike IgG binding titers than individuals with Delta breakthrough infection or those receiving 3 mRNA vaccine doses (FIG. 4, anti-Delta RBD: $p<0.0001$, Delta BT vs. Omicron BT, $p=0.047$, Vax3 vs. Omicron BT; anti-Omicron BA.1 Spike: $p<0.0001$, Delta BT vs. Omicron BT, $p=0.021$, Vax3 vs. Omicron BT).

[00507] Plasma neutralizing activity in 49 participants was measured using HIV-1 pseudotyped with the WT SARS-CoV-2 spike protein (Cho et al., 2021; Wang et al., 2021c) (FIG. 1c and Table 1). Compared to individuals that received 2 mRNA vaccine doses(Cho et al., 2021), Delta breakthrough infection resulted in 11-fold increased geometric mean half-maximal neutralizing titer (NT50) ($p=0.0003$, Vax2 vs. Delta, FIG. 1c). However, the resulting geometric mean NT50 was lower than after the 3rd mRNA vaccine dose ($p=0.03$, Delta vs. Vax3, FIG. 1c). Notably, the NT50 against WT after Omicron breakthrough was not significantly different from individuals that received a 3rd vaccine dose (Muecksch et al., 2022) ($p>0.99$, Vax3 vs. Omicron, Fig. 1c).

[00508] Plasma neutralizing activity was also assessed against SARS-CoV-2 Delta, Omicron BA.1, BA.2, and BA.4/5 variants using viruses pseudotyped with appropriate variant spike proteins.

[00509] Delta breakthrough infection resulted in 15-fold increased neutralizing titers against Delta compared to 2-dose vaccinated-only individuals ($p<0.0001$, FIG. 1c) with resulting titers being comparable to 3-dose vaccinated individuals before and after Omicron breakthrough infection ($p>0.99$, FIG. 1c). While Delta breakthrough infection also increased neutralizing titers against Omicron BA.1, BA.2, and BA4/5 ($p=0.0003$, $p=0.002$ and $p<0.0001$, respectively, FIG. 1c), the titers were not significantly different from titers observed in 3-dose vaccinated individuals (Muecksch et al., 2022)($p>0.99$, $p>0.99$ and $p=0.61$, respectively, FIG. 1c). Conversely, Omicron breakthrough infection after 3-dose vaccination resulted in a further 3.5-fold and 2.9-fold increase of Omicron BA.1 and BA.2 neutralizing titers, respectively, when compared to 3-dose vaccinated only individuals (Muecksch et al., 2022)($p=0.005$ and $p=0.019$, respectively. FIG. 1c). Omicron BA.4/5 showed the highest neutralization resistance of all variants tested, resulting in low geometric mean neutralizing titers in plasma samples obtained after the second vaccine dose (NT50=72, FIG. 1c). Nevertheless, individuals who had at least 3 antigen exposures (Delta breakthrough, Vax3 and Omicron breakthrough) were able to neutralize Omicron BA.4/5 with NT50s of 2173, 1311 and 2476, respectively at the time points assayed.

Memory B cells

[00510] mRNA vaccines elicit memory B cells (MBCs) that can contribute to durable immune protection from serious disease by mediating rapid and anamnestic antibody response (Muecksch et al., 2022; Victora and Nussenzweig, 2022). To better understand the MBC compartment after Delta or Omicron BA.1 breakthrough infection in vaccinated individuals, RBD-specific MBCs were enumerated using Alexa Fluor 647 (AF647)- and phycoerythrin (PE)-labeled WT RBD of the SARS-CoV-2 spike protein by flow cytometry (FIG. 2a, FIG. 5). The number of WT RBD-specific MBCs after Delta breakthrough infection was significantly higher than after the 2nd or 3rd vaccine dose (Delta vs. Vax2, $p<0.0001$, and Delta vs. Vax3, $p=0.011$, FIG. 2b). Omicron BA.1 breakthrough infection elicited a 1.7-fold increase in the number of MBCs compared to individuals that received 3 vaccine doses (Vax3 vs. Omicron, $p=0.013$, FIG. 2b). Consistent with previous reports (Goel et al., 2022; Kaku et al., 2022; Nutalai et al., 2022; Park et al., 2022), flow cytometry showed that a larger fraction of the MBCs developing after the 3rd vaccine dose or Omicron BA.1 breakthrough infection were cross-reactive with WT-, Delta- and Omicron BA.1-RBDs than after Delta breakthrough infection (FIG. 2c). Additional phenotyping indicated that

RBD-specific memory B cells elicited by Vax3 or Delta or Omicron BA.1 breakthrough infection showed higher frequencies of IgG than IgM and IgA expression (FIGs. 5c-e).

[00511] To examine the specificity and neutralizing activity of the antibodies produced by MBCs, antibody genes were purified and sequenced in individual WT-RBD-specific B cells from 10 individuals that experienced Delta or Omicron BA.1 breakthrough infection, following the 2nd or 3rd vaccine dose, respectively (FIG. 2d, FIG. 5f, Table 1), including 2 participants for whom paired samples were collected shortly after their 3rd vaccine dose and after subsequent Omicron BA.1 breakthrough infection.

[00512] 686 paired heavy and light chain anti-RBD antibody sequences were obtained (FIG. 2d). Clonally expanded WT-RBD-specific B cells represented 9% of all memory B cells after Delta breakthrough infection and 28% of the repertoire after Omicron BA.1 breakthrough infection (FIG. 2d). Similar to mRNA vaccinees (Cho et al., 2021; Muecksch et al., 2022; Wang et al., 2021c), several sets of VH genes including VH3-30 and VH3-53 were over-represented in Delta- or Omicron BA.1 breakthrough infection (FIGs. 6a-f). In addition, VH3-49, VH4-38, and VH1-24 were exclusively over-represented after Delta breakthrough infection (FIG. 6a), while VH1-69, VH1-58, VH4-61, and VH4-38 were specifically over-represented after Omicron BA.1 breakthrough infection (FIG. 6d). These results suggest that Delta and Omicron BA.1 breakthrough infections elicit variant-specific memory antibody responses. While levels of somatic mutation in memory B cells emerging after Delta breakthrough infection were comparable to those after the 2nd vaccine dose, significantly higher numbers of somatic mutations were noted following Omicron BA.1 breakthrough infection compared to the 3rd vaccine dose ($p<0.0001$) (FIG. 2e, FIG. 6g).

Monoclonal antibodies

[00513] 338 anti-RBD monoclonal antibodies were expressed and tested for binding by ELISA, including 115 antibodies obtained after Delta breakthrough infection (Delta BT), 40 isolated from 2 longitudinal samples after their 3rd vaccine dose in individuals that were subsequently infected (Vax3), and 183 antibodies obtained from 6 individuals after Omicron BA.1 breakthrough infection (Omicron). 85% (n=288) of the antibodies bound to the WT RBD with an EC50 of less than 1000 ng/mL (Table 2). The geometric mean ELISA half-maximal concentration (EC50) against WT RBD for the monoclonal antibodies obtained from Vax3 was comparable to those found after Delta or Omicron BA.1 breakthrough infections (FIG. 3a). In addition, antibodies

isolated after both Delta and Omicron-breakthrough infection showed comparable affinity for WT RBD to antibodies obtained from Vax3 when measured by biolayer interferometry (BLI, FIG. 7a). However, when tested against Delta-RBD antibodies obtained after Delta breakthrough infection showed increased binding compared to those after Vax3. In contrast, there was no statistically significant difference in binding to Omicron BA.1-Spike by Omicron and Vax3 antibodies (FIG. 3a).

[00514] Anti-RBD antibodies elicited by mRNA vaccination target 4 structurally defined classes of epitopes on the SARS-CoV-2 RBD (Barnes et al., 2020a; Cho et al., 2021; Muecksch et al., 2022; Yuan et al., 2020). To compare the epitopes recognized by anti-RBD memory antibodies elicited by mRNA vaccination (Muecksch et al., 2022) and breakthrough infection, BLI competition experiments were performed. A preformed antibody-RBD-complex was exposed to a second antibody recognizing one of four classes of structurally defined antigenic sites (C105 as Class 1; C144 as Class 2, C135 as Class 3, and C2172 as Class 4 (Barnes et al., 2020a)). Antibodies obtained after Delta (n=48) or Omicron BA.1 (n=49) breakthrough infection were examined, including 30 of 48 from Delta Breakthrough and 30 of 49 from Omicron BA.1 breakthrough with IC50s lower than 1000 ng/mL (neutralizing) against WT (FIG. 7b). In general, there was no significant difference in the distribution of targeted epitopes among antibodies obtained following breakthrough infection as compared to those obtained after mRNA vaccination (FIG. 7b).

[00515] All 288 WT RBD-binding antibodies were tested for neutralization in a SARS-CoV-2 pseudotype neutralization assay based on the WT SARS-CoV-2 spike (Robbiani et al., 2020; Schmidt et al., 2020b). For comparison, a previously characterized set of antibodies isolated after the 2nd (Cho et al., 2021) or the 3rd vaccine dose (Muecksch et al., 2022) were used. Potency against WT was considerably improved after Delta breakthrough infection compared to the 2nd vaccine dose (Vax2) (IC50=182 ng/ml vs IC50=50ng/ml, p=0.0013, FIG. 3b) but not compared to the 3rd vaccine dose (IC50=98 ng/ml, p=0.62, FIG. 3b). In addition, there was no further improvement of neutralizing activity following Omicron BA.1 breakthrough infection compared to the 3rd dose (IC50=73 ng/ml) (p>0.99, FIG. 3b).

[00516] To examine whether and how neutralizing breadth evolves in vaccinees after Delta or Omicron BA.1 breakthrough infection, the 288 newly expressed antibodies obtained from breakthrough individuals and 45 previously described antibodies obtained from Vax2 individuals (Cho et al., 2021) were analyzed, and their neutralizing activity against SARS-CoV-2

pseudoviruses carrying amino acid substitutions found in the Delta-RBD and Omicron BA.1 variant was measured. In addition, 105 randomly selected antibodies from all four groups were tested against an Omicron BA.4/5 pseudovirus (FIG. 3c). Neutralizing potency was generally lower against Omicron BA.1 compared to Delta pseudovirus. However, while antibodies obtained 5 months after the 2nd vaccine dose were not significantly more potent against Delta (IC50=181ng/ml) vs. BA.1 pseudovirus (IC50=405ng/ml) ($p=0.20$, FIG. 3c), those obtained after subsequent Delta breakthrough infection neutralize Delta with 6.8-fold increased potency compared to BA.1 ($p<0.0001$, FIG. 3c). In contrast, the ratio of Delta vs. BA.1 IC50 in Vax3 antibodies was only 2.2 ($p=0.07$, FIG. 3c), while antibodies recovered after subsequent omicron breakthrough neutralized Delta and Omicron with similar potencies IC50=122 ng/ml for Delta vs. 148 ng/ml for Omicron ($p=0.92$, FIG. 3c).

[00517] Compared to the 2nd vaccine dose, antibodies from Delta breakthrough infection showed increased potency against Delta pseudovirus (181 vs. 61 ng/ml, $p=0.047$, FIG. 3d). However, there was no significant improvement of antibody potency against Delta, Omicron BA.1 or Omicron BA.4/5 pseudovirus comparing 5m-Vax2 versus Delta breakthrough antibodies. Moreover, there were only 2 fold differences that did not reach statistical significance when comparing Vax3 and Omicron breakthrough antibodies for Omicron BA.1 and BA.4/5 neutralization (FIG. 3d). Notably, Omicron BA.4/5 showed the highest degree of neutralization resistance for all tested antibody groups (FIGs. 3c-d).

[00518] When comparing the fraction of antibodies showing neutralizing activity against Delta or Delta+WT, or Omicron BA.1 or Omicron BA.1+WT, or all three viruses (WT+Delta+Omicron BA.1), it became apparent that antibodies isolated after 2 vaccine doses and subsequent Delta breakthrough infection show the largest proportion of Delta-neutralizing antibodies. Conversely, antibodies isolated after the 3rd vaccine dose and subsequent Omicron BA.1 breakthrough infection show the largest number of antibodies that neutralized all three pseudoviruses (FIG. 3e, FIG. 8). Vax3 antibodies and Omicron BA.1 breakthrough antibodies were enriched for those neutralizing BA.4/5 with IC50 values of less than 1000 ng/ml with 37% and 38% of all tested antibodies neutralizing BA.4/5, respectively, while only 17% and 27% of Vax2 and Delta breakthrough antibodies, respectively neutralized BA.4/5 (FIG. 3f). Thus, in both cases tested a 3rd exposure to antigen increases memory antibody potency and breadth but a 4th exposure with Omicron BA.1 does little more when it occurs in the time frame measured in this study.

Discussion

[00519] Individuals that receive a 3rd mRNA vaccine dose show enhanced protection against severe COVID19 but little is known about the impact of breakthrough infections on memory responses. Here, the memory antibodies that develop after a 3rd or 4th antigenic exposure by Delta or Omicron BA.1 infection were examine, respectively. A 3rd exposure to antigen by Delta breakthrough increases the number of memory B cells that produce antibodies with comparable potency and breadth to a 3rd mRNA vaccine dose. A 4th antigenic exposure with Omicron BA.1 infection increased variant specific plasma antibody and memory B cell responses. However, the 4th exposure did not increase the overall frequency of memory B cells or their general potency or breadth compared to a 3rd mRNA vaccine dose. In conclusion, a 3rd antigenic exposure by Delta infection elicits strain-specific memory responses and increases in the overall potency and breadth of the memory B cells. In contrast, the effects of a 4th antigenic exposure with Omicron BA.1 is limited to increased strain specific memory with little effect on the potency or breadth of memory B cell antibodies. The results suggest that the effect of strain-specific boosting on memory B cell compartment may be limited.

[00520] Omicron and its subvariants are reported to be more transmissible than any prior VoC and have spurred a resurgence of new cases worldwide (Mallapaty, 2022). While early reports suggested that Omicron may cause less severe illness, recent studies show variant-specific symptoms but similar virulence (Whitaker et al., 2022), and increased resistance to approved vaccine regimens (Nealon and Cowling, 2022).

[00521] It was shown that a 3rd mRNA vaccine dose boosts plasma antibody responses to SARS-CoV-2 variants, including Omicron BA.1, and increases the number, potency, and breadth of the antibodies found in the memory B cell compartment (Goel et al., 2022; Muecksch et al., 2022). Although the antibodies in plasma are generally not sufficient to prevent breakthrough infection boosted individuals are protected against serious disease upon breakthrough infection (Kuhlmann et al., 2022; Nemet et al., 2022). The present study shows that a 3rd exposure to antigen in the form of Delta breakthrough infection produces similar effects on the overall size of the memory compartment to a 3rd mRNA vaccine dose, and specifically boosts strain-specific responses. In contrast, while a 4th antigen exposure by infection with Omicron elicits strain-specific memory, it has far more modest effects on the overall potency and breadth of memory B cell antibodies. The data indicate that a variant-specific mRNA vaccine boost will increase plasma

neutralizing activity and memory B-cells that are specific to the variant and closely related strains but may not elicit memory B cells with better general potency or breadth than the Wuhan-Hu-1-based mRNA vaccine. The data highlights the challenges involved in selecting variant-specific vaccines in the absence of reliable information on the nature of the next emerging variant and suggests that a focus should be on designing vaccines with broader general activity against coronaviruses.

[00522] The foregoing examples and description of the preferred embodiments should be taken as illustrating, rather than as limiting the present invention as defined by the claims. As will be readily appreciated, numerous variations and combinations of the features set forth above can be utilized without departing from the present invention as set forth in the claims. Such variations are not regarded as a departure from the scope of the invention, and all such variations are intended to be included within the scope of the following claims. All references cited herein are incorporated by reference in their entireties.

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[00523] It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad inventive concept thereof. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications within the spirit and scope of the present invention as defined by the present description.

[00524] Various publications, articles and patents are cited or described in the background and throughout the specification; each of these references is herein incorporated by reference in its entirety. Discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is for the purpose of providing context for the invention. Such discussion is not an admission that any or all of these matters form part of the prior art with respect to any inventions disclosed or claimed.

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TABLES AND SEQUENCES

Table 1. Individual participant characteristics

					Study subgroup				
ID	Age (years)	Sex	Race	Ethnicity	Previously published cohort	Breakthrough infection VOC	1st dose	2nd dose	3rd dose
B001	29	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B002	21	F	Caucasian	Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B003	24	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Moderna	Moderna	-
B004	24	F	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B005	24	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Moderna	Moderna	-
B006	61	F	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B007	30	M	Asian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B008	34	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B009	49	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B010	30	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B011	29	F	Asian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B012	24	F	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B013	38	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B014	39	F	Caucasian	Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B015	24	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B016	63	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Moderna	Moderna	-
B017	29	F	Asian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B018	25	M	Asian	Non-Hispanic	Yes ▽	Delta	Moderna	Moderna	-
B019	41	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-

B021	57	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B024	34	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Pfizer	Pfizer	-
B025	30	M	Caucasian	Non-Hispanic	Yes ▽	Delta	Moderna	Moderna	-
B026	30	F	Caucasian	Non-Hispanic	Yes ▽	Delta	Moderna	Moderna	-
B027	28	M	Asian	Non-Hispanic	Yes ▽	Delta	Moderna	Moderna	-
B029	49	F	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B030	38	M	Caucasian	Non-Hispanic	Yes ▽	Omicron	Moderna	Moderna	Pfizer
B031	23	F	Caucasian	Non-Hispanic	Yes ▽	Omicron	Moderna	Moderna	Moderna
B033	25	M	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B034	34	M	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B035	27	M	Black	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B036	40	M	Caucasian	Non-Hispanic	Yes ▽	Omicron	Moderna	Moderna	Moderna
B037	28	F	Asian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B039	35	F	Asian	Non-Hispanic	Yes ▽	Omicron	Moderna	Moderna	Moderna
B040	42	M	Caucasian	Non-Hispanic	Yes ▽	Omicron	Moderna	Moderna	Moderna
B042	24	F	Black	Non-Hispanic	Yes ▽	Omicron	Moderna	Moderna	Pfizer
B043	56	F	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B046	30	F	Caucasian	Hispanic	Yes ▽	Omicron	Moderna	Moderna	Moderna
B047	25	M	Asian	Non-Hispanic	Yes ▽	Omicron	Moderna	Moderna	Pfizer
B048	45	M	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Moderna
B049	28	M	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B051	37	M	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Moderna
B054	57	F	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B055	33	F	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B057	22	M	Asian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Moderna
B058	47	F	Caucasian	Non-Hispanic	Yes ▽	Omicron	Pfizer	Pfizer	Pfizer
B060	28	M	Asian	Non-Hispanic	No	Omicron	Pfizer	Pfizer	Pfizer
B061	47	M	Caucasian	Hispanic	No	Omicron	Pfizer	Pfizer	Pfizer

C018	24	F	Caucasian	Non-Hispanic	Yes ¶§	Omicron	Pfizer	Pfizer	Pfizer
C023	79	F	Caucasian	Non-Hispanic	Yes ∇¶§	Omicron	Pfizer	Pfizer	Pfizer
C034	39	F	Caucasian	Non-Hispanic	Yes ¶§	Omicron	Pfizer	Pfizer	Pfizer
B041	33	M	Caucasian	Non-Hispanic	No	Omicron	Pfizer	Pfizer	Moderna
B056	28	F	Asian	Non-Hispanic	No	Omicron	Pfizer	Pfizer	Pfizer
B059	56	M	Black	Non-Hispanic	No	Omicron	Pfizer	Pfizer	Moderna

∇ = published as Gaebler, C., DaSilva, J., Bednardski, E., et al. SARS-CoV-2 neutralization after mRNA vaccination and variant breakthrough infection. Open Forum Infectious Diseases (2022). doi: doi.org/10.1093/ofid/ofac227

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Table 1 (continued)

	Vaccination time line (days)			
ID	1st to 2nd dose	2nd to 3rd dose	Most recent Vax to study visit	Positive test to study visit
B001	55	-	172	13
B002	15	-	134	13
B003	30	-	109	21
B004	38	-	138	19
B005	28	-	136	20
B006	22	-	204	52
B007	22	-	146	22
B008	21	-	207	19
B009	19	-	146	0
B010	30	-	175	33
B011	12	-	174	39
B012	21	-	112	36
B013	28	-	174	39
B014	21	-	167	41
B015	30	-	145	17
B016	29	-	158	20
B017	21	-	141	30
B018	25	-	207	30
B019	21	-	162	23
B021	21	-	211	60
B024	21	-	170	15
B025	28	-	177	55

B026	30	-	138	54
B027	30	-	176	39
B029	28	254	26	23
B030	31	228	52	17
B031	28	239	30	22
B033	21	308	32	26
B034	21	249	72	20
B035	22	202	54	21
B036	28	264	82	21
B037	21	228	52	30
B039	28	252	49	23
B040	28	250	42	24
B042	28	222	55	24
B043	21	188	141	31
B046	28	225	56	15
B047	28	246	39	21
B048	21	241	59	18
B049	21	183	98	30
B051	22	204	87	25
B054	30	221	119	30
B055	21	238	104	34
B057	21	210	64	34
B058	21	185	122	37
B060	21	266	98	31
B061	21	223	111	27
C018	21	242	122	24
C023	21	215	106	10
C034	24	273	76	29

B041	23	228	51	23
B056	21	190	89	25
B059	21	250	100	30

	Serological parameters								
	ELISA binding to RBD (AUC)			Neutralization (NT50)					
ID	IgG (Wuhan-Hu-1 RBD)	IgG (Delta RBD)	IgG (Omicron BA.1 spike)	(Wuhan-Hu-1)	(Wuhan-Hu-1 R683G)	(Delta)	(Omicron BA.1)	(Omicron BA.2)	(Omicron BA.4/5)
B001	182659	41182	106934	4551	12637	3373	1217	2873	3404
B002	665007	111307	138031	9159	44468	12652	2884	4825	7086
B003	315295	20436	50576	4132	15407	4778	658	662	943
B004	308632	10715	57513	2174	21734	4869	4148	1550	1626
B005	153880	28885	45840	2120	14488	3742	1590	1633	1727
B006	857602	30487	148682	27830	133843	46555	6899	6800	6082
B007	126639	62405	144110	9338	39189	11682	5654	5521	4954
B008	408655	131227	229394	8448	39418	12946	6044	5722	4462
B009	7810	3876	244584	8230	9283	7215	5433	3855	4779
B010	286260	56375	140770	8841	58163	16910	7315	2768	1142
B011	176031	13025	56242	3375	17374	4686	1360	1277	811
B012	251695	5142	60845	2866	10064	2515	743	1143	1075
B013	458864	8315	168177	16956	31341	15758	3117	3332	3420
B014	146152	6175	119013	996	12374	3305	1449	1321	1090
B015	172111	3145	88181	2685	20597	6918	1869	1490	850
B016	1061547	13037	272382	25952	132711	42875	13021	19781	15536
B017	400976	8193	74284	7309	14988	6060	1422	1930	898
B018	306694	35488	58558	3532	22081	11313	1989	3969	1543
B019	34145	2581	29662	1157	7089	2131	1310	1379	825
B021	126713	134168	222340	13130	64055	17263	13749	24447	6395
B024	405248	20987	160944	5054	23886	6925	3516	2529	1723
B025	114111	5813	31265	9831	18703	13793	605	812	481
B026	363151	37719	209643	11884	61369	23705	6497	6123	2905
B027	930512	25881	237587	23407	111421	25685	6081	7204	3474
B029	892673	242699	543095	4514	36547	8452	9193	6481	581
B030	732498	45957	899502	12675	100110	22363	18409	14430	3811
B031	464058	59309	597187	6393	50252	12209	7680	7661	2172
B033	278433	40372	208781	7643	39809	9149	5136	4055	1015
B034	326259	43239	438457	7193	68783	14338	44367	14637	2134

	Serological parameters								
	ELISA binding to RBD (AUC)			Neutralization (NT50)					
ID	IgG (Wuhan-Hu-1 RBD)	IgG (Delta RBD)	IgG (Omicron BA.1 spike)	(Wuhan-Hu-1)	(Wuhan-Hu-1 R683G)	(Delta)	(Omicron BA.1)	(Omicron BA.2)	(Omicron BA.4/5)
B035	576405	2356545	453526	5361	44561	9890	13698	6843	1695
B036	1924741	255791	662307	16056	68335	17052	21198	14621	4540
B037	2401996	534436	802032	11007	62487	17803	30348	31994	4036
B039	559336	185296	135467	7323	22638	5596	6806	7837	2030
B040	5035207	2046810	2735601	86100	300044	73010	109591	129068	43105
B042	269736	21646	269083	11725	79180	16686	22565	23216	5544
B043	426860	22103	119527	9348	37380	9559	4729	4813	1332
B046	361891	24170	212903	7473	29665	7668	5739	5155	1044
B047	1551414	162370	440404	6567	46136	9531	19932	12225	3537
B048	573699	95534	181361	4453	23789	6288	9183	9917	5107
B049	121616	42188	167404	3621	30634	6155	37161	27699	1130
B051	464649	164651	399034	6668	41528	11307	26657	19402	3897
B054	758282	71130	1081649	9017	49236	11487	12189	14776	3614
B055	257410	92389	204006	5880	47115	6196	10571	4653	1320
B057	1562727	228575	279497	12257	72623	17227	16101	11471	2782
B058	260839	11396	145325	3748	21661	4829	8051	8968	3837
B060	209841	139856	429771	11725	256229	6804	12006	15926	8050
B061	150879	98421	528397	10159	272641	1189	35237	23588	1433
C018	116416	21844	134749	2396	42285	1356	10771	9317	1683
C023	741514	18519	40882	60042	143081	73494	2197	1386	406
C034	876158	84786	646143	ND	ND	ND	ND	ND	ND
B041	ND	ND	ND	ND	ND	ND	ND	ND	ND
B056	ND	ND	ND	ND	ND	ND	ND	ND	ND
B059	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 2. Sequences, RBD binding and neutralization of representative cloned recombinant antibodies.

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (aa)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (aa)
B030	B2000	Omicron BT	Singlet	VH5-51	JH3	1	EVQLVQSGAEVKKPGESL KISCKGFGYSFSNYWIAW VRQMPGKGLEWMGIIYPE DSDTRDSPSSQGQVTMS VDKSTSTAYLQWSSLKAS DTAMYYCVRRSGHLIWH GFDIWGQGTMVTVSS	VK1-16	JK1	2	DIQLTQSPSSLSASVGD RVTVTCRASQGINYFLA WFQQKPGKAPKSLIYA ASSLQSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYFCLQYYSYPWTFG PGTKVEIK
	B2002	Omicron BT	Singlet	VH3-23	JH1	3	EVQLLESGGALAQPGGSL RLSCAASGFPFSTYAMS WVRQAPGKGLEWVSGIS SRGGRTYNADSVKGRFTI SRDNSKNTLYLQMNSLRA EDTAVYYCARDEILHGDN PEYFQHWGQGTLVTVSS	VK1-5	JK4	4	DIQMTQSPSTLSASVG DRVTITCRASQTINSWL AWYQQKPGKAPTLLIY DASSLKSGAPSRFSGS GSGTEFILTISSLQPDDF ATYYCQQYHSYSPLTF GGGTKVEIK
	B2003	Omicron BT	Singlet	VH3-23	JH4	5	EVQLLESGGGLVQPGGS LTLSCAASGFSFSNYAMT WVRQPPGKGLEWVSGIG GYGGDTYYADSVKGRFT VSRDDSKNTLYLHMNNLR AEDTALYYCAKGVRSNSD YFEYWGQGTLVTVSS	VK1-5	JK2	6	DIQMTQSPSTLSASVR DRVSITCRASQSIGSWV AWYQQKPGKAPKLLIY DASNLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQHYNSYSATF GQGTKLEIK
	B2004	Omicron BT	Clone	VH4-30	JH4	7	QVQLQESGPGLVKPSQT LSLTCTVSGGSVRSGGYY WSWIRQPPGKGLEWIGYI YYSGNTFYLPSLQSRVTIS VDMSKNQFSLRLSSVTAA DTAVYYCARDQHESHYG SGPSGRIDSWGQGTLVT VSS	Vk1-33	JK4	8	IRMTQSPSSLSASVGD RVTITCQASQDINNYLN WYQQKPGKAPKVLIYD ASNLETGVPSRFSGSG SGTDFTFTISNLQPEDIA TYYCQQYDNLPLTFGG GTKVEIK
	B2005	Omicron BT	Singlet	VH3-9	JH3	9	EVQLVESGGGLVQPGRS LRLSCAAGGFTFDDYAM HWVRQGPGKGLEWVSGI AWNSGTLGYAASVQGRFI	VL3-21	JL2	10	SYELTQPPSVSGAPGQ TARITCGGNNIGSKSVH WYQQKPGQAPVLVVY DDNDRPSGIPERFSGS

						ISRDNAKKSVYLHMNSLR TEDTAFYFCVKDRTNGDP QGDAFDMWGQGTMVTV SS				NSGNRATLTISRVEAED EADYYCQVWDSSSEH VLFGGGTKLTVL
B2006	Omicron BT	Clone	VH5-51	JH4	11	EVQLVQSGAEVKKPGESL KISCKGFGSSFTNYWIGW VRQMPGKGLEWMGSVY AGDSDTRYSPSFQGQVT VSADKSITTAYLQWTSLK ASDTAMYFCARASQGNY FDFWGQGTLVTVSS	VK1-5	JK2	12	DIQMTQSPSTLSASVG DRVTITCRASQSISRWL AWYQQKPGKAPKLLIY DASILESGVPSRFSGSG SGTDFTLTISSLQPDDY ATYYCQQFYSNLYTFG QGTKLEIK
B2007	Omicron BT	Singlet	VH3-64D	JH4	13	EVQLVESGGDLVQPGES LRLSCSDSGLTFRTHGFY WVRQAPGKRPEYISGISN NGDATYYADSVKGRFTV SRDNSKNTLFLQMNSLSV DDTAVYYCVKGRVDYWG QGTLVTVSS	VK1-33	JK5	14	DIQMTQSPSSLSASVG DRVTITCQASQDISNSL NWYQQKPGRAPKLLIY DASHLQTGVPSRFSGS GSGTNFTFTISGLQPED IATYYCQEYYDSITFGQ GTRLEIK
B2008	Omicron BT	Clone	VH1-58	JH3	15	QLVQSGPEIKKPGTSVKV SCKASGFTFSNSAVQWV RQARGQHLEWIGWIVVG SGDPNYAQKFQERVTLT RDMSTGTAYMELSSLRS EDTAFYYCATNNCSRTIC SDGFDIWGQGTMVTVSS	VK1-5	JK1	16	DIQMTQSPSTLSASVG DRVTITCRASQSLTSWL AWYQQKPGKAPNLLIY DASILDSGVPSRFSGS GSGTEFTLTISSLQPQD FATYYCQQYKGYPWTF GQGTKVEIK
B2009	Omicron BT	Singlet	VH1-8	JH4	17	QVQLVQSGAEVKKPGAS VKVSCKASGYAFTNYAIS WVRQATGQGLEWMGW MSPQDGDTGYAQKFQGR VTMTSDTSISTAYMELSG LTSEDTALYYCARGPRTN SDYFDFWGQGTLVTVSS	VK1-5	JK3	18	DIQMTQSPSPLSASVG DRVTITCRASQTISTWL AWYQQKPGQAPKLLIY DASSLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNNYPFTF GPGTKVDIK
B2010	Omicron BT	Singlet	VH1-58	JH3	19	QLVQSGPEIKKPGTSVKV SCKASGFTFSNSAVQWV RQARGQHLEWIGWIVVG SGDPNYAQKFQERVTLT	VK1-39	JK4	20	DIQLTQSPSSLSASVGD RVTISCRASQTINNYLN WYQQKPGKAPKLLIYA ASTLHRGVPSRFSGSG

						RDMSTGTAYMELSSLRS EDTAFYYCATNNCSRTIC SDGFDIWGQGTMVTVSS				SGTDFTLTISSLQPEDF ATYYCQQSYSSPPLTF GGGTKVEIK
B2011	Omicron BT	Singlet	VH4-39	JH4	21	QLQLQESGPRLVKPSETL SLTCTVSGGPTISSSNYW GWIRQPPGKGLEWIGSV YYSGDTSYNPALQSRVTI SVDTSKNQFSMKLTSVTA ADTAVYYCAKLFCGGHC PLEYWGQGTLVTVSS	VK1-5	JK2	22	DIQMTQSPSTLSASVG DRVTITCRASQSISTWL AWYQQKPGRAPKLLIY DASNLESGVPSRFSGS GSGTEFTLTINSLQADD FATYHCHQYSSSSQTF GQGTKLEIK
B2012	Omicron BT	Singlet	VH1-58	JH3	23	QLVQSGPEIKKPGTSVKV SCKASGFTFSNSAVQWV RQARGQHLEWIGWIVVG SGDPNYAQKFQERVTLT RDMSTGTAYMELSSLRS EDTAFYYCATNNCSRTIC SDGFDIWGQGTMVTVSS	VK1-33	JK5	24	IRMTQSPSSLSASVGD RVTITCQASQDINNYLN WYQQKPGRAPKLLIYD ASNLETGVPSRFSGSG SGTEFTFTISSLQPEDIA TYYCQQYDNLPITFGQ GTRLEIK
B2014	Omicron BT	Singlet	VH1-46	JH4	25	QVQLVQSGAELKRPGAS VKVSCKASGYTFSDYHM NWVRQAPGQGLEWMGII NPSGGGASYPQKFQGRV TMTRDTSTSTVFMQLNSL TYEDTAVYYCARGTPPSR GWYGGFDNWGQGTLVT VSS	VL1-40	JL1	26	QSVLTQPPSVSGAPGQ RITISCTGSTSNIGAGYD VQWYQQLPGTAPKLLIF DNNNRPSGVPDRFSGS KSGTSASLAITGLQAED EADYYCQSFDSTLSGS TFVFGPGTKVTVL
B2097	Omicron BT	Singlet	VH3-7	JH4	27	EVQLVESGGGLVQPGGS LRLSCAASGFTFNMYWM TWVRQAPGKGLEWVANI EPDGSDKDYGESVKGRF TISRDNAKNSLYLQMNSL RAEDSAVYYCATEAMGV GPTSGGFDSWGQGTLVT VSS	VK1-39	JK1	28	DIQLTQSPSSLSASVGD RVTITCRASEGISSYLN WYQQKSGKAPKLLMYA ASSLQSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYYCQQSYTTPRTFG QGTKVEIK
B2098	Omicron BT	Singlet	VH3-23	JH4	29	EVQLLESGGALVQPGGSL RLSCAASGFTFSTYAMS WVRQAPGKGLEWVSGLT	VK4-1	JK5	30	DIVMTQSPDSLAVSLGE RATINCKSSQSVLYTSN NKNYLAWFQQKPGQP

						SSGGRPYYADSVKGRFT VSRDISKNTLYLQMNSLR VEDTAVYYCAKDRGSYS GYDFLSDSWGQGTLVTV SS				PKLLIYWASTRESGVPD RFSGSGSGTDFTLTISS LQAEDVAAYYCQQYYN TPITFGQGTRLEIK
B2099	Omicron BT	Singlet	VH3-48	JH4	31	EVQLVESGGDLVHPGESL TLSCAASGFTFSSYSMN WVRQAPGKGLEWVSYVS SSATTIYYAESVKGRFTIS RDNAKNSLYLQMNSLRD EDMAVYYCARDRTPFYD AWNGWGPLDYWGQGT WVTVSS	VK1-5	JK2	32	DIQMTQSPSTLSASVG DRVTITCRASQSISSWL AWYQQKPGKAPKLLIS DASNLESGVPSRFSGS GSGTEFTLSISSLQPDD FATYYCQQYNSYRYTF GQGTKLEIK
B2100	Omicron BT	Singlet	VH3-33	JH6	33	QVQLVESGGGLVQPSQS LSITCTVSGFSLTTYGVH WVRQSPGKGLEWLGVK WSGGSTDYNAAFISRLSI TKDNSKSQVFFKINSLQA DDTAIYYCARGDYDPYYY AMDYWGQGTSVTVSS	VL1-40	JL1	34	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAGS DVHWYQQFPGTAPKLL IYGSTHRPSGVPDRFS GSKSGTSASLAITGLQA EDEADYYCQSYDSSLS APYVFGTGTKVTVL
B2101	Omicron BT	Singlet	VH4-38	JH3	35	QVQLQESGPGLVKPSETL SVTCAVSGYSISSSYYWG WIRQSPGRGLEWIGSIYH SGTTYHNPSVKSRLTISV DTPTNQFSLTLRSVTAAD TAMYYCASNSGQVVIGAF DIWGQGTMVTVSS	VK3-20	JK4	36	EIVLTQSPGTLSLSPGE RATLSCRASQSVRNSY LAWYQQKPGQAPRLLI YGASRRATDIPDRFSG SGSGTDFTLTISRLEPE DFAVYYCQHYGDSPLT FGGGTKVEIK
B2102	Omicron BT	Singlet	VH1-69	JH1	37	QVQLVQSGAEMKKPGSS VKVSCEASGNTFSTYPIS WVRQAPGQGLEWMGRII PMLGIANYAQKFQDRVTI TVDKSTSTAYMELTSLRS EDTAVYYCARTPSRPDSN TWYFHQWGQGTLVTVSS	VL1-40	JL2	38	QSVLTQSPSVSGAPGQ RVTISCTGSNSNIGAGY DVHWYQQLPGTAPKLL IYANNNRPSGVPDRFS GSKSDTSASLAITGLQA EDEADYYCQSYDSSLS DSVFGGGTKLTVL
B2103	Omicron BT	Singlet	VH3-48	JH4	39	EVQLVESGGDLVHPGESL TLSCAASGFTFSSYSMN	VK4-1	JK2	40	DIVMTQSPDSLAVSLGE RATINCKSSQSVLRSSN

					WVRQAPGKGLEWVSYVS SSATTIYYAESVKGRFTIS RDNAKNSLYLQMNSLRD EDMAVYYCARDRTPFYD AWNGWGPLDYWGQGTL VTVSS					NKNYLAWYQQKRGQP PKLLIYWASTRESGVPD RFSGSGSGTDFTLTIST LQAEDVAVYYCQQYYG PLYTFGQGTKLEIK
B2104	Omicron BT	Singlet	VH5-51	JH5	41	EVQLVQSGAEVKKPGESL KISCKGSGYMFTSSWIAW VRHMPGKGLEWMGIIHP GDSDTRYSPSFQGQVTF SADKSISTAYLQWSSLKA SDTAMYYCASYGGIYHG WLDPWGQGTLVTVSS	VL1-44	JL1	42	QSVLTQPPSASGTPGQ RVTISCSGSSSNIGTNP VNWYQQLPGTAPKLLIY NNHQRPSGVPDRFSG SKSATSASLAISGLQSE DEADYYCATWDDSLNG YVFGTATKVTVL
B2105	Omicron BT	Singlet	VH4-38	JH3	43	QVQLQESGPGLVKPSETL SVTCAVSGYSISSSYYWG WIRQSPGRGLEWIGSIYH SGTTYYNPSVKSRLTISV DTSTNQFSLTLRSVTAAD TAMYYCASNSGQVVIGAF DIWGQGTMVTVSS	VK1-5	JK1	44	DIQMTQSPSTLSASVG DRVTITTCRASQSINSWL AWYQQKPGKAPELLIY DASSLQSGVPSRFSGS GSETEFTLTISSLQPDD FATYYCQQYKTYSWTF GQGTKVEIK
B2106	Omicron BT	Singlet	VH3-9	JH6	45	EVQLVESGGALQQPGRS LTLSCAASGFTFEDYAMH WVRQAPGKGLEWVSGIT WTGGMIDYADSVKGRFII SRDNAKKSLYLHMRGLR PEDTALYYCARGSRSGS YHLRDHFYGMDVWGQG TTVTVSS	VK1-5	JK1	46	DIQMTQSPSTLSASVG DRVTITTCRASQNINSWL AWYQQKPGKAPKLVIY DASDLESGVPSRFSGS GSGTEFTLTITSLQPDD FATYYCQQYKAYWSFG QGTKVEIK
B2107	Omicron BT	Singlet	VH4-38	JH3	47	QVQLQESGPGLVKPSETL SVTCAVSGYSISSSYYWG WIRQSPGRGLEWIGSIYH SGTTYYNPSVKSRLTISV DTSTNQFSLTLRSVTAAD TAMYYCASNSGQVVIGAF DIWGQGTMVTVSS	VK3-20	JK1	48	EIVLTQSPGTLSLSPGE RATLSCRASLSLSSTYL AWYQQRPGQAPRLLIY GASSRATGIPDRFSGS GSGTDFTLTISRLEPED FAVYYCQQYGRSPWTF GQGTKVEIK

	B2108	Omicron BT	Singlet	VH3-9	JH6	49	EVQLVESGGALQQPGRSLTLSCAASGFTFEDYAMHWVRQAPGKGLEWVSGITWTGGMIDYADSVKGRFIISRDNAKKSLYLHMRGLRPEDTALYYCARGSRSGSYHLRDHFYGMDVWGQGTTVTVSS	VK1-39	JK5	50	DIQLTQSPSSLSASVGDRVTITCRASQNVNYYLNWYQQRPGKAPELLIYGASSLQSGVPSRFSGGGSETDFTLTISSLQPEDFATYYCQQSYDLPPTFGQGTRLEIK
	B2109	Omicron BT	Singlet	VH4-38	JH3	51	QVQLQESGPGLVRPSETLSVTCAVSGYSISSSYYWGWIRQSPGRGLEWIGSIYHSGTTYYNPSVKSRLTISVDTSTNQFSLTLRSVTAADTAMYYCASNSGQVVIGAFDIWGQGTMVTVSS	VK3D-20	JK2	52	EIVLTQSPATLSLSPGERATLSCRASQSLSTYLAWYQQKPGLAPRLLIYDTSTRATGIPDRFSGSGSETDFTLTISRLDPEDFAVYYCQQYGSSPRTFGQGTKLEIK
	B2111	Omicron BT	Singlet	VH3-9	JH2	53	EVQLVESGGGLVQPGRSLRLSCAASGFTFEDYAMHWVRQVPGKGLEWVSGLTWNGGTIGYADSVKGRFFISRDNAENSLYLQMMRLRPEDTALYYCVKDRGDYGDSSWYLDLWGRGTLVTVSS	VL2-11	JL1	54	QSALTQPRSVSGSPGQSVTISCTGTSSGVGSYDYVSWYQQHPGKAPKLMIFDVSKRPSGVPDRFSGSKSGNTASLTISGLQAEDEADYYCCSYAGDYYVFGIGTKVTVL
B039	B001	Omicron BT	Clone	VH1-69	JH4	55	QVQLVQSGAEVKKPGSSVKVSCKASDTFSSYPTSWVRQAPGQGLEWMGRIIPIVNIANYAQKFQGRVTITADKSTNTAYIELSSLNSEDTAVYYCARESGITGYCSSTACFRAWGRGTGVTVSS	VL1-40	JL3	56	QSXXTQPPSVSGAPGQRVTISCTGSNSNIGAGYDVHWYQQLPGTAPKLLIYDNNNRPSGVPDRFSGSKSDTSASLAITGLQAEDEADYYCQSYDSSLSDSVFGGGTKLTVL
	B002	Omicron BT	Clone	VH3-30	JH4	57	QVQLVESGGGVVQPGRSLRLSCAASGFTFGKYGMHWVRQAPGKGLEWVAGISYDGDYKDYADSLKGRVTISRDNSNNKMYLQMNSLRAEDTAVYYCAKKISEYC	VK1-33	JK4	58	DIQMTQSPVSLSASVGDRVTITCQASHDIANSLIWYQQRPGKAPKSLIYDASNLEAGVPSRFSGSGSGTDFSLTISSLQPEDL

						GGDCHTAYFDYWGQGTL VTVSS				ATYYCQQYHNMPLTFG GGTKVQTK
B003	Omicron BT	Clone	VH3-66	JH6	59	EVQLVESGGGLVQPGGS LRLSCAASEIIVGHNYMS WVRQAPGKGLEWVSIIYP GGTTYYADSVKGRFSISR DNSKNTLYLQMNSLRVED TAVYYCARDLGPAGGMD VWGQGTTVTVSS	VK1-6	JK2	60	AIQMTQSPSSLSASVG DRVTITCRASQDIGNDL GWYQQKPGKAPKLLIY AASSLQTGVPSRFSGS GSGTDFTLTISSLQPED FATYYCLQDSNYPYTF GQGTKLEIK
B004	Omicron BT	Singlet	VH3-30-3	JH4	61	QVQLVESGGGVVQPGRS LRLSCAASGFPFSSYAIH WVRQSPGKGLEWVAVIS SDGNFKYSADSVKGRFTI SRDNSKSTLYLQMNSLRA EDTAVYYCAREADDDMGI VPIFDYWGQGTLVTVSS	VL2-23	JL3	62	QSALTQPASVSGSPGQ SISISCTGTSSDVGSYN LVSWYQHHPGKAPKSII YEDTKRPSGVSNRFSG SKSGNTASLTISGLQAE DEGDYYCCSYAGSHT WVFGGGTKVTVL
B005	Omicron BT	Singlet	VH3-30	JH4	63	QVQLVESGGGVVQPGRS LRLSCAASGFTFSHYGMH WVRQAPGKGLEWVAVIL YDGSDKYYADSVKGRFTI SRDNSKNMLYLQMNSLR AEDRAIYYCAKDLGSYAY LFNYFDYWGQGTLVTVS S	VK3-20	JK1	64	EIVLTQSPGTLSLSPGE RATLSCRASQSVGGGY LAWYQQKPGQAPRLLI YGASSRATGVPDRFSG SGSGTDFTLTISRLEPE DFAVYYCQQYSSSRTF GQGTKVEIK
B006	Omicron BT	Singlet	VH4-59	JH6	65	QVQLQESGPGLVKPSETL SLTCTVSGGSISSYYWSW VRQSPGKGLEWIGYIYYS GSTNYNPSLKSRVTISVD TSKSQFSLKLSSVTAADT AVYYCASYYYDSSGYSY GLDVWGQGTTVTVSS	VK1-12	JK4	66	DIQMTQSPSSVSASVG DRVTITCRASQGVAGW LAWYQQKPGKAPKLLIY ATSTLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQTNSFPLTF GGGTKVDIK
B007	Omicron BT	Singlet	VH3-66	JH6	67	EVQLVESGGGLVQPGGS LTLSCAASGLTVSSNYMS WLRQTPGKGLEWVSTIYS GGSTYYADSVKGRFTISR DNSKNTLYLQMNSLRDE	VK3-11	JK2	68	EIVLTQSPATLSLSPGE RATLSCRASQSVSSYL AWYQQKPGQAPRLLIY DASNRATGFPARFSGS GSGTDFTLTINSLEPED

						DTAVYYCARDLPPGTTAP HHYYDMDVWGQGTTVIV				FAVYYCQQRSNWPYTF GQGTKLEIK
B008	Omicron BT	Singlet	VH3-53	JH3	69	EVQLVESGGGLIQPGGSL RLSCAASGLIVSSNYMSW VRQAPGKGLEWVSVVYP GGTTYSADSVKGRFTISR DNSKNTLYLQMNSLSAED TAVYYCARVSGGAVKVLE DAFDIWGQGTMVTVSS	VL3-21	JL1	70	SYELTQPPSLSVAPGKT AKITCGGNDIGSRSVH WYQQKPGQAPVLVIYY ESDRPSGIPERFSGSN SGNTATLTISRVEAGDE ADYYCQVWDSSSDHY VFGTGTKVTVL
B009	Omicron BT	Singlet	VH3-53	JH3	71	EVQLVESGGGLIQPGGSL RLSCAASGLIVSSNYMSW VRQAPGKGLEWVSVVYP GGTTYSADSVKGRFTISR DNSKNTLYLQMNSLSAED TAVYYCARVSGGAVKVLE DAFDIWGQGTMVTVSS	VL3-21	JL3	72	SYELTQPPSVSVAPGK TARITCGGNNIGSKSVH WYQQKPGQAPVLVIYY DSARPSGIPERFSGSN SGNTATLTISRVEAGDE ADYSCQVWDTSSDRG VFGGGTKLTVL
B010	Omicron BT	Singlet	VH3-30	JH4	73	QVQLVESGGGVVQPGRS LRLSCATSGFTFRSYAMH WVRQAPGKGLEWVAIISH DGTEKFYADSVKGRITVS RDNSKNTLYLQLNTLRPE DTAVYYCARDVSCGGDC YPGGFDFWGQGTLVTVS S	VK3-20	JK1	74	EIVLTQSPGTLSLSPGE RATLSCRASQSVRSNYI AWYQQKPGQAPRLLIN GASSRATGVPDRFSGS GSGTDFTLTISRLEPED FAVYYCQHYDKSPSWT FGQGTKVEMK
B011	Omicron BT	Singlet	VH3-30-3	JH4	75	QVQLVESGGGVVQPGRS LRLSCATSGFTFRSYAMH WVRQAPGKGLEWVAIISY DGSDKNYADSVKGRLTIS RDNSKNILYLQMNSLRPE DTAIYYCARDVSCGGDCY PGGFDYWGQGTLVTVSS	VK1-6	JK1	76	AIQMTQSPSSLSASVG DRVTITCRASQDIRNDL GWYQQKPGKAPKLLIY AASSLQNGVPSRFSGS GSGTDFTLTISSLQPED FATYYCLQDYSSPWTF GQGTKVEFK
B012	Omicron BT	Singlet	VH3-30	JH4	77	QVQLVESGGGVVQPGRS LRLSCAASGFTFSTYGMH WVRQAPGKGLEWVALIS YDGSDKYYADSVKGRFTI SRDNSKDTLFLRLNSLRA	VK3D-20	JK5	78	EIVLTQSPATLSLSPGE RATLSCGASQSVSSGY LAWYQHKPGLAPRLLM YDASTRATGIPDRFSGS GSGTDFTLTISRLEPED

						EDTAVYYCAKQISPYYAS GRSYFDYWGQGVLVTVS S				FAVYFCQQYGSSPITFG QGTRLEIK
B013	Omicron BT	Singlet	VH3-30	JH4	79	QVQLVESGGGVVQPGRS LRLSCAASGFTFSTYGMH WVRQAPGKGLEWVALIS YDGSDKYYADSVKGRFTI SRDNSKDTLFLRLNSLRA EDTAVYYCAKQISPYYAS GRSYFDYWGQGVLVTVS S	VK1-33	JK4	80	DIQMTQSPSSLSATVG DRVTITCQASQDISYYL GWYQQKPGKAPKLVIY DASDLEAGVPSTFSGS GSGTDFTFTISSLQPED IATYYCQQYDNLPPTFG GGTKVEIK
B014	Omicron BT	Singlet	VH3-30	JH4	81	QVQLVESGGGVVQPGKS LRLSCVGSGFTFSTYGMH WVRQAPGKGLEWVALIS YDGSDEYYADSVRGRFT MSRDNSKNTLYLQMNSL RVEDTAVYYCAKQISTYY AAGIYYFDYWGQGTLVTV SS	VK1-33	JK4	82	DIQMTQSPSSLSASIGD TVTITCQASQDINNCLI WYQQKPGKAPKILIYDA SNLEAGVPSRFSGSGS GTDFTFTISSLHREDIAT YYCQQCNGLPPTFGG GTKVEI
B015	Omicron BT	Singlet	VH1-69	JH3	83	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSNNAIS WVRQAPGQGLEWMGRII PIPGITNYAQEFQGRVTIT ADKSTRTAYMEVSSLRSE DTAIYYCATDVDTALFADA FDIWGQGTMVIVSS	VK1-27	JK3	84	DIQMTQSPSSLSASVG DRVTITCRASQGISNYL AWYQQKAGKVPKLLIY AASTLQSGVPSRFSGS GSGTDFTLTISSLQPED VATYYCQKYNSVPFTF GPGTKVDIK
B016	Omicron BT	Singlet	VH3-66	JH6	85	EVQLVESGGGLVQPGGS LRLTCAASGITVSSNYMN WVRQAPGKGLEWVSVLY AGGSTFYADSVKGRFTIS RDNSNNTLYLQMNSLRA EDTAVYYCARDLVDFGM DVWGQGTTVTVSS	VK1-33	JK3	86	DIQMTQSPSSLSASVG DRVTITCQASQDIGNNL NWYQQKPGKAPKLLIY DASNLETGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQYDNLPPITF GPGTKVDIK
B017	Omicron BT	Singlet	VH1-58	JH4	87	QMQLVQSGPEVKKPGTS VKVSCKASGFPFTTSAVQ WVRQARGHRLEWIGWIV	VK3-20	JK2	88	EIVLTQSPGTLXSSPGE RATLSCRASQSVNSNY LAWYQQKAGQAPRLLI

						VGSGTTYYAQKFQERVTI TRDRSTSTAYMELTSLRS DDTAIYYCAAVRGYYSGS GSFDYWGQGTLVTVSS				YGASSRATGIPDRFSG SGSGTDFTLTISRLEPE DFAVYHCQQYGSSPYT FGQGTKLEIK
B018	Omicron BT	Singlet	VH3-7	JH1	89	EVQLVESGGGLVQPGGS LRLSCAASGFTFSNYWM TWVRQAPGKGLEWVASI KQDGSETFYVDSVKGRF TISRDNAKNSLHLHMNSL RPEDTAVYYCARAETDYI AAGGSPEYFQHWGQGTL VTVSS	VK1-33	JK4	90	DIQMTQSPSSLSASVG DRVIITCQASQDIGNFL NWFQQRPGRAPKLLIY DASNLDTGVPARFSGS GSGTDFTFTISSLQPED IATYYCQHYDNVALTFG GGTKVDFK
B019	Omicron BT	Singlet	VH3-30-3	JH4	91	QVQLVESGGGVVQPGRS LRLSCAASGFTFNSYAMH WVRQAPGKGLEWVAVIS HDGSIKYSADALKGRFTIS RDNSKNTLYLQMKSLRTE DTAVYYCARDLDPRIQVVI PGYWGQGALVTVSS	VK1-39	JK2	92	DIQMTQSPSSLSASVG DRVTITCRASQSISTYL NWYQQKPGKAPKLLIY TTSSLQSGVPSRFSGT GSGTDFTLTISSLQPED FATYYCQQSYSAPYTF GQGTNLDIK
B020	Omicron BT	Singlet	VH3-23	JH6	93	EVQLLESGGGLVQPGGS LRLSCAASGFTFKYFAMN WVRQAPGKGLEWVSVIS GSGDNTYYADSVKGRFTI SRDNSKNTLYVQMNSLR AEDTAVYYCAKDRYGGP RASTMDVWGQGTTVTV	VK1-33	JK4	94	DIQMTQSPSSLSASVG DRVTITCQASQDITTYL NWYQQKPGNAPKLLVY DASNLETGVPSRFSGS GSGTDFTFTITSLQPED FATYFCQQYGGHPLTF GGGTKVEIK
B023	Omicron BT	Singlet	VH1-69	JH6	95	QVQLVQSGAEMKKPGSS VKVSCKASGGTFSSYGIS WVRQAPGQGLEWMGGII PMFGAARYAQRFQGRVTI SADESTSTAYMELSSLRS DDTAVYYCARDQSPAKIV VVPAYRADHYYAMDVWG QGTAVTVS	VK2-28	JK1	96	DIVMTQSPLSLPVTPGE PASISCRSSQSLLHSNG NNYLDWYLQKPGQSP QLLIYLGSNRASGVPDR FSGSGSGTDFTLKISRV EAEDVGVYYCMQGLQT PRTFGQGTKVEIK
B024	Omicron BT	Singlet	VH3-21	JH4	97	EVQLVESGGGLVKPGGS LRLSCAASGVTFISYSMN	VK1-33	JK2	98	DIQMTQSPSSLSASVG DRVTITCQASQDINIYLN

						WVRQAPGKGLEWVSSIS SSSDYIAYADSVKGRFTIS RDNAKNSVYLQMTSLRA DDTAVYYCARRGDYGEC YDYWGQGALVTVSS				WYQQKLGKAPKLLIND ASNLQPGVPSRFSGSG SGTDFTFTISSLQPEDIA TYYCLQYDNLPRTFGQ GTKLEIK
B026	Omicron BT	Singlet	VH3-30-3	JH4	99	QVQLVESGGGVVQPGRS LRLSCAASGFTFNTFAMH WVRQAPGRGLEWVAAIS YDGTIKTYADSVKGRFTIS RDTSKSTLYLQVNSLRTE DTALYYCARDSDIVRTAQ FDYWGQGTLVTVSS	VK1-39	JK2	100	DIQMTQSPSSLSASVG DRVAITCRASQSISNYL NWYQKKPGKAPNLLIY TASSLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSYTTPYTF GQGTQLENK
B028	Omicron BT	Singlet	VH3-53	JH4	101	EVQLVESGGGLIQPGGSL RLSCAASGFIVSRNYMSW VRQAPGKGLEWVSLLYA GGSTFYADSVKGRFTVS RDNSKNTLFLQMDSLRAE DTAVYYCARDLQDRGGL DYWGQGTLVTVS	VL7-46	JL3	102	QAVVTQEPSLTVSPGG TVTLTCGFSTGAVTSG HYPYWFQQKAGQAPR TLIYDTINKHSWTPARF SASLLGGRAALTLSGA QPEDEADYYCLLSNIGA RRVFGRGTKLTVL
B029	Omicron BT	Singlet	VH3-53	JH4	103	EVQLVESGGGLIQPGGSL RLSCAASGFTVSANYMT WVRQAPGKGLDWVSVIY PGGSTFYADSVKGRFAIS RDKSNNTLYLQMNSLRAE DTAVYYCARGPYPPKDS GFWGQGTLVTVSS	VK4-1	JK1	104	DIVMTQSPDSLAVSLGE RATINCKSSQSVLYSSN NKNYLAWYQQKPGQP PKLLIYWASTRESGVPD RLSGSGSGTDFTLTISS LQAEDVAVYYCQQYYS APPTFGQGTKVEIK
B030	Omicron BT	Singlet	VH4-34	JH4	105	QVQLQQWGAGLLKPSET LSLTCAVSGGSFSGYYW SWIRQPPGKGLEWIGEIIY SGDTNYNPSLKSRITLSLD TAKNQFSLKLTSVTAADT AVYYCARGLSSGYDWGY WGQGTLVTVSS	VL2-14	JL1	106	QSALTQPASVSGSPGQ SITISCTGTSSDVGGYN YVSWYQQHPGKAPKL MISDVSKRPSGISNRFS GSKSGNTASLTISGLQA EDEADYYCSSYTSNNS YVFGTGTKVTVL
B031	Omicron BT	Singlet	VH4-34	JH4	107	QVQLQQWGAGLLKPSET LSLTCAVSGGSFSGYYW SWIRQPPGKGLEWIGEIIY	VL1-47	JL7	108	QSALTQPPSASGTPGQ RVTISCSGSSSNIGSNF VYWYQQLPGTAPKLLIY

							SGDTNYNPSLKSRITLSLD TAKNQFSLKLTSVTAADT AVYYCARGLSSGYDWGY WGQGTLVTVSS				SNNQRPSGVPDRFSGS KSGTSASLAISGLRSED EADYFCAAWDDSLSGY AVFGGGTQLTVL
	B034	Omicron BT	Singlet	VH1-46	JH6	109	QVQLVQSGAELKKPGAP VKISCKASGYILTNHYIHW VRQAPGQGLEWMGMINP SGGITHYAQNFQGRVTM TRDTSTRTVYMEVSSLKS EDTAVYYCARDRLMGYY ELWNTYGGMDVWGQGT TV	VK1-27	JK4	110	DIQMTQSPSSLSASVG DRVTITCRASQGISNYL AWYQQKPGKAPKLLIY AASTLQSGVXSRFTGS GSGTDFTLTISSLQPED GATYYCQNYDSDPAPF GGGTRVEIK
	B035	Omicron BT	Singlet	VH4-38-2	JH3	111	QVQLQESGPGLVKPSETL SVTCAVSGYSISSSYYWG WIRQSPGRGLEWIGSIYH SGTTYYNPSVKSRLTISV DTSTNQFSLTLRSVTAAD TAMYYCASNSGQVVIGAF DIWGQGTMVTVSS	VK1-33	JK4	112	DIQMTQSPSSLSASVG DRVTITCQASQDISNYL NWYQQKPGKAPKLLIY GASNLETGVPSRFSGS GSGTDFTFTISSLQPED IATYYCQKYDNVPLTFG GGTKVEIK
B046	B1058	Omicron BT	Clone	VH1-69	JH6	113	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSSHAIS WVRQAPGQGLEWMGGII PIFGTANYAHNFQGRVTIT ADKSTTTAYMEMSSLRSE DTAVYYCARGGGYDFRS GYPTPHYYYYYMDVWGK GTTVTVS	VK3-20	JK1	114	EIVLTQSPGTLSLSPGE RATLSCRASQSVSSSY LAWYQQKPGQAPRLLI YGASSRATGIPDRFSG SGSGTDFTLTISRLEPE DFAVYYCQQYGSSQGT FGQGTKVEIK
	B1059	Omicron BT	Clone	VH3-11	JH2	115	QVQLVESGGGLVKPGGS LRLSCAASGFTFTNYYMT WIRQAPGKGLEWVSYIRS ENGNTYYADSVKGRFTIS RDNAKNLLYLQMNNLRVE DTAVYYCARDLDTVTLNG IYWYFDLWGRGTLVTVSS	VK1-12	JK4	116	DIQMTQSPSSVSASVG DRVTITCRASQGISRSV AWYQQKPGEAPKLLIY AASSLQSGVPSRFSGS GSGTDFTLVISSLQPED FATYYCQQSNSVYLLS FGGGTKVEIK
	B1060	Omicron BT	Clone	VH1-58	JH3	117	QVQLVQSGPEVKKPGTS VKVSCKSSEFTLTPSAVQ	VK3-20	JK1	118	EIVLTQSPGTLSLSPGE RATLSCRASQSVSSNY

						WVRQARGQRLEWIGWIV VGSGKTDYAGNLRERVTI TRDTSTGTVYMEVNSLRS EDTAVYFCAAPHCNRTKC HDGFDMWGQGTMVTVS S				LAWYQQKPGQAPRLLI YGASSRATGIPDRFGG SGSGTDFILTISRLEPED FAVYHCQQYGISPWTF GQGTKVEIK
B1061	Omicron BT	Singlet	VH5-51	JH4	119	EVQLVQSGPEVKKPGESL KISCRASGYSFTNYWIGW VRQIPGKGLEWLGIIYPGD SDTTYSPSFQDHVTLSAD NSISTAYLQWNSLKASDT AMYYCARLAVVIDLSVFD FWGQGTLVTVS	VK1-9	JK5	120	DIQLTQSPSFLSASVGD RVTITCRASQGISKYLG WYQQKPGKAPKLLIYG ASTLHSGVPSRFSGSG SGTEFTLTIRSLQPEDF ATYYCQHLNSYLITFGQ GTRLEIK
B1062	Omicron BT	Singlet	VH5-51	JH4	121	EVQLVQSGAEVKKPGESL KISCKGSGYTFANYYIGW VRQLPGKGLDWLGIIYPG DSETIYSPSFQGPATISAD KSISTAYLQWSSLRASDT AMYYCARLGVDIDVLPFD YWAQGTLVTVSS	VK1-9	JK3	122	DIQLTQSPSFLSASVGD RVTITCRASQDISSYLA WYQQKPGKAPKLLIYA ASTLHSGVPSRFSGSG SGTEFTLTINSLQPEDF ATYYCQQLNSYSFTFG PGTKVDIK
B1063	Omicron BT	Singlet	VH4-4	JH6	123	QVQLQESGPGLVKPSGT LSLTCAVSGGSIRSSNW WSWVRQPPGKGLEWIGE IYLSGSTDYNPSLKSRVTI SVDKSKNRLSLNLTSVTA ADTAVYYCATMGNTDMV PKNYYMDVWGKGTTVTV SS	VK3-11	JK5	124	EIVLTQSPATLSLSPGE RATLSCRASQTVSSYL AWYQQKPGQAPRLLIY DTSARATGIPARFSGS GSGTDFTLTISSLEPED FAVYYCQQRSDWPPTF GQGTRLEI
B1064	Omicron BT	Singlet	VH3-23	JH6	125	EVQLLESGGGLVQPGGS LRLSCRASGFTFSNYAMS WVRQAPGKGLECVSGIS GSGGFTNYADPVKGRFII SRDDSKNTLYLQMNSLR GEDTAVYFCAKGDWLSP NLNHYYMDLWGKGTTVT VSS	VK1-5	JK4	126	DIQMTQSPSTLSASVG DRVTIACRASQSISNWL AWYQQKPGKAPKLLIY KASSLESGVPSRFSGS GSGTEFTLTISGLQPDD FATYYCQQYNSFPLTF GGGTKVDIK

B1065	Omicron BT	Singlet	VH3-15	JH3	127	QVQLVESGGGLVKPGGSLRLSCAASGFTFSNAWMNWVRQAPGKGLDWVGRIKNRRDGGTTDYAAPVKGRFTISRDDSKNTLYLQMNSLKIEDTAVYYCTTDRGDVSRFLDLFHDAFDVWGQGTMVTVSS	VK1-39	JK4	128	DIQMTQSPSSLSASVGDRVTISCRANQSIRYYLNWYQQKPGKAPKLLIYAVSSLHSGVPSRFSGSGSDTDFTLTITSLQPEDFATYYCQQCYTTPHFGGGTKVEIK
B1066	Omicron BT	Singlet	VH3-15	JH3	129	QVQLVESGGGSVKPGGSLRLSCAGSGLSFSRAWMNWVRQAPGKGLEWVGRIKSKNDGAAIDYAAPVKGRFTISRDDSRSTLYLQMDSLKTEDTAVYYCTTDLTSITMVEHDAFDIWGQGTMVTVSS	VK1-39	JK2	130	DIQMTQSPSSLSASVGDRVTITCRAGQSVSTFLNWYQQRPGKAPKLLIYAASILQSGVPSRFSGSGSGTDFTLTISNLQPEDFATYYCQQSYGPLGSFGQGTKLEIK
B1067	Omicron BT	Singlet	VH3-13	JH4	131	QVQLVESGGGLVQPGGSLRLSCAASGFPFSQYDMHWVRQTTTKGLEWVAVIGTAGEAYYPDSVKGRITISRDNARNSLYLQINSLRAEDTAVYYCVRDVGQVWPYFDSWGQGILVTVSS	VK1-39	JK4	132	DIQMTQSPSSLSATVGDRVTITCRASQTIGNYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQAEDFATYYCQQSYTTLALTFGGGTKVEIK
B1068	Omicron BT	Singlet	VH1-18	JH3	133	QVQLVQSGAEVKKPGASVKVSCKTSGYTLSNYGLSWVRQAPGQGLEWMGWISAHDGDTKYAQKFQGRVTMTTDTSTSTAYMELRSLRSDDTAMYYCAREGGLTTMTLSDAFDIWGQGTMVIVSS	VK4-1	JK4	134	DIVMTQSPDSLAVSLGERATINCKSSQSVLYTSNNQDYLAWYQQKPGQPPKLLIYWASARQSGVPDRFSGSGSGTAFTLTISSLQAEDVAVYYCQQYFQTPLTFGGGTKVEIK
B1069	Omicron BT	Singlet	VH1-69	JH2	135	QVQLVQSGAEVKKPGSSVKVSCKASGGTFSSSSITWVRQAPGQGLEWMGGIIPTLGIANYAQKFQDRLTLIADKSTSTASMELSSLRSD	VL1-40	JL3	136	QSVLTQPPSVSGAPGQRVTISCAGTNSNIGAGYDVHWYQQLPGTAPKLLIYANNNRPSGVPDRFSGSKSGTSASLAITGLQA

						DTAVYYCARVAGYSGYG AAEYFDLWGRGTLVTVSS				EDEADYYCQSYDSSLS GSVFGGGTSLTVL
B1070	Omicron BT	Singlet	VH4-61	JH5	137	QVQLQESGPGPVKPSET LSLTCTVSGASVTSHNFY WSWIRQPPGKGLEWIGF FSSRGSPNYNPSLKSRVT ISVDMSKSQFSLRLSSVT AADTAVYYCARETYFYDR NGNYLSDGFDSWGQGTL VTVS	VK1-5	JK2	138	DIQMTQSPSSLSASVG DSVTITCRASQTISTWL AWYQQKPGQAPKLLIY QASSLETGVPSRFSGS GSGTEFTLTIGSLQPDD FATYYCQQYKSSSPYT FGQGTKLEIK
B1071	Omicron BT	Singlet	VH1-69	JH4	139	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSRYAIH WVRQAPGEGLEWVGGII PMFGAADYAQKFQGRVTI TADKSTSTAYMELSGLKS EDTAIYYCARGQIQWELL SFAVGVHFDYWGQGTLV TVSS	VK4-1	JK2	140	DIVMTQSPESLAVSLGE RATIKCKSSQSVLYSSN NKNYLAWYQQKPGQP PKLLIYWASYRESGVPD RFSGSGSATDFTLTISS LQAEDVAVYYCQQSYP VPPYTFGQGTKLEIK
B1072	Omicron BT	Singlet	VH5-10	JH4	141	EVQLVQSGAEVKKPGKSL MISCKASGYSFTDYWINW VRQMPGKGLEWMGRIDP SDSYTNYSPSFQGHVTIS ADKSINTAFLQWSSLKAS DTAVYYCARGQYHLDPIG HYFFDFWGQGALVTVSS	VL2-23	JL2	142	QSALTQPASVSGSLGQ SITISCTGTSSDVGSYD LVSWYQQYPGKAPKLII YEVIKRPSGVSNRFSG SKSGNTASLTISGLQAD DEAHYYCCSYAGIITYV VFGGGTKLTVL
B1073	Omicron BT	Singlet	VH1-69	JH6	143	QVQLVQSGAEMKKPGSS VKVSCEAPGGTFTSYSIN WVRQAPGQGLEWMGGII PTLGTTNYGQKFQGRVTI TADKSTSTAYMELSSLRS EDTAVYYCARGKLDFRS GFFYNFRSMDVWGKGTT VTVSS	VK1-33	JK4	144	DIQMTQSPSSLSASVG DRVTITCQASHDISSCL NWYQQKPGKAPKLLIY DASNLETGVPSRFSGS GSGTGFTFTISSLQPED IATYYCQQYENLPLTFG GGTKVEI
B1074	Omicron BT	Singlet	VH1-69	JH6	145	QVQLVQSGAEVKKPGSS VKVSCKASGGTLSNYAIS WVRQAPGQGLEWMGGII	VL2-14	JL1	146	QSALTQPASVSGSPGQ SITISCSGTSSDVGGFN YVSWFQQHPGKAPKL

						PIFGTTNYAQKFQGRVTIT ADESTSTANMELDSLRSE DTALYFCATYSSGWYSM GDFYYYYMDVWGKGTTV TVSS				MICDVSFRPSGVSDRF SGSKSGNTASLTISGLQ AEDEADYYCSSFTRTN TYVFGTGTKVT
B1075	Omicron BT	Singlet	VH3-53	JH3	147	EVQLVESGGGLIQPGGSL RLSCAASELIVSYNYMTW VRQAPGKGLEWVSIIYSG GSTFYADSVKGRFTISRD NSKNTLYLQMNSLRPEDT AVYYCARVLPTIWDAFDI WGQGTMVTVSS	VK1-9	JK5	148	DIQLTQSPSFLSASIGD KVTITCRASQGISSYLA WYQQKPGKAPKLLIYA ASTLQSGVPSRFSGSG SGTEFTLTIDSLQPEDF ATYYCQQLNSYPVGTF GQGTRLEIK
B1107	Omicron BT	Singlet	VH1-69	JH6	149	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSSYAIS WVRQAPGQGLEWMGRII PILGIANYAQKFQGRVTIT ADKSTTTAYMEMSSLRSE DTAVYYCARGGGYDFRS GYPTPHYYYYYMDVWGK GTTVT	VK1-33	JK4	150	DIQMTQSPSSLSASIGD RVTITCQASQDITDYLN WYHHVPGTAPKLLIYDA SHLQTGVSSRFSGSGS GTHFNLTISSLQPEDIAT YYCQHYDNLSLTFGGG TKVELK
B1108	Omicron BT	Singlet	VH3-7	JH4	151	EVQLVESGGGLVQPGGS LRLSCSASGFTFNNYWM SWVRQAPGKGLEWIANIK QDGSEKYYVDSVKGRFTI SRDNAKNSLYLLMNSLRA DDTAVYYCARLERWLWG YFDYWGQGSLVTVSS	VK4-1	JK5	152	DIVMTQSPDSLAVSLGE RATINCKSSQSVLYSSN NKNYLAWYQQKPGQP PKLLIYWASTRESGVPD RFSGSGSGTDFTLTINS LQAEDVAVYYCQQYYS GPPITFGQGTRLEIK
B1109	Omicron BT	Singlet	VH3-9	JH6	153	EVQLVESGGALQQPGRS LTLSCAASGFTFEDYAMH WVRQAPGKGLEWVSGIT WTGGMIDYADSVKGRFII SRDNAKKSLYLHMRGLR PEDTALYYCARGSRSGS YHLRDHFYGMDVWGQ	VK1-33	JK2	154	DIQMTQSPXSLSASVG DRVTITCQASQDINKYL NWHQQRPGKAPKLLIY DASNLETGVPSRFSGS GSGTDFTLTIDSLQPED IATYYCHQYDNLPQSF GQGTKVEIK
B1110	Omicron BT	Singlet	VH3-9	JH6	155	EVQLVESGGALQQPGRS LTLSCAASGFTFEDYAMH	VK3-20	JK1	156	EIVLTQSPGTLSLSPGE RATLSCRASQSVNSNY

						WVRQAPGKGLEWVSGIT WTGGMIDYADSVKGRLII SRDNAKKSLYLHMRGLR PEDTALYYCARGSRSGS YHLRDHFYGMDVWGQG TTVT				LAWYQQKPGQAPRLLI YGASSRATGIPDRFSG SESGTDFTLTISRLEPE DFAVYYCQQYGFSAWT FGQGTKVEIK
B1111	Omicron BT	Singlet	VH3-9	JH6	157	EVQLVESGGGLVQPGRS LTLSCAASGFTFEDYAMH WVRQAPGKGLEWVSGIT WTGGMIDYADSVKGRFII SRDNAKKSLYLHMRGXR PEDTALXYCARGSRSGS YHLRDHFYGMDVWGQG TTVTVSS	VL2-14	JL3	158	QSALTQPASVSGSPGQ SITISCTGTSSDVGAYN FVSWYQQHPGKAPKLII FDVNSRPSGVSNRFSG SKSGSTASLTISGLQAE DEADYYCSSYRDFSSW VFGGGTRLTV
B1112	Omicron BT	Singlet	VH4-59	JH6	159	QVQLQESGPGLVKPSETL SLTCSVSGGSMNNYYWS WIRQPPGKGLEWIGYIEY SGSTNYNPSLKSRVTISV DTAKNQFSLKLRSVTAAD TAVYYCARVATFSITFGG VITDYYNYYMDVWGKGT AVTVSS	VK3-20	JK4	160	EIVLTQSPGTLSLSPGE SATLSCRARHSISSNYL AWYQQKPGQAPRLLIY GVSSRATGIPDRFSGS GSGTDFTLTISRLEPED FAVYYCQQYAGTPLTF GGGTKVEIK
B1113	Omicron BT	Singlet	VH1-69	JH4	161	QVQLVQSGAEVKKPGSS VKVSCKASGDTFSTSAFN WVRQAPGQGLEWMGEII PTFDTSTYAQKFQGRVTI TADKSTSTVYMELSSLRS EDTAVYFCARVPGFYSG HFDSWGQGTLVTVSS	VK1-33	JK2	162	DIQMTQSPSSLSASVG DRVTITCQASQDMSNY LNWYQQKPGKAPKLLI YDVFNLEAGVPSRFSG SRSGTDFTLTISSLQPE DIATYYCQHYDNLSSYS FGQGTKLEIK
B1114	Omicron BT	Singlet	VH1-69	JH6	163	QVQLVQSGAEVKKPGSS VKVSCKASGDSFTAYAM SWVRQAPGRGLEWLGGI VPVFLTTQSSQKFQGRLT ITADMSTSTVYMELNSLR SDDTAVYFCARGPVGSP	VL2-14	JL3	164	QSALTQPASVSGSPGQ SITISCTGTSSDIGAYNF VSWYQQHPGKAPKLVI CDVHNRPSGVSNRFSG SKSGTTASLTISGLQAE DEAYYYCSSYRDISSW VFGGGTKLTVL

						RNYYSYPLAVWGQGTPV TVSS				
B1115	Omicron BT	Singlet	VH3-53	JH6	165	EVQLVESGGGLVQPGGS LRLSCAASGFIVSDSYMT WVRQAPGKGLEWVSLIH SGGSTYYADSVKGRFTIT RHYSTNNLYLQMNSLRVE DTAVYYCARDTAASSGYY YNALDVWGQGTTVTV	VK1-39	JK1	166	DIQMTQSPSSLSASVG DRVTITCRASQSISNYL NWYQQKPGKAPKLLIF AASSLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYFCQQSYSTPPTF GQGTKVEIK
B1116	Omicron BT	Singlet	VH30-3	JH4	167	QVQLVESGGGVVQPGRS LRLSCAASGFTFNRHAIH WVRQAPGKGLEWLGVIS NDGAIKSYPDSVKGRFTIS RDNSRNTLYLQMNSLRTE DTAVYYCARDQEALTPIF DYWGQGTLVTVSS	VK1-39	JK5	168	DIQMTQSPSSLSASVG DRVTITCRASQSISSYL NWYHQKPGKAPKLLIY NAASLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSYNTPPITF GQGTRLE
B1117	Omicron BT	Singlet	VH30-3	JH4	169	QVQLVESGGGVVQPGRS LRLSCAASGFTFNNYDIH WVRQAPGRGLEWVAVIS YDGSSKFYADSVKGRFTI SRDNSKNTLYLQMNSLRA EDTAVYYCTKDYGGRVPI FDSWGQGTLLTVSS	VK1-39	JK4	170	DIQMTQSPSSLSASVG DRVTITCRASQSISSYL NWYQQKPGKAPKLLIY AASSLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSYSTPGLT FGGGTKVEIK
B1118	Omicron BT	Singlet	VH5-51	JH4	171	EVQLVQSGAEVKKPGESL KISCKASGYSFTTYWIGW VRQMPGKGLEWMGIIYP GDSDARYSPSFQGQVTF SVDKSITTASLQWSSLKA SDTAMYYCARSRSGDYF DYWGQGTLVTVS	VK1-13	JK3	172	AIQLTQSPSSLSASVGD RVTITCRASQGISNGLA WYQQKPGNAPKLLIYD ASNLESGVPSRFSGSG SVTDFTLTISSLQPEDF ATYYCQHFKSYPFTFG PGTKVDIK
B1119	Omicron BT	Singlet	VH3-13	JH6	173	EVQLVESGGGLVQPGGS LRLSCAASGFTFSNDDMH WVRQASGKGLKWVSAIG TAGDRYYADSVKGRFTIS RENAKNSFYLQMNDLRA EDTAVYYCARGVHERIDY	VK1-39	JK1	174	DIQMTQSPSSLSASVG DRVTITCRASQSISRYL NWYQQKPGKAPKLLIH AASSLQSGVPSRFSGS GSGTDFTLTISSLQPED

							YYYYYMDVWGKGATVIV S				FATYYCQQSYSSPPWT FGPGTKVEIK
	B1120	Omicron BT	Singlet	VH3-13	JH6	175	EVQLVESGGGLVQPGGS LRLSCAASGFTFSSDDMH WVRQVTGKGLEWVSGIG TNSDKYYAGSVKGRFTIF REDAKNSLYLQMNSLRAE DSALYYCTRGVQVVRGV KFYYSMDVWGKGTTVTV S	VK1-39	JK2	176	DIQMTQSPSSLSASVG DRITITCRASQTISSYLN WYQQKPGKAPKLLIYA ASSLQSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYYCQQSYSNPPESS FGQGTKLEIK
	B1121	Omicron BT	Singlet	VH3-53	JH6	177	EVQLVESGGGLIQPGGSL RLSCAASGIIVSSNYMTW VRQAPGKGLECVSLIYPG GSTFYPDSVKGRFTISRD NSKNILYLQMDSLRAEDT AVYYCARSYVDYYMDVW GKGTTVTVSS	VK3-15	JK1	178	EIVMTQSPATLSVSPGE RATLSCRASQSVSSNL AWYQQKPGQAPRLLIY GASTRATGIPARFSGS GSGTEFTLTISSLQSED FAVYYCQHYNNWWTF GQGTKVEIK
B048	B2052	Omicron BT	Clone	VH5-10	JH6	179	EVQLVQSGAEVKKPGESL RISCKGSGYSFPSYWITW VRQMPGKGLEWMGRIDP SDSYTDYSPSFQGHVTIS VDKSINTAYLQWSSLKPS DTAKYYCARDQQHLLTFT GMDVWGQGTTVTVSS	VK1-5	JK1	180	DIQMTQSPSTLSASVG DRVTITCRASQSISSWL AWYQQKPGKAPKLLMY KASTLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQHYNAISRTFG QGTKVEIK
	B2053	Omicron BT	Clone	VH3-30	JH4	181	VQLVESGGGVVQPGMSL RLSCTASGFTFSNYAVH WVRQAPGKGLEWVAIVS NDGKIKFYADSVKDRFTIS RDNSKNTLFLQMNGLRS DDTAVYYCARDREELSY WSLDYWGQGTLVTVSS	VK1-39	JK4	182	DIQMTQSPSSLSASVG DRVTVTCRASQSIRTYL NWYQQKPGKAPKLLIY AASNLQSGVPSRFSGS GSGTDFTLTISSLQRED FATYFCQQSYSTPPLTF GGGTRVEIK
	B2054	Omicron BT	Clone	VH3-30	JH4	183	VQLVESGGGVVQPGRSL RLSCAASGFTFRTYAMH WVRQAPGKGPEWLAVIS DDGSIKYYADSVQGRFTI SRDNSESTLYLQLNSLRA	VK1-39	JK2	184	DIQLTQSPSSLSASVGD RVTLTCRASQSIGNYLN WYQQKPGKAPKLLIYA ASSLQSGVPSRFSGSG SGTDFTLTISSLQPEDF

						EDTAVYYCATEGMTGLVI YFDFWGQGTLVTVSS				ATYYCQQSYSTSEYTF GQGTKLEIK
B2055	Omicron BT	Clone	VH4-31	JH3	185	QVQLQESGPGLVKPSQT LSLTCTVSGVSITSGGNY WTWIRQFPGKGLEWIGYI DYSGSAFFNPSLKSRFAM SLDTSNNQFSLTVNSVTA ADTAVYYCAREIRLLELQ GNVFDTWGQGTMVTVSS	VK1-33	JK2	186	DIQMTQSPSSLSASVG DRVTITCQASQDSTNCL NWYQQKPGKAPKLLIY DASNLGTGVPSRFSGR GSGTDFTLTISSLQPEDI ATYYCQQYENLPYTFG QGTKLEIK
B2056	Omicron BT	Clone	VH5-51	JH3	187	EVQLVQSGAEVKKPGESL KISCQGSGHIFTRYWIAW VRQMPGKGLEYMGIIYPP DSDTTYSPSFQGQVTISA DKSISTAFLQWSSLKASD TAIYYCATLPRGPKSGDP FDIWGQGTMVTVSS	VK1-39	JK2	188	DIQLTQSPSSLSASVGD RVTITCRASESISSYLN WYQQKPGKAPELLIYA ASSLQSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYYCQQSYSTPPTFG QGTKLEIK
B2057	Omicron BT	Singlet	VH3-15	JH6	189	EVQLVESGGGLAKPGGS LRLSCAASGFSFSDAWM NWVRQGPGKGLEWVGRI KTKIDGGTIDYAASVKGRF TISRDDSKNTLYLQMSRL KTDDTAVYYCSTDEVSSG YDFPMDVWGQGTTVTVS S	VK1-5	JK1	190	DIQMTQSPSTLSASVG DRVTITCRASQSVSVW LAWYQQKPGKAPNLLI YKASNLQSGVPSRFSG SGSGTEFTLTISSLQPD DFATYYCLQYNTLWTF GQGTKVEIK
B2058	Omicron BT	Singlet	VH3-53	JH6	191	EVQLVESGGGLIQPGGSL RLSCAASGLTVSSNYMS WVRQAPGKGLEWVSVIY PGGSTFYADSVKGRFTIS RDNSKNTLYLQLNSLRAD DTAVYFCARGDGYTDYY YGLDVWGQGTTVTVSS	VK1-39	JK1	192	DIQLTQSPSSLSASVGD RVTITCRASQSISSYLN WYQQKPGKAPKLLIYA ASSLQSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYYCQQRGFGQGTK VEIK
B2059	Omicron BT	Singlet	VH4-31	JH4	193	QVQLQESGPGLVKPSQT LSLTCTVSGDSISRGGFY WNWIRQHPGKGLEWIGNI YYSGSTYYNPSLKSRVTI SVDTSKNQFSLKLNSVTA	VK1-33	JK4	194	IRMTQSPSSLSASVGD RVTITCQASQDINNYLN WYQQKPGKAPKLLIYD ASNLETGVPSRFTGSG SGTDFTFTISSLQPEDIA

						ADTAVYYCARDYGGNAQ QFSFWGQGTLVTVSS				TYYCQHYHNFPLTFGG GTKVEIK
B2060	Omicron BT	Singlet	VH1-46	JH3	195	QVQLVQSGAEVKKPGAS VKVSCKASGNTFSVYYIH WVRQAPGQGLEWMGIFN PSGGSTTYAQKFQGRVT MTRDTSTSTVYMELSSLR SDDTAVYYCARGGLVPAT REPFDIWGQGTMVTVSS	VK1-5	JK1	196	DIQMTQSPSTLSASVG DRVTITCRASQSISYWL AWYQQKPGKAPKLLIY KASSLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYFCQQYNSFPWTF GQGTKVEIK
B2061	Omicron BT	Singlet	VH3-33	JH5	197	QVQLVESGGGVVQPGRS LRLSCAASGFTFSSYGMH WVRQAPGKGLEWVAVIW YDGSGKHYADSAKGRFTI SRDNSKNTLYLQMNSLRA EDTAVYYCARDESGSYP VSWFDPWGQGTLVTVSS	VK1-39	JK1	198	DIQMTQSPSSLSASVG DRVTITCRASQSIGIYLN WYQQRPGKGPNLLIYA ASSLQSGVPSRFSGSG SGTEFTLTISSLQPEDF ATYYCQQSYNTPPWTF GQGTKVEIK
B2062	Omicron BT	Singlet	VH4-38	JH3	199	QVQLQESGPGLVKPSETL SVTCAVSGYSISSSYYWG WIRQSPGRGLEWIGSIYH SGTTYYNPSVKSRLTISV DTSTNQFSLTLRSVTAAD TAMYYCASNSGQVVIGAF DIWGRGTMVTVSS	VK1-39	JK2	200	DIQMTQSPSSLSASVG DRVTVTCRASQSIDSYL NWYQQKPGKAPKVLIY AASTLQSGVPSRFSGS GSGTEFTLTISSLQPED FATYYCQQTYSTPSYT FGQGTKLEIK
B2063	Omicron BT	Singlet	VH5-10	JH5	201	EVQLVQSGAEVKKPGESL RISCKGSGYPFTTFWITW VRQRPGKGLEWMGRIDP SDSETDYSPSFQGHVTIS TDKSINTAYLHWSSLKAS DTAMYYCATAVSPGTGW FAPWGQGTLVTVSS	VL3-12	JL1	202	SYVLTQPPSVSVAPGK TARITCGGDKIGSKSVH WYQQKPGQAPVLVIYY DSDRPSGIPERFSGSN SGNTATLTISRVEAGDE ADYYCQVWDSDSAVF GTGTKVSVL
B2064	Omicron BT	Singlet	VH1-69	JH4	203	QVQLVQSGAEVKKPGSS VNVSCKASGGTLNIYTFS WVRQAPGQGLEWVGTIV PLVGKANYPHKFQGRVTI TADKSTSTVNMELSSLRS	VK1-39	JK4	204	DIQMTQSPSSLSASVG DRVTITCRASQSVSSYL NWYQQKPGKAPKLLIY AVSSLQSGVPSRFSGS GSGTDFTLTISSLQPED

						EDTAVYYCASEVLDNLRD GYNFWGQGTLVTVSS				FATYYCQQTYNTLTFG GGTKVEIK
B2065	Omicron BT	Singlet	VH3-13	JH6	205	EVQLVESGGGLAQPGGS LRLSCGGSGFTFGSHDM HWVRQATGKGLEWVAAI TTAGDTYYSGSAKGRFTI SRDNAKNSFYLQMNSLR GEDTAVYYCAFVSWNRY CSRSSCHGLGVWGQGTT VTVSS	VL3-9	JL2	206	SYELTQSLSVSVALGQT ATITCGGDNLRNRNVH WYQQRPGQAPVLILYR DYNRPSGIPERFSGSN SGNTATLTISRAQAGDE ADYYCQVWDSDTGVV FGGGTKLTVL
B2066	Omicron BT	Singlet	VH3-13	JH4	207	EVQLVESGGGLVQPGGS LRLSCAASGFTFSTYDMH WVRQATGKGLEWVSTIG TSGDTYYLDSVKGRFTIS RENAKNSLYLQMNSLRAE DTAVYYCARGHATSMVT VFDFWGQGSLVTVSS	VK1-39	JK4	208	DIQMTQSPSSLSASVG DRVTITCRASQSISTYL NWYQQKPGKAPKLLIY AASSLHSGVPSRFSGR GSGRDFTLTISSLQPED FATYFCQQSYINPHVTF GGGTKVEIK
B2112	Omicron BT	Singlet	VH5-51	JH5	209	EVQLVQSGAEVKKPGESL KISCKGSGYSFISYWIGW VRQMPGKGLEWMGIIHP QESETRGSQSFQGQVTIS ADKSIITAYLQWSSLKASD TAMYYCVRYSSSPSGWF DPWGQGTLVTVSS	VL1-44	JL2	210	QSVLTQPPSASGTPGQ RVTISCSGSSSNIGGNA VSWYQQLPRTAPKLLIY NNNQRPSGVPDRFSG SKSGTSASLAISGLQSE DEADYYCAAWDDSLN GVVFGGGTKLTVL
B2113	Omicron BT	Singlet	VH1-18	JH4	211	QVQLVQSGAEVKKPGAS VKVSCKASGYTFSSYGIS WVRQAPGQGLEWMGWI SGYSGNTKYAQKLQGRV TMTTDTSTSTAYMELRSL RSDDTAVYYCARNSGSY YLGVEYWGQGALVTVSS	VL6-57	JL3	212	NFMLTQPHSVSESPGK TVTISCTGSSGSIASNY VQWYQQRPGSAPTTVI YEDNQRPSGVPDRFSG SIDSSSNSASLTISGLKT EDEADYYCQSSDSGN WVFGGGTKLTVL
B2114	Omicron BT	Singlet	VH3-53	JH6	213	EVQLVESGGGLVQPGGS LRLSCAASGFIVSDSYMT WVRQAPGKGLEWVSLIH SGGSTYYADSVKGRFTIT RHYSTNNLYLQMNSLRVE	VK1-5	JK2	214	DIQMTQSPSTLSASVG DRVTITCRASQSISSWL AWYQQKPGKAPKLLIS EASILEGGVPSRFRGS GSGTEFTLTINSLQPDD

						DTAVYYCARDTAASSGYY YNALDVWGQGTTVTVSS				FAIYYCQQYRSYSYTFG QGTKLEIK
B2115	Omicron BT	Singlet	VH1-24	JH1	215	QVQLVQSGTEVKKPGAS VKVSCKVSGYTLTELSIH WVRQAPGKGLEWMGGF DPEDGETIFAQKFQGRVT MTEDTSTDTAYMDLSSLR SEDTAIYYCATNLRGHLLE PAAKGNSRAEYFQHWGQ GTLVTVSS	VK3-20	JK1	216	EIVLTQSPGTLSLSPGE RAALSCRASQSVTRSY LAWYQQKPGQAPRLLI FDASSRATGIPDRFSGS ASGTDFTLTISRLEPED FAVYYCQLYGTSSTFG QGTKVEIK
B2116	Omicron BT	Singlet	VH1-69	JH6	217	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSNYGIS WVRQAPGQGLEWIGGIV PIFVSAKYAQKFQGRVTIT ADRLTTTAYMELSSLRSD DTAVYYCARATDETILHKI DCGGDCHFYYAMDVWG QGTTVTVSS	VK3-20	JK1	218	EIVLTQSPGTLSLSPGE RATLSCRASQSVSHTY LAWYQQKPGQAPGLLI YGASSRATGIPDRFSG SGSGADFTLTISRLEPE DFAVYYCQLYGSSPVT FGQGTKVEIK
B2117	Omicron BT	Singlet	VH1-18	JH3	219	QVQLVQSGADVRQPGAS VKVSCKASGYIFPNYGIS WVRQAPGQGLEWMGWI SAHDDQTNYAQRLQGRIT MTTDPSTSTAYMELRGLR SDDTAMYYCAREGAGAF FAWSSTWHGERAAFDIW GQGTMVTVSS	VK3-20	JK1	220	EIVLTQSPGTLSLSPGE RAALSCRASQSVTRSY LAWYQQKPGQAPRLLI FDASSRATGIPDRFSGS ASGTDFTLTISRLEPED FAVYYCQLYGTSSTFG QGTKVEIK
B2118	Omicron BT	Singlet	VH1-3	JH4	221	QVQLVQSGAEVKKPGAS VKVSCKASGYTFTNYAIH WVRQAPGQRLEWMGWI NAGNGNTKYSQKFQGRV TITRDTSASTAYMELSSLR SEDTALYHCARDALYCSG GNCLKPDYVDFYFDFWG QGTLVTVSS	VK1-5	JK1	222	DIQMTQSPSTLSASVG DRVTITCRASQSISTWL AWYQQKPGKAPKLLIY KASSLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNSYCTFG QGTKVEIK
B2119	Omicron BT	Singlet	VH3-30	JH4	223	VQLVESGGGVVQPGRSL RLSCAASGFTFRNYGMH	VK1-33	JK4	224	IRMTQSPSSLSASVGD RVTITCQASQDIRNYVN

						WVRQAPGKGLEWVAMIS YDGDNKYYVDSAKGRFTI SRDNSKNTLYLQMSSLRA DDTAVYYCAKGVGPYCS GGSCYPGALDYWGQGTL VTVSS				WYQQHPGKAPKLLIYD ASNLEAGVPSRFSGSG SGTDFTFTISGLQPEDF ATYYCQQYDNYPPFTF GGGTKVEIK
B2120	Omicron BT	Singlet	VH4-39	JH4	225	QLQLQESGPGLVKPSETL SLTCTVSGGSVSSYLYYW GWIRQPPGKGLEWIGTIF YSGTTYYNVSLKRRGTISI DTSKNQFSLRLSSVTAAD TAVYYCARLGGSIGPHLA AAGTPDYWGQGTLVTVS S	VK1-33	JK4	226	IRMTQSPSSLSASVGD RVTITCQASQDISNYLN WYQQKPGKAPKLLIYD ASNLETGVPSRFSGSG SGTDFTFTISSLQREDV ATYYCQQYDNLPLTFG GGTKVEIK
B2121	Omicron BT	Singlet	VH4-39	JH2	227	QLQLQESGPGLVKPSETL SLTCSLSGGSISSSSYYW GWIRQPPGKGLEWIGGIY YSANTLYNPSLKSRVSISV DTSKNQFSLKVRSVTAAD TAVYYCARFHCTTNRCY GDDWYFDLWGRGTLVTV SS	VL3-25	JL3	228	SYELTQPPLVSVSPGQ TARITCSGDAFPNQYAY WYQQKSGQAPVLVIYK DSERPSGIPERFSGSS SGATVTLTISGVQAEDE ADYYCQTADSRGTLFG GGTKLTVL
B2122	Omicron BT	Singlet	VH3-30	JH4	229	VQLVESGGGVVQPGRSL RLSCAASGFTFSDYGMH WVRQAPGKGLEWLAVIS SDGSLKYFDDSVKGRFTI SRDNSKNTLYLQMNSLRV EDTAVYYCAKDRDLESFL LLDYWGQGTLVTVSS	VK1-39	JK5	230	DIQLTQSPSSLSASVGD RVTITCRASQSIATYLN WYQQKPGKAPKLLIYA ASSLQSGVPSRFSGSG SGRDFTLTISGLQREDF ATYYCQQSYSTPPITFG QGTRLEIK
B2123	Omicron BT	Singlet	VH1-58	JH3	231	QLVQSGPEIKKPGTSVKV SCKASGFTFSNSAVQWV RQARGQHLEWIGWIVVG SGDPNYAQKFQERVTLT RDMSTGTAYMELSSLRS EDTAFYYCATNNCSRTIC SDGFDIWGQGTMVTVSS	VK1-39	JK1	232	DIQLTQSPSSLSASVGD RVTITCRASQSIRSYLN WYQQKPGKAPKLLIYV ASSLQTGVPSRFSGSG SGTEFTLTISSLQPEDF ATYYCQQSYSTPPWTF GQGTKVEIK

	B2124	Omicron BT	Singlet	VH5-51	JH5	233	EVQLVQSGAVVKKPGESLKISCQGSGYSFPYYWIGWVRQMPGKGLEYMGVVYPSDSDTKYSPSFQGQVTISADKSISTAYLQWNGLKASDTAMYYCARIDPHDCSGGACFPAGFDPWGQGTLVTVSS	VK1-33	JK3	234	DIQMTQSPSSLSASVGDRVTITCQASQDIGNYLNWYQQKPGKAPKLLIYDASNLETGVPSRFSGSGSGTDFTFTISSLQPEDIATYYCQQYDNLLLTFGPGTKVDIK
	B2125	Omicron BT	Singlet	VH1-58	JH3	235	QLVQSGPEIKKPGTSVKVSCKASGFTFSNSAVQWVRQARGQHLEWIGWIVVGSGDPNYAQKFQERVTLTRDMSTGTAYMELSSLRSEDTAFYYCATNNCSRTICSDGFDIWGQGTMVTVSS	VK3-20	JK2	236	EIVLTQSPGTLSLSPGERATLSCRASQSVSSSYLAWHQQKPGQAPRLLIYGASSRATGIPDRFSGSGSGTDFTLTISRLEPEDFAVYYCQQYGSSRVTFGPGTKLEIK
	B2126	Omicron BT	Singlet	VH4-31	JH3	237	QVQLQESGPGLVKPSQTLSLTCTVSGASISNGGYYWSWIRQHRGQGLEWIGYIYYSGDTYYNPSLKSRLIMSVDTSKNQFSLELSSVTAADTALYYCARIRTPLTRDTEGEHAFDMWGQGTMVTVSS	VK1-39	JK5	238	DIQLTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLESGVPSRFSGSGSGTEFTLTISSLQREDFATYYCQQSHSILFTFGQGTRLEIK
C018	B2015	Vax3	Clone	VH1-69	JH6	239	QVQLVQSGAEVKKPGSSVKVSCKASGGTLSSTAISWVRQAPGQGPEWMGRIIPIFGTTDYAPNFQGRVTITADESTSTVYMELSSLRFQDTALYYCARDHETAPLYGMDVWGQGTTVTVSS	VK1-39	JK5	240	DIQLTQSPSSLSASVGDRVTITCRASQSISRFLNWYQQKPGKAPELLIYATSTLQDGVPPRFSGSGSGTDFTLTISSLQPEDFATYYCQQSYSIPPITFGQGTRLEIK
	B2016	Vax3	Clone	VH3-30	JH6	241	VQLVESGGGVVQPGRSLRLSCAASGFTFSNYAMHWVRQTPGKGLEWVAVISYDGSKKYYGDSVKGRFTISRDNSKNTLYLEMNSLRAEDTAVYYCAKAEGPYGS	VK1-39	JK4	242	DIQLTQSPSSLSASVGDRVTITCRASQSISTYLHWYQQKPGKAPNLLIYAASSLQSGVPSRFRGSGSGADFTLTISSLQPEDF

						GTSHYYYGMDVWGQGN TVTVSS				ATYYCQQSYSTPLTFG GGTKVEIK
B2017	Vax3	Clone	VH1-69	JH4	243	QVQLVQSGAEVKKPGSS VKVSCKASGGIFSSYAIS WVRQAPGQGLEWMGGII PIFGTTTYAQKFQGRVTIT ADESTTTAYMELSSLRSE DTAVYYCASGPPTYNDF WSGYSFDYWGQGTLVTV SS	VK3-20	JK3	244	EIVLTQSPGTLSLSPGE RATLSCRASQSVNSDF LAWYQQIPGQAPRLLIY GASNRATGIPEKFSGS GSGTDFTLTISRLEPED FAVYYCQQYGNSPFTF GPGTKVDIK
B2018	Vax3	Clone	VH1-69	JH4	245	QVQLVQSGAEVKKPGSS VKVSCKTSGGTFSSYAIS WVRQAPGQGLEWMGGII PRFGIPNYVQKFQGRVTI TADKSTSTAYMELASLRS EDTAVYYCARVGDRSTV PYFDYWGQGILVTVSS	VK3-15	JK5	246	EIVMTQSPATLSVSPGE RATLSCRASQSVSSDL AWYQQKPGQAPRLLIS GASTRATGIPARFSGS GSGTEFTLTISSLQSED FAVYYCQQYNNWPITF GQGTRLEIK
B2019	Vax3	Singlet	VH3-9	JH3	247	EVQLVESGGGLVQPGRS LRLSCAASGFNIADYGMH WVRQAPGKGLEWVAGIS WNSGRIGYADSVKGRFTI SRDNAKKSLSLQMNSLRA EDTALYYCAKTYCGGDC YSLLLYDPLDIWGQGTMV TVSS	VK1-27	JK3	248	DIQLTQSPSSLSASVGD RVTITCRASQDISNDLA WYQQKPGKVPKLLIYG ASTLQSGVPSRFSGSG SGTDFTLTISSLQPEDV ATYYCQQYNSGGTFGP GTKVDIK
B2020	Vax3	Singlet	VH3-30	JH6	249	VQLVESGGGVVQPGTSV RLSCAASRFTFSSYGMH WVRQAPGKGLEWVAGIS FHGSNKYYADSVKGRFNI SRDNSKNTLSLQMNSLRT EDTAVYYCAKDRGGGILR FLEWLSDYDCGLDVWGQ GTTVTVSS	VK1-39	JK5	250	DIQMTQSPSSLSASVG DRVTITCRASQNINRYL NWYQQKPGEAPKLLIY AASSLQSGVPSRFSGS GSGTDFALTISSLQPED FANYYCQQTYRTPPST FGQGTRLEIK
B2021	Vax3	Clone	VH4-31	JH5	251	QVQLQESGPGLVKPSQT LSLTCTVSGGSISSYGYY WSWIRQHPEKGLEWIGHI	VK1-33	JK2	252	IRMTQSPSSLSASVGD RVSITCQASQDISNFLN WYQQKPGQAPKLLIYD

						YYSGSTYYNPSLKSRVTI SVDTSKNQFSLKLSSLTA ADTAVYYCARDPLAGRG QFDRWGQGTLVTVSS				ASSLETGVPSRFSGSG SGTHFTFTISSLQPEDIA TYYCQQFDDVPPSFGQ GTKLEIK
B2023	Vax3	Singlet	VH3-43	JH4	253	EVQLVESGGVVQPGGS LRLSCAASGFTFDDYTMH WVRQAPGKGLEWVSLIF WDGGSPYYADSVKGRFT ISRDNSKNSLYLQMNSLRI EDTALYYCAKAAMGYCS GGDCYSYYFDYWGQGTL VTVSS	VK1-5	JK1	254	DIQMTQSPSTLSASVG DRVTITCRASQSISGWL AWYQQKPGKAPKLLIY KASSLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNSYSTFG QGTKVEIK
B2024	Vax3	Clone	VH1-58	JH3	255	QLVQSGPEVKKPGTSVK VSCKASGFTFTTSAVQW VRQARGQRLEWIGWIAV GSGKTEYAQKFQERVAL SRDTSANTAYMDLRSLTS EDTAVYYCAAPDCNRTTC LDGFDIWGQGTMVTVSS	VK3-20	JK2	256	EIVLTQSPGTLSLSPGE RTTLSCRASQSVSRNY LAWYLQKPGQAPRLLIY AASSRATGIPDRFSGS GSGTDFTLAISRLEPED FAVYYCQQYGTSPWTF GQGTKLEIK
B2025	Vax3	Singlet	VH3-53	JH4	257	EVQLVETGGGLIQPGGSL RLSCAASEILVSRNYMSW VRQAPGKGLEWVSVLFP GGSTNYADPVKGRFTISR DNSKNTLYLQMNSLRAED TAVYYCARGLFGEWGYF DCWGQGTLVTVSS	VK1-27	JK1	258	DIQLTQSPSSLSASVGD RVTITCRASQGISNYLA WYQQKPGKAPKLLISA ASTVESGVSSRFSGSG SGTDFTLTISSLQSEDV ATYYCQKYNSAPGTFG QGTKVEIK
B2026	Vax3	Clone	VH3-9	JH6	259	EVQLVESGGGLVQPGRS LRLSCAASGFSFEDYAMH WVRQAPGKGLEWVSGIS GNSGTLGYADSVKGRFII SRDNAKNSLYLQMRSLR VEDTALYYCAKDMAGVVI LGVEEKYGMDVWGQGTT VTVSS	VL3-21	JL2	260	SYELTQPPSVSVAPGK TAKITCGGDNIGSKSVH WYKQKPGQAPLLVIYY DNDRPSQIPERFSGSN SGNMATLTINRVEAGD EADYYCQVWNSGSDH VVFGGGTKLTVL
B2027	Vax3	Singlet	VH3-30	JH4	261	VQLVESGGVVQPGRSL RLSCAVSGFAFRKYGIHW	VK1-13	JK4	262	AIRMTQSPSSLSASVG DRVTITCRASQGISSAL

					VRQAPGKGLEWVAViSYD GGNIDYADSVKGRFTISR DNSKDTVYLEMNNLRAE DTAVYYCAKQTGTYCSG GNCYSGYFDYWGQGTLV TVSS	263				VWYQQKPGKAPKLLIY DASSLESGVPSRFSGS GSGADFTLTISSLQPED FATYYCQQFYDSPPLT FGGGTKVEIK
B2028	Vax3	Singlet	VH3-30	JH4	VQLVESGGGVVQPGRSL RLSCAASGFTISTYGMHW VRQAPGKGLEWVAViSYD GSNIYYADSVKGRFTISR DNSNNTLYLQMNSLRAE DTAVYYCAKQNAPYCSG GSCYEGYFDYWGQGALV TVSS	265	VK3-20	JK4	264	EIVLTQSPGTLSLSPGE RATLSCRASQSVTSSY LAWYQQKPGQAPRLLI SGASSRATGIPDRFSG SGSGTDFTLTISRLEPE DFAVYYCQQYGSSLLT FGGGTKVEIK
B2029	Vax3	Singlet	VH1-69	JH4	QVQLVQSGAEVKKPGSS VKVSCKASGGTFRIYAIN WVRQAPGQGLEWMGGII PMVGKANYAQKFRGRVTI TADESTSTAYMELSSLRS EDTAVYYCARDFRECTST SCLYFFDYWGQGTLVTV SS	266	VK1-39	JK1	266	DIQLTQSPSSLSASVRD RVTLTCRASQNITTYLN WYQQKPGKAPKLLIYA ASSLQSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYYCQQSFSGPRTFG LGTKVEIK
B2030	Vax3	Clone	VH1-69	JH4	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSTYAII WVRQAPGQGLEWMGGII PVFDAANSAQKFQGRVTI TADKSTSTAYMELSSLRS EDTAVYYCARVKRLWHE SVARYYFDYWDQGTLVT VSS	267	VK1-33	JK4	268	IRMTQSPSSLSASVGD RVTITCQASQDISNYLN WYQQKPGKAPKLLIYD ASNLETGVPSRFSGSG SGTDFTFTISSLQPEDIA TYYCQQYENLPVLSFG GGTKVEIK
B2031	Vax3	Singlet	VH3-9	JH4	EVQLVESGGGLVQPGRS LRLSCAASGFIFEDYAMH WVRQAPGKGLEWVSGV SYNSGTIGYADSVKGRFI SRDNAKNSLYLQMRSLR PEDTAFYYCAKAKEPKDA	269	VL1-47	JL2	270	QSVLTQPPSASGTPGQ RVTVSCSGSSSNIGSN YVSWYQQLPGTAPKLL VYRSNQRPSGVPDRFS GSKSGTSASLAISGLRS

						YSDGDEYCFDSWGQGIL VTVSS				EDEADYYCAAWDDSLS GVLFGGGTKLTVL
B2032	Vax3	Singlet	VH4-39	JH5	271	QLQLQESGPGLAKPSETL SLTCSVSGGSISSVNYYW GWIRQPPGKGLEWIVSVY YGGNTHYNPSLKSRVTIS VDTSKNQMSLKLNSVTAA DTAVYYCARHEYYYDRR GSPRLGWFDPWGQGTLV TVSS	VK1-33	JK4	272	IRMTQSPSSLSASVGD RVTITCQASQDINTYLN WYQQKPGKAPKLLIYD VFNLETGVPSRFSGSG SGTEFTLTISSLQPEDIG TYYCQQYNNFALTFGG GTKVEIK
B2033	Vax3	Singlet	VH3-30	JH4	273	VQLVESGGGVVQPGRSL RLSCAASGFTFSIYGMHW VRQAPGEGLEWVALISYD ESNKYYADSVKGRFTISR DNSKNTLYLQMDSLRAED TAVYYCVKQLGTYCSGG SCYSGFFDYWGQGTLVT VSS	VK1-33	JK3	274	IRMTQSPSSLSASVGG RVTITCQASQDITNYLN WYQQKPGKAPKLLIYD ASNLEAGVPSRFSGSG SGTHFTFTINSLQPEDIA TYYCQQYDNLPFTFGP GTKVDIK
B2141	Vax3	Singlet	VH1-69	JH1	275	QVQLVQSGAEVKKPGSS VRVSCKASGGTLINYAVS WVRQAPGQGLEFMGGLI PILGTSYYAQKFQGRVTII ADESRRTVYMELSNLKSE DTAVYYCATGVRNCPGG GCYSAYFQHWGQGTLVT VSS	VK3-20	JK2	276	EIVLTQSPGTLSLSPGE RATLSCRASQSVSRSH LAWYQQKPGQAPRLLI FGASSRATGIPDRFNG SGSGTDFTLTIRSLDRE DFAVYYCHHYGDSTGT FGQGTKLEIK
B2143	Vax3	Singlet	VH4-59	JH4	277	QVQLQESGPGLVKPSETL SLDCTVSGASINYYYWTW IRQPPGKGLEWIGYVFYS GSTNYNPSLKSRVTISVD SSANQFSLRLSSVTAADT AVYYCARGGMEYDGLLT GYYLDSWGQGTLVTVSS	VK1-33	JK4	278	IRMTQSPSSLSASVGD RVTITCRASQDISNFLN WYQQKPGKAPKLLIYR ASSLETGVPSRFSGSG SGTHFTFTISSLQPEDIA TYYCQQYDNVLLTFGG GTKVDIK
B2144	Vax3	Singlet	VH4-31	JH4	279	QVQLQESGPGLVKPSQT MSLTCTVSGVDITSGGHF WSWIRHHPGKGLEWIGHI	VK1-33	JK5	280	IRMTQSPSSLSASVGD RVTITCQASQDISNHLN WYQQRPGKAPKLLIYD

						FYSGSTNYNPSLKSRVM MSVDTSKNQFSLKLTSVT AGDTAVYYCVRGGSGSY YMADYWGQGTLVTVSS				ASNLEAGVPSRFSGSG SGTDFTFTIQSLQPEDI ATYYCQSYDNLPRPFF GQGTRLEIK
B2034	Omicron BT	Clone	VH1-69	JH4	281	QVQLVQSGPEVKKPGSS VKVSCKAPGGTASTYAII WVRQAPGQGLEWMGGII PLFGATRYTQRFQGRVTI TADKSTTTAYMELSSLTS EDTAVYYCARVKRLWHE SVARYYFDYWGQGTLVT VSS	VK1-33	JK4	282	DIQMTQSPSSLSASVG DRVTITCQASQDISNYL NWYQQKPGKAPKLLIY DASNVETGVPSRFSGS GSGTDFTFTISSLQPED IATYYCQQFDNLPVVTF GGGTKVEIK
B2035	Omicron BT	Singlet	VH1-69	JH4	283	QVQLVQSGAEVKKPGSS VKVSCKASGGALSTYGIS WVRQAPGKGLEWVGGIV PVLKRTNYAQKFQGRVTI TADESTNTAYMELRSLRS EDTALYYCARCLNMGFC SGGSCFDYCDYWGQGTL VTVSS	VL2-14	JL2	284	QSVLTQPASVSGSPGQ SITISCTGTSSDVGGYN YVSWYQQHPGKAPKLII FDVTDRPSGVSNRFSG SKSGNTASLTISGLQAE DEADYYCSSYTSSYTL VVFGGGTHLTVL
B2036	Omicron BT	Singlet	VH1-18	JH4	285	QVQLVQSGAEVKKPGAS VKVSCKVSGYTFINYGIS WVRQAPGQGLEWMGWI SAYDGYTNYAQKFQGRV TMTTDTSTSTAYMDLRSL RSDDTAIYYCARDPGATD YYESTAFELDYWGQGSL VTVSS	VL3-27	JL3	286	SYELTQPSSVSVSPGQ TARITCSGDLLAKKYAR WFQQKPGQAPVLVIYR DKERPSEIPERFSGSSS GTTVTLTISGAQVDDEA DYYCYCAAAENNKVFG GGTKLTVL
B2037	Omicron BT	Singlet	VH1-69	JH6	287	QVQLVQSGDEVKKPGSS VKVSCKTSGGTLTSYAIS WVRQAPGQGLEWMGGII PISGTPSYGEKFQGRVTIT ADKSTSTASMELTSLRYE DTAMYYCARETPAAVRFS ERHPQGLGLYAMDVWG QGTTVTVSS	VL3-21	JL3	288	SYELTQPPSVSVAPGQ TARISCGGDNIGSKNVH WYQQKPGQAPILVVFD DSDRPSGIPERFSGSN SGNTATLTISRVEAGDE ADYSCQVWDSISARPS WVFGGGTKLTVL

B2038	Omicron BT	Clone	VH1-46	JH6	289	QVQLVQSGSEVKKPGAS VKVSCKASGYTFTSYTIH WVRQAPGQGLEWMGVIN PSGGSSTYAQRFHARVN MTRDMSTTTVYMDLNSL RSEDTAVYFCARVCSTVN CPPRATDGLDVWGQGTT VTVSS	VK1-39	JK5	290	DIQMTQSPSSLSASVG DRVTITCRASQSINFFL NWYQQKPGKAPKLLIY AASSLDRGVPSRFGGS GSGTDFTLTINSLQPED FATYYCQQSYTPSITFG QGTRLEIK
B2039	Omicron BT	Singlet	VH3-53	JH3	291	EVQLVESGGGLIQPGGSL RLSCAASGFTVSSNYMS WVRQAPGKGLEWVSLIY PGGSTFYADSMKGRFTIS RDNSKNTLYLQMNSLRAE DTAVYYCARVVGPTGTD AFDVWGQGTMVTVSS	VK1-33	JK3	292	DIQMTQSPSSLSASVG DRVTITCQASQDISNSL NWYQQKPGKAPKLLIY DASNLQTGVPSRFSGS GSGTDFTFTISSLQPED IATYYCQQFDNLPSFTF GPGTKVDIK
B2041	Omicron BT	Singlet	VH3-53	JH4	293	EVQLVESGGNLIQPGGSL RLSCAASGFIVSNSYMSW VRQAPGKGLEWVSVIYS GDSTFYADSVKGRFTISR DNSRNTMYLQMNSLRAE DTAVYYCARLGGIQLHDG GFDYWGQGTLVTVSS	VL2-8	JL3	294	QSALTQPPSASGSPGQ SVTISCTGTSSDVGGY NYVSWYQQHPGKAPK FLIYEVSKRPSGVPGRF SGSKSGNTASLTVSGL QAEDEAYYHCSSYAGS HLWVFGGGTKLTVL
B2042	Omicron BT	Singlet	VH3-13	JH2	295	EVQLVESGGGLVQPGGS LRLSCAASGFTFSDYDMH WVRQSTEKRLEWVSTIGT SGDTYYPDSVKGRFTISR ENAKNSLYLQMNSLSAG DTAVYYCARGGNHDSWS AYYSRLPTWYFDLWGHG TLVTVSS	VK1-39	JK5	296	DIQLTQSPSSLSASVGD RVTITCRASQTIRNNLI WYQQKPGKAPKLLIYD ASILQSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYYCQQSYTMPPITF GQGTRLEIK
B2043	Omicron BT	Clone	VH1-69	JH6	297	QVQLVQSGAEVKKPGSS VKVSCKASGGTLSSTAIS WVRQAPGQGPEWMGRII PIFGTTDYAPNFQGRVSIT ADESTTTVYMELSSLTFQ	VK1-39	JK5	298	DIQMTQSPSSLSASVG DRVTITCRASQSISRFL NWYQQKPGKAPELLIY GTSTLQDGVPPRFSGS GSGTDFTLTISSLQPED

						DSALYYCARDHEVAPLYG MDVWGQGTTVTVSS				FATYYCQQSYSIPPITF GQGTRLDIK
B2044	Omicron BT	Clone	VH1-58	JH3	299	QLVQSGPEVKKPGTSVK VSCRSSGFTFFSISAVQW VRQARGQRLEWIGWIVIG SGNTDYAQNFQGRVSLT GDLSTSTAYMELSSLRSD DTAVYYCAAPDCSRTTCL DGFDIWGQGTMVTVSS	VK3-20	JK2	300	EIVLTQSPGTLSLSPGE RATLSCRASQSVSRSY LAWYKQKPGQAPRLLI YAASSRATGIPDRFSGS GSGTDFTLTIRRLEPED FAVYYCQQYGSSPWTF GQGTKVEIK
B2045	Omicron BT	Singlet	VH3-53	JH4	301	EVQLVESGGGLIRPGGSL RLSCAASGFSVSNNYMS WVRQAPGKGLEWVSVIY SGGTTYYADSVKGRFNIS RDNSKNTVYLQMNSLRA EDTAVYYCAREGDVEGY YDFWSGYSRDRYYFDYW GQGALVTVSS	VK1-39	JK1	302	DIQLTQSPSSLSASVGD RVTITCRASQSVGRHLS WYQQKSGKAPKLLIYD ASTLQSGVPSRFSGSG SGTDFSLTISNLRPEDF ATYYCQQSYETPPWTF GQGTKVEIK
B2046	Omicron BT	Singlet	VH1-69	JH4	303	QVQLVQSGAEVKKPGSS VKVSCKASGGAFSIYAIS WVRQAPGQGLEWVGEII PMSGTPKSAPKFQGRVTI TADESTTTAYMELSSLRS EDTAFYYCARHFRDCRET SCLYYFDSWGQGTLVTV SS	VK1-39	JK1	304	DIQLTQSPSSLSASVGD RVTITCRATHNIVNYLN WYQQKVGNAPKLLIYA ASTLQSGVPSRFSGSG SGTEFTLTISSLQPEDF ATYYCQQSHSAPRTFG QGTKVEIK
B2047	Omicron BT	Clone	VH1-69	JH4	305	QVQLVQSGTEVKKPGSS VKVSCKTSGGIFSSYGSY GISWVRQAPGQGLEWM GGIIPIFGSTTFAQQFQGR VTITADESTTTVYMELSSL RSDDTAFYYCASGPSTYH DFWSGYSFDYWGQGTLV TVSS	VK3-20	JK3	306	EIVLTQSPGTLSLSPGE RATLSCRASQSVSSTH LAWYQQRPGQAPRLLI HGASTRATGISERFSG SGSGTDFTLTISRLEPE DFAVYYCQQYGNSPFT FGPGTKVDIK
B2048	Omicron BT	Clone	VH1-18	JH4	307	QVQLVQSGAEVRKPGAS VKVSCKTYGYTFTSYGFS WVRQAPGQGLEWMGWI	VL6-57	JL3	308	NFMLTQPHSVSESPGK TVTVSCTRSSGSIASNY VLWYQQRPGSAPTTVI

						SVYNGNTIYAQKFQGRVT MTTDTSKSTSYMELKSLR SDDTAIYYCTRVLGIYFGA DYWGQGTLVTVSS				FEDDQRPSGVPGRFSG SIDSSSNSASLTISGLKT EDEADYYCQSYDGTNR SWVFGGGTKLTVL
B2049	Omicron BT	Singlet	VH1-18	JH4	309	QVQLVQSRPEAKKPGAS VRVSCQASGYTFTTYGIH WVRQAPGQGLEWLGRV SSSNGNPIYAPRFRGRLT MTTDASTSTASMELRSLR SDDTAVYYCARDPTVVAP RDFFDYWGQGTLVTVSS	VL3-21	JL1	310	SYELTQPPSVSVAPGQ TARITCGGDNIGSKNVH WYQQKPGQAPVLVVFE DSDRPSRIPDRFSGSN SGNTATLTISRVEAGDE ADYYCQVWDSSSDPY VFGSGTRVTVL
B2050	Omicron BT	Clone	VH4-59	JH3	311	QVQLQESGPGLVKPSETL SLTCTVSGGSISTYYWSW LRQPPGKGLEWIGYIFNS GGTNYHPSLRSRVTMSV DTSNNQFSLTLRSVTAAD TAVYYCARDLGYDTSGP DAFQIWGQGTMVTVSS	VK3-11	JK1	312	EIVLTQSPATLSLSPGE RATLSCRASQSVYTYL AWYQHKPGQAPRLLIY DASTRATGIPARFSGS GSGTDFTLTISSLEPAD FAVYYCQQRSNWPGT FGQGTKVEIK
B2051	Omicron BT	Clone	VH3-9	JH6	313	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYTMH WVRQAPGKGLEWVSGIT SNGGIIGFADSVKGRFIIS RDNAKNSLYLQMNSLRA EDTAFYYCAKDMAGVVLL GVEENYGMDVWGQGTT VTVSS	VL3-21	JL3	314	SYELTQPPSVSGAPGK TARITCGGNNIGSKSVR WYQQKPGQAPVLVIYY DSDRPSGIPERFSGSN SGNTATLTIGRVEAGDE ADYYCQVWDSSSDHV VFGGGTKLTVL
B2127	Omicron BT	Singlet	VH3-13	JH4	315	EVQLVESGGGLVRPGGS LRLSCVASGFSFSSYDMH WVRQSAEKGLEWVSTIG TSGDTYYADSVKGRFTIS RQNDKNSLYLQMNGLTA GDTAVYYCTRGSPAVTTV FDYWGQGTLVTVSS	VK1-39	JK3	316	DIQMTQSPVSLSASIGD RVTITCRASQSVSRYLN WYQVKPGKAPKLLIYG ASNLQSGVSSRFSGSG SGTDFTLTISTLQPEDF ATYYCQQSYVNPGVTF GPGTKLDIK
B2128	Omicron BT	Singlet	VH3-15	JH6	317	EVQLVESGGGLAKPGGS LRLSCAASGFTFRNAWM SWVRQAPGKGLEWVGR	VK2-28	JK1	318	DIVMTQSPLSLPVTPGE PASISCRSSQSLLASNG YNYLDWYLQKPGQSP

						MKTKTHGGTTDYAAPVK GRFTISRDDSQNTLYLQIN SLKTEDTAVYFCTATLKS SWVQEWSRDHYFGMDL WGRGTTVTVSS				QLLIYFGFNRASGVPGR FSGSGSGTDFTLKISRV EAEDVGVYYCMQALQT PWTFGQGTQVEIK
B2129	Omicron BT	Singlet	VH3-13	JH4	319	EVQLVESGGGLVQPGGS LRLSCAASGFTFSSDDMH WVRQVKGEGLEWVSGIG TSGDTYYRGAVKGRFTIS REDAKNSVYLQMNSLRA GDTAVYYCARGGWDGR NYYFDYWGQGVLVTVSS	VK1-39	JK1	320	DIQLTQSPSSLSASVGD RVTITCRASQIINKFLNW YQQRPGKAPKLLIYGAS TLHSGVPSRFSGSGSG TDFTLTISSLQPEDFAT YYCQQSYSSPPWTFGP GTKVEIK
B2130	Omicron BT	Singlet	VH1-2	JH5	321	QVQLVQSGAEVKKPGAS VKVSCKASGYNFPAYYIH WVRQAPGQGLEWMGWI NPNSGDTNSAQRFQGRV SLTRNTSITTAYMELTGLR SYDTAVYFCVRDRRTAPT PTRAWFDVWGQGTLVTV SS	VL7-46	JL1	322	QAVVTQEPSLTVSPGG TVTLTCGSSTGAVTSG HYPYWIQQKPGQAPRT LIYDTGNKHSWTPARF SGSLLGGKAALTLSGA QPEDEAEYYCLLSYSG VLYVFGTGTKVTVL
B2131	Omicron BT	Singlet	VH3-53	JH4	323	EVQLVETGGGLIQPGGSL RLSCAVSEFIVSSNYMSW LRQAPGKGLEWVSVIYSG GSTFYADSVKGRFIISRDN SKNTLYLQMNSLRPEDTA IYYCARDWGEFYFDHWG QGTLVTVSS	VK3-20	JK2	324	EIVLTQSPGTLSLSPGE RATLSCRASESVGGSY LAWYQQKPGQAPRLLI YDASNRATGIPDRFSG SGSGTDFSLTISRLEPV DFAIYYCQQYHSSPRTF GQGTKLEIK
B2132	Omicron BT	Singlet	VH3-7	JH6	325	EVQLVESGGGLVQPGGS LRLSCAASGFTFSSYWM SWVRQAPGKGLEWVANI KQDGSEKYYVDSVKGRF TISRDNAKNSLYLQMNSL RAEDTAVYYCARDAADLA GTGTPLYYYYGMDVWGQ GTTVTVSS	VK1-39	JK1	326	DIQMTQSPSSLSASVG DRVTITCRASQSISSYL NWYQQKPGKAPKLLIY AASSLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSYSTVWTF GQGTKVEIK

B2133	Omicron BT	Singlet	VH1-69	JH6	327	QVQLVQSGAEVQKPGSSVKVSCKTSGGTFGSYGISWVRQASGQGLEWMGGIIPVFGAVNYAQKFQGRVTITADKSTSTVYMELSSLRFEDTAVYYCGRAVGHEWELLSFGRDAYGMNVWGQGTTVTVSS	VK3-11	JK4	328	EIVLTQSPATLSLSPGERATLSCRASQSVSRYLAWYQQKPGQAPRLLIYGASERATGIPARFSGSGSGTDFTLTISSLEPEDFAVYYCQQRSIRPSFGGGTKVEIK
B2134	Omicron BT	Singlet	VH1-58	JH6	329	QLVQSGPEVKKPGTSVKVSCKVPRHTFSSSAVHWVRQARGQRLEWIGWIVVGRGTTNYAQKFQERVTITRDMSASTVNMELSSLTSEDTAVYFCAAGDGDYGHYGMDVWGQGTTVTVSS	VL1-40	JL7	330	QSVLTQPPSVSGAPGQRVTISCTGSNSNIGAGYDVHWYQQLPGTAPKLLIHGNSNRPSGVPDRFSGSKSGTSASLAITGLQPEDEADYYCQSYDSSLSGSVFGGGTQLTVL
B2135	Omicron BT	Singlet	VH3-33	JH6	331	QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVIWYDGSNKYYADSVKGRFTISRDNSKNTLYLQMNSLRAEDTAVYYCASNEGGRVAGRGMNYYYYGMDVWGQGTTVTVSS	VL3-21	JL1	332	SYELTQPPSVSVAPGQTARITCGGNNIGSKNVHWYQQKPGQAPVLVVHDDSDRPSGIPERFSGSNSGNTATLTISRVEAGDEAEYYCQVWGSSSDHPYVFGTGTKVTVL
B2136	Omicron BT	Singlet	VH3-30	JH4	333	VQLVESGGGVVQPGRSLRLSCAASGFTFSVYGMHWVRQAPGSGLEWVAVISFDGNKKYYADSVKGRFTISRDNPKNTLYLQMNSLRPNDTAVYYCAKDGMATSDHLDYWGLGALVTVSS	VK1-39	JK1	334	DIQMTQSPSSLSTSVGDRVTITCRASQSITNYLNWYQQKPGKAPKLLIYAASTLRSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQSYSTPGTFGQGTKVEIK
B2137	Omicron BT	Singlet	VH4-31	JH2	335	QVQLQESGPGLVKPSETLSLTCSVSGGSITSGGDYWSWIRQRPGKGLEWIGYIDYSGSTYYNPSITNRVSISLDTSKNEFYLSLTSVTAAD	VL4-69	JL1	336	QSVLTQPPSASARLGASVKLTCTLSSDHNNYAVAWHQQQPGKGPRCLMKVYSNGSHIKGDGFPDRFSGSSSGAERYLTIS

							TAVFYCARGGGGYSYED YWYFGLWGRGTLVTVSS				NLQSEDEADYYCQTW GNVFGAGTKLTVL
	B2138	Omicron BT	Singlet	VH1-69	JH1	337	QVQLVQSGAEVKKPGSS VRVSCKASGGTFINFAVS WVRQAPGEGLEYMGGLI PILRTSHHAQKFQGRLTIT ADESASTAYMELSSLKSE DTAVYYCATGVRYCGGG GCYSAYFQQWGQGTLVT VSS	VK3-20	JK1	338	EIVLTQSPGTLSLSPGE RATFSCRASQSVSSSH LAWYQQKPGQAPRLLI YGTSSRATGIPDRFSG SGSGTDFTLTISRLERE DFAVYYCHHYGSSTGT FGQGTKVEIK
C023	B1001	Omicron BT	Clone	VH1-69	JH4	339	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSNYAIS WVRQAPGQGLEWMGGII PMFAIANYAQKFQGRVTI SADKSTSTAHMELSSLSS EDTAVYYCASLGNGITIVR GAPITDHHFAFWGQGTLV TVSS	VL2-23	JL3	340	QSALTQPASVSGSPGQ SITISCTGTSSDVGNYN LVSWYQHHPGKAPKLM IYEVSKRPSGVSNRFS GSKSGNTASLTISGLQA EDEADYFCCSFAASST GHWVFGGGTKLAV
	B1002	Omicron BT	Clone	VH1-69	JH4	341	QVQLVQSGAEVKKPGSS VKVTCRASGGTFSNLAIS WVRQAPGQGLEWMGSII PMFTISNYAQKLKGRVTIT ADKSTSTAYMELSSLRSG DTAVYFCASLGSNITVVR GAPITDHHFHYWGQGTL VTVSS	VL2-23	JL3	342	QSALTQPASVSGSPGQ SVTISCTGTSSDVGTYN LVSWYQQHPGKAPKL MIYEVSKRPSGVSNRF SGSKSGNTASLTISGLQ AEDEADYYCCSYAASS TTHWVFGGGTKLAV
	B1003	Omicron BT	Clone	VH4-61	JH6	343	QVQLQESGPGLLKPSETL SLTCSVSGGSLSSANFR WNWIRQPPGKGLEWIGN FIYSVSTNYNPSLKSRLTI SMDTSKNQFSLKLTSVTA ADTAVYFCARDTRYYDRS GSVTSDGMDVWGQGTT VTVSS	VK1-5	JK2	344	DIQMTQSPSTLSASVG DRVTITCRASQSISNWL AWYQQKPGQAPRLLIY EASTLERGVPSRFSGS GSGTEFTLTISRLQPDD FATYYCQQCGGDSVTF GQGTKLEIK
	B1004	Omicron BT	Clone	VH4-61	JH6	345	QVQLQESGPGLLKPSETL SLTCTVSGGSVSSANFH	VK1-5	JK2	346	DIQMTQSPSTLSASVG DRVTITCRASQTISNWL

						WSWIRQPPGKGLEWIGN FFYSGSTNYNPSLKSRLTI SVDTSKNQFSLKLTSVTA ADTAVYYCARDTRYYDR SGYVRSDGMDVWGQGT TVTVSS				AWYQQKPGQAPRLLIY EASTLERGVPSRFSGS GSGTEFTLTITGLQPDD FATYYCQQFDGDSVTF GQGTKLEIK
B1005	Omicron BT	Clone	VH1-69	JH4	347	QVQLVQSGAEVKKPGAS VKVSCKASGDTFSNYAIS WVRQAPGQGLEWMGNII PMFDIATYAQKFQGRVTI SADKSTSTAYMELSSLSS EDTAVYFCASLGNGITLV RGVPITDHHFDYWGQGT LVTVSS	VL2-23	JL3	348	QSVLTQPASVSGSPGQ SITISCTGTSSDIGTYNL VSWYQQHPGKAPKLMI YEVSKRPSGVSNRFSG SKSGNTASLTISGLQAE DEADYYCCSYAASTTH WVFGGGTKLAV
B1006	Omicron BT	Clone	VH1-69	JH4	349	QVQLVQSGTEVKKPGAS VKVSCMASGNSFSNYAIS WVRQAPGQGLEWMGNII PMFDIATYAQKFQGRVTI SADKSTSKVFMDLNSLSS EDTGVYFCASLGNGITLV RGAPITDHHFDYWGQGA LVTVSS	VL2-23	JL3	350	QSVLTQPASVSGSPGQ SITISCTGTSSDIGSYNL VSWYQQHPGKAPKLMI YEVSKRPSGMSNRFSG SKSGNTASLTISGLQAE DEADYYCCSYAAGTTH WVFGGGTTLAV
B1007	Omicron BT	Clone	VH1-46	JH6	351	QVQLVQSGAEVRKPGAS VTVSCKASGYTFTNYYIH WARQAPGQGLEWMGMM NPSGGNTNYAQKFQGRV TMTRDTSTSTVYMELSSL RSEDTAVYYCARDRLMG YYDLWNAYGGMDVWGQ GTTVTVSS	VL3-21	JL3	352	SYELTQPPSVSVAPGK TARITCGGNNIGIKSVH WYQQKSGQAPVLVMF SDRDRPSGIPVRFSGS NSGNTATLTISGVEAGD EADYYCQVWDNSSAW VFGGGTKLTVL
B1008	Omicron BT	Clone	VH1-46	JH6	353	QVQLVQSGAEVKKPGAP VKISCKASGYILTNHYIHW VRQAPGQGLEWMGMINP SGGSAHYAQNFQGRVTM TRDTSTSTVSMELSSLKS EDTAVYYCARDRLMGYY	VL3-21	JL3	354	SYELTQPPSVSVAPGK TARISCGGNDIGSKRVH WYQQKPGLAPVLVIYY DGDRPSGIPERFSASN SGFTATLTISRVEAGDE

						ELWNAYGGMDVWGQGT TVTVSS				ADYYCQVWDNTSAWV FGGGSKLTVL
B1009	Omicron BT	Clone	VH4-59	JH3	355	QVQLQESGPGLVKPSETL SLTCTVSGVSVISNYWSW IRQPPGKGLEWIGYIFYSG NTKYNPSLKSRVTISRDM SKNQFSLKLSSVTTADTA VYYCAREGGAYCGGDCL DGFDIWDHGTMVTVSS	VL1-40	JL2	356	QSVXTQPPSVSGAPGQ RVTISCTGSSSNIGAGY DVHWYQQLPGTAPKLL IFSNNNRPSGVPDRFS GSKSGTSASLAITGLQV EDEADYYCQSYDSSLS VLFGGGTKLTVL
B1010	Omicron BT	Clone	VH1-8	JH6	357	QVQLVQSGAEVKKPGAS VKVSCKAAGYTFTSSDIN WVRQATGQGLEWMGW MNPNTGNTDYAQKFQGR VTMTRDTSISTAYMELSS LRSEDTAVYYCASRSLIT MVREGIKYHYYVMDVWG PGTTVTVSS	VK2-28	JK3	358	DIVMTQSPLSLPVTPGE PASISCRSSQSLLHTNG YNYLDWYLQKPGQSPH LLIYLGSNRTSGVPDRF SGSGSGTDFTLKISRVE AQDVGVYYCMQALQTP PTFGPGTKVDIK
B1011	Omicron BT	Clone	VH1-46	JH5	359	QVQLVQSGAEVKKPGAS VKVSCKASGYTFISYYTH WVRQAPGQGLEWMGIIN PSDGYTSYAQKFQGRVT MTRDTSASTVYMELSSLR SEDTAVYYCARDSSIAAR VVAWGQGTLVTVSS	VK1-33	JK2	360	DIQMTQSPSSLSASVG DRVTITCQASQDIYNYL NWYQQKPGKAPKLLIF DAINLETGVPSRFSGSG SGTDFTFTISSLQPEDIA TYYCQQHDNLPYSFGQ GTKLEIK
B1012	Omicron BT	Clone	VH1-46	JH5	361	QVQLVQSGAEVKKPGAS VKVSCKASGYTFISYYTH WVRQAPGQGLEWMGIIN PSDGYTSYAQKFQGRVT MTRDTSASTVYMELSSLR SEDTAVYYCARDSSIAAR VVAWGQGTLVTVSS	VK1-33	JK2	362	DIQMTQSPSSLSASVG DRVTITCQASQDIGNYL NWYQQKPGKAPKLLIF DASNLEAGVPSRFSAS GSGTDFTFAISSLQPED IAAYYCQQHDDLPYSF GQGTTLEIK
B1013	Omicron BT	Clone	VH3-9	JH6	363	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYAIH WVRQPPGKGLEWVSGTS WNSGTIGYADSVKGRFIIS RDNAKNSLYLQMNSLRA	VL2-14	JL2	364	QSALTQPASVSGSPGQ SITISCTGTSSDVGGYN YVSWYQQLPGKAPKLM IYDVSTRPSGVSNRFS GSKSGNTASLTVSGLQ

						EDTALYYCAKDIRRSGYC SGGICYTEYYAMDVWGQ GTTVTVSS				AEDEANYYCTSYTSDSI VVFGGGTKLTVL
B1014	Omicron BT	Clone	VH3-9	JH6	365	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYAIH WVRQPPGKGLEWVSGV SWNSGTIGYADSVKGRFII TRDNAKNSLYLQMNSLRA EDTALYYCAKDIRRSGYC SGGLCNTEYYAMDVWGQ GTTVTVSS	VL2-14	JL2	366	QSALTQPASVSGSPGQ SITVSCTGTTSDVGGYN YVSWYQQHPGKAPEL MIYDVNKRPSGISNRFS GSKSGNTASLTISGLQA EDEADYYCTSYASSSIV VFGGGTKLTVL
B1015	Omicron BT	Clone	VH3-30	JH4	367	QVQLVESGGGVVQPGRS LRLSCTVSGFTFRHYGMH WVRQAPGKGLEWVAVIL YDGSDKQYADSVKGRFTI ARDNSKNTLYLQMNSLRA EDTAVYYCVKRRGSYCG GDCYSGEFDYWGQGTLV TVSS	VK1-33	JK4	368	DIQMTQSPSSLSASVG DRVTITCQASQDISTYL NWFQQKPGKAPNLLIS DASNLETGVPSRFSGS GSGTDFTFTISSLQPED VATYYCQQYHNLPTFA GGTKVELK
B1016	Omicron BT	Clone	VH3-9	JH6	369	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYAMH WVRQAPGKGLEWVSGIS WNSGTIGYVDSVKGRFIIS RDNAKNSLYLQMYSLRTE DTALYYCVKDVYMGKINL YGHEDYGMDVWGQGTT VTVSS	VL1-40	JL2	370	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGASY DVHWYQQLPGTAPKLL IYGKGNRPSGVPDRFS GSKSGTSASLAITGIQA EDEADYYCQSFDSSLS GVVFGGGTKLTVL
B1017	Omicron BT	Clone	VH1-69	JH5	371	QVQLVQSGSEVKKPGSS VKVSCKASGGTFSSYSVT WVRQAPGHGLEWMGGIL PILNLPNYAEKFQGRLTIT ADRSANIAYMELSSLRPD DTAVYYCARDRVNSSGS PYWFDPWGQGTLVTVSS	VL1-40	JL2	372	QSVLTQPSSVSGAPGQ RVTISCTGSNSNIGAGY DVHWYQQVPGIAPKLLI YANNNRPSGVPDRFSG SKSDTSASLAITGLQAE DEADYYCQSYDSSLSG SVFGGGTKLTVL
B1018	Omicron BT	Clone	VH1-2	JH4	373	QVQLVQSGAEVKKPGAS VKVSCKASGYTFNGQYM	VK1-39	JK5	374	DIQMTQSPSSLSASVG DRVTITCRASQSISSYL

						HWVRQAPGQGLEWLGWI DPNSGGTNFAQRFRGRV TMTWDTSISTAYMDLSRL RSDDTAVYYCATDTGTS WSEAEYLDYWGQGTLVT VSS				NWYQQKPGKAPNLLIY TTSSLQSGVPSRFSGS GSGTDFTFTISSLRPED FATYYCQQSYSTPPITF GPGTRLEIK
B1019	Omicron BT	Clone	VH3-20	JH5	375	EVQLVESGGRVVRPGGS LRLSCAASGFTFGDYGM SWVRQVPGKGLEWVSNI NWNGGSITYADSVKGRF TVARDNTKNSLHLQMTSL RVEDTAFYYCARMSCGG DCYSLVGPTGDTWFDPW GQGTLVTVSS	VL6-57	JL3	376	NFMLTQPHSVSESPGK TVTISCTGSSGSIASNY VHWYQQRPGSAPITVIY EDKQRPSGVPDRFSGS VDGSSNSASLTISGLKT EDEADYYCQSYDSSSH WVFGGGTKLTVL
B1021	Omicron BT	Clone	VH5-51	JH2	377	EVQLVQSGAEVKKPGESL KISCKGSGYSFISNWIGW VRQMPGKGLEWMGIIYPS DSDTIYSPSFQGQVTISAD KSISTAYLHWSSLKASDT AIYYCARRESGSYSGYFD LWGRGTLVTVSS	VL1-44	JL3	378	QSVLTQPPSASGTPGQ RVTISCSGSSSNIGGTP VSWYQQLPGTAPKLVI YNNNQRPSGVPARFSG SKSGTSASLAISGLQSE DEADYYCAAWDDSLN GVFGGGTKLTVL
B1022	Omicron BT	Clone	VH3-30	JH6	379	QVQLVESGGGVVQPGRS LRLSCATSGFIFSSYGMH WVRQAPGKGLEWVADIS YHGSNKYYADSVKGRFNI SRDNSNKTLYLQMNSLRP EDTALYFCAKDLGQGILH FVQWSISRHGLDVWGQG TTVTVSS	VL2-8	JL2	380	QSALTQPPSASGSPGQ SVTISCTGTSSDVGGY NYVSWYQQHPGKAPK LLIYEVTKRPSGVPDRF SGSKSGNTASLTISGLQ AEDEADYYCSSCAVSVI FGGGTKLTVL
B1023	Omicron BT	Clone	VH4-34	JH3	381	QVQLQQWGAGLLKPSET LSLTCAVSGGSFSGYYW NWIRQPPGKGLEWIGEIN HSGSTNYNPSLKSRVTIS LDTSKNHFALKLTSVTAA DTAVYYCATAEYNSSWY DAFDLWGQGTMVTVSS	VL1-44	JL3	382	QSVLTQPPSASGTPGQ RVTISCSGSSSNIGSNP VNWYQQVPGRAPKLLI YSRNQRPSGVPDRFSG SWSGTSASLAISGLQS EDEAEYYCAAWGGNV NGWVFGGGTKLTVL

B1024	Omicron BT	Clone	VH1-69	JH4	383	QVQLVQSGAEVKKSGSSVKVSCKASGGIFSRLAISWVRQAPGQGLEWMGGIIPVFATTNYAQKFQGRVTITADESASTVYMELSSLRSEDTAVYFCARALYYYDRSGRTRMEDYFDYWGQGTLVTVSS	VL1-40	JL1	384	QSVLTQPPSVSGAPGQRVTISCTGSSSNIGAPSDVHWYQQLPGTAPKLLIYGNSNRPSGVPDRFSGSKSGTSASLAITGLQAEDEADYYCQSYDSSLSAPYVFGTGTKVTVL
B1025	Omicron BT	Singlet	VH4-61	JH6	385	QVQLQESGPGLMKPSETLSLTCTVSGGSVRSGNFHWNWIRQSPGKGLEWIGHMHYTGSPSYNPSLKSRVTILLDTSKNQFSLRLSSVTAADTAVYFCARDTRYYDRSGYVRSDGMDVWGQGTTVTVSS	VK1-5	JK2	386	DIQMTQSPSTLSASVGDRVSMTCRASQTIGSWLAWYQQKPGNAPKLLIYEASSLQSGVPSRFSGSGSGTEFTLTISSLQPDDFASYYCQQYNSYPVTFGQGTKLEIK
B1026	Omicron BT	Singlet	VH1-58	JH3	387	QMQLVQSGPEIKKPGTSVKVSCKASGFTFSNSAVQWVRQARGQRLEWIGWIVVGSGDPNYAQKFQERVTLTRDMSTSTAYMELSSLRSEDTAVYYCATNHCSRTICSDGFDIWGQGTVVTVSS	VK3-20	JK1	388	EIVLTQSPVSLSLSPGERATLSCRASQTVRSSYFVWYQQKLGQAPRLLIYSASSRAAGIPDRFSGSGSGTDFTLTISRLEPEDFAVYYCQQYGSSPWTFGQGTKVEIK
B1027	Omicron BT	Singlet	VH3-74	JH4	389	EVQLVESGGGLVQPGGSLRLSCVGSGFSFSRYWLHWVRQAPGKGLVWVSRIDSDGSSPVYADFVKGRFTMSRDNAKNTLYLQMNSLRAEDTAVYYCARASPGFGGLPFDYWGQGALVTVA	VL3-21	JL3	390	SYELTQPPSVSVAPGMTARISCGVNNIGSESVHWYQQRPGQAPVLVLYYGSDRPSGIPERFSGSNSGNTATLTISRVEAGDEADYYCQLWDSSSSSDLWVFGGGTKLTVL
B1028	Omicron BT	Singlet	VH3-9	JH6	391	EVQLVESGGGLLQPGRSLTLSCAASGFTFDDYAMHWVRQAPGKGLEWVSGISWSGGVIDYADSVRGRFTISRDNAKESLYLHMRSLRP	VK2-28	JK2	392	DIVMTQSPLSLPVTPGGPASISCRSSQSLLHSNGYNYLDWYLQKPGQSPQLLISLGSNRASGVPDRFSGSGSGTDFTLKISRV

						EDTALYYCARGSRSGSFS LRDHDYGMDVWGRGTTV TVSS				EAEDVEVYYCMQGLQP PPTFGQGTKLEIK
B1029	Omicron BT	Singlet	VH5-51	JH4	393	EVQLVQSGAEVKKPGESL KISCKGSGYSFISSWIGW VRQMPGKGLEWMGIIYP GDSDTRYSPSFQGQVTIS VDKSISTAYLQWTSLKAS DTAMYYCARSSDYGGTP GAYWGQGTLVTVSS	VL1-44	JL3	394	QSVXTQPPSASGTPGQ RVTIYCSGRSSNIGSNP VNWFQQLPGTAPKLVN YNNNQRPSGVPDRFS GSKSGTSASLAISGLQS EDEADYYCATWDDSLN GWVFGGGTKLTVL
B1030	Omicron BT	Singlet	VH1-46	JH1	395	QVQLVQSGAEVKKPGAS VRVSCKASGYTFTSYYM HWVRQAPGQGLEWMGII NPSDGGASYAQKFQGRV TMTSDTSTSTVYMELSSL RSEDTAVYYCARALRHHS SGWYSALDFQHWGQGTL VTVSS	VL1-44	JL1	396	QSVLTQPPSASGTPGQ RVTISCSGSSSNIGSNP VNWYQQLPGTAPRLLI YSNNQRPSGVPDRFSG SKSGTSASLAISGLQSE DEADYYCAAWDDSLYV FGTGTKVTVL
B1032	Omicron BT	Singlet	VH3-9	JH6	397	EVQLVESGGGLVQPGRS LRLSCEASGFTFEDFAMH WVRQAPGKGLEWVSGV SWNSGTIGYGDSVKGRFI IRDNAKNSVYLQMNSLR PEDTAFYYCVKDMATYYK DISGTYGMDVWGQGTTV TVSS	VL3-21	JL2	398	SYELTQTPSVSVAPGQ TARITCVGNNIGSESVH WYQQKSGRAPVLVVY DDSDRPSGIPERFSGS TSGTTATLIINRVEAGD EAGYYCQVWDASSDH VVFGGGTKLTVL
B1033	Omicron BT	Singlet	VH3-9	JH4	399	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYALH WVRQAPGKGLEWVSGS SWNSATIGYADSVKGRFII SRDNAKNSLYLHMSSLRV EDTALYYCAKDSSGGDW PLCFDYWGQGILVTVSS	VK3-15	JK2	400	EIVMTQSPATLSVSPGE RATLSCRASQSVSSNL AWYQQKPGQAPRLLIY GASTRATGIPARFSGS GSGAEFTLTISSLQSED FAVYYCQQYNNWRYTF GQGTKLEIK
B1034	Omicron BT	Singlet	VH1-46	JH4	401	QVQLVQSGSEVKKPGAS VKVSCKASGNTFITYYTH WVRQAPGQGLEWMGVIK	VK1-33	JK2	402	DIQMTQSPSSLSASVG DRVTITCQASQDIYNYL NWYQQKPGKAPKLLIF

						PSDGYTNYAQKFQGRVT MTRDTSASTVYMELSSLT SDDTAVYYCARDSSIAAR VVDWGQGTLVTVSS				DAINLETGVPSRFSGSG SGTDFTLTISSLQPEDIA TYYCQQHDNLPYSFGQ GTKLEIK
B1035	Omicron BT	Singlet	VH3-11	JH4	403	QVQLVESGGGLVKPGGS LRLSCAASGFIFSNYYISW IRQSPGKGLEWLSYISGS GSTIYYADSVKGRFTISRD NAKNSLYLEMNSLRPEDT AVYYCARDGSLTGYIDYW GQGTLVTVSS	VL3-21	JL3	404	SYELTQPPSVSVAPGQ TARITCGGDDIGSKGVH WYQQKPGQAPVLVVY DDSDRPSGIPERFSGS NSGNTATLTISRVEVGD EADYYCQVWDSHANP HWVFGGGTKVTVL
B1036	Omicron BT	Singlet	VH3-30	JH4	405	QVQLVETGGGVVQPGRS RRLSCVASGFTFRHYAM HWVRQAPGKGLEWVAVI SYDGSHKHYGDSVKGRV TISRDDSGNTLYLQMNNL RPEDTAMYYCAKVSGPY CRGGNCYSGGEFDYWG QGTLVTVSS	VL1-51	JL2	406	QSVXTQPPSVSAAPGR TVTISCSGSSSNIGSNY VCWYQQFPGTAPKLLI YDNNERPSGIPARFSG SKSGTSATLGIIGLQTG DEADYYCETWDSSLNA VVFGGGTKVTV
B1037	Omicron BT	Singlet	VH1-69	JH4	407	QVQLVQSGAEVKKPGSS VKVSCKASGDTFISYAITW VRQAPGQGLEWMGRIIPI LGVADYAPKFQGRVTITA DKSTSTAYMELSSLRSED TAVFYCASWRGREYNGY DWTGPTRGFDSWGQGT LVTVSS	VK3-20	JK1	408	EIVLTQSPGTLSLSPGE RATLSCRASQSVSSSY LAWYQQKPGQAPRLLI YGASSRATGIPDRFSG SGSGTDFTLTISRLEPE DFAVYYCQQYDSSPWT FGQGTKVEIK
B1038	Vax3	Clone	VH1-46	JH6	409	QVQLVQSGAEVKKPGAS VKVSCKASGYTFTNYYM HWVRQAPGQGLEWLGMI KASGGTTHYAEKFQGRV TMTRDTSTNTVYVELSSL RSEDTAVYYCARDRLMG YYELWTAYGGMDVWGQ GTTVTVSS	VL3-21	JL3	410	SYVLTQPPSVSVAPGK TASVTCGGNDIGIKTVR WYQQKPGQAPVLVIYS DSDRPSGIPERFSGSN SGNTASLTINRVEAGDE ADYYCQVWDSSSAWV FGGGTKLTV

B1039	Vax3	Clone	VH3-30	JH4	411	QVQLVESGGGVVQPGRSLRLSCTVSGFTFRHYGMHWVRQAPGKGLEWVAVILYDGSDKQYADSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCVKRRGSYCGGDCYSGEFDYWGQGTLVTVSS	VK1-33	JK4	412	DIQMTQSPSSLSASVGDRVTITCQASQDISTYLNWFQQKPGKAPNLLISDASNLETGVPSRFSGSGSGTDFTFTISSLQPEDVATYYCQQYHNLPTFAGGTKVELK
B1040	Vax3	Clone	VH3-9	JH6	413	EVQLVESGGGLVQPGRSLRLSCAASGFTFDDYAMHWVRQAPGKGLEWVSGISWNSGTIGYADSVKGRFIISRDNAKNSLYLQMYSLRAEDTALYYCAKDVYMGKINLYGHEDYGMDVWGQGTTVTVS	VL1-40	JL2	414	QSVLTQPPSVSGAPGQRVTISCTGSSSNVGASYDVHWYQQLPGTAPKLLIYGKDNRPSGVPDRFSGSKSGTSASLAITGLQAEDEADYYCQSFDSSLSGVLFGGGTKLTVL
B1041	Vax3	Clone	VH1-69	JH5	415	QVQLVQSGAEVKKPGSSVKVSCKASGGTFSSYTVTWVRQAPGQGLEWMGGIIAALGAANYAQKFQGRVTFTADDSRSTVYMELSSLTYEDTAVYYCATSRGYSGYGANNWFDPWGQGSLVTVSS	VL1-40	JL2	416	QSVLTQPPSVSGAPGQRVTISCTGSNSNIGAGYDVHWYQQLPGTAPRLLIHVNSNRPSGVPERFSGFKSGTSASLAITGLQAEDEAIYYCQSYDSSLTGSLFGGGTKLTVL
B1042	Vax3	Clone	VH1-2	JH4	417	QVQLVQSGAEVRKPGASVKVSCKASGNTFTGYYIHWVRQAPGQGLEWMGWINPNSGGTNYAQRFRGRVALTTDTPINIVHMELSGLRSDDTAVYYCAKDTGSSWSEAEYFDSWGQGTLVTVSS	VK1-39	JK5	418	DIQMTQSPSSLSASVGDRVTITCRASQSISNYLNWYQQKPGKAPNLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPDDFATYYCQQSYSTPPITFGQGTRLEI
B1043	Vax3	Clone	VH3-30	JH6	419	QVQLVESGGGVVQPGRSLRLSCAASGFIFSSYGMHWVRQAPGKGLEWVADISYHGSNKYYADSVKGRFNI	VL2-8	JL2	420	QSALTQPPSASGSPGQSVTISCTGTSSDVGGYNYVSWYQKYPGKAPKLIIYEVDKRPSGVPDRFS

						SRDNSKNTLFLQMNSLRP EDTALYFCAKDLGQGILH FVQWSLSRHGLDVWGQ GTTVTVSS				GSKSGNTASLTVSGLQ AEDEADYYCSSSAVSVI FGGGTKLTVL
B1044	Vax3	Clone	VH1-69	JH4	421	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSSYAIS WVRQAPGQGLEWMGGII PIFGTANYAQKFQGRVTIT ADESTSTAYMELSSLRSE DTAVYYCARALYYYDSSG RTRMEEYFDYWGQGTLV TVSS	VL1-40	JL1	422	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAAY DVHWYQQLPGTAPKLL IYGNSNRPSGVPDRFS GSKSGTSASLAITGLQA EDEADYYCQSYDSSLS ARYVFGTGTKVTVL
B1045	Vax3	Singlet	VH1-58	JH4	423	QMQLVQSGPEXKKPGTS VRVSCKASGFTFYSSAVQ WVRQARGQRLEWIGWIV VASGNTNYAQKFQERVTI TRDMSTSTAYMELSSLRG EDTAVYYCAAPYCNSTIC AGGFDYWGQGTLVTVSS	VK3-20	JK1	424	EIVLTQSPGTLSLSPGD RATLSCRASQSVRSGY FAWYQQQPGQSPRLLI SGASNRATGIPDRFSG SGSGTDFTLTISRLEPE DFAVYHCQQYDKSPW TFGQGTKVEMK
B1046	Vax3	Singlet	VH4-61	JH6	425	QVQLQESGPGLLKPSETL SLTCTVSGGSVSSANFH WSWIRQPPGKGLEWIGN FFYSGSTNYNPSLKSRLTI SVDTSKNQFCLKKYSLTA ADTAVYYCARDTRYYDR SGYVRSDGMDVWGQGT TVTVSS	VK2-28	JK3	426	DIVMTQSPLSLPVTPGE PASISCRSSQSLLHNNA YNYLDWYLQKPGQSP QLLIYLGSNRASGVPDR FSGSGSGTDFTLKISRV EAEDVGVYYCMQALQT PPTFGPGTKVDIK
B1047	Vax3	Singlet	VH3-30	JH4	427	QVQLVESGGGVVQPGRS LRLSCVASGFTFNNHAMH WVRQAPGKGLDWVAVIS YDGSNKYYADSVKGRFTI SRDNSKNTLYVQMNSLR AEDTAVYYCAREDYYDSS GSFDYWGQGTLVTVSS	VL2-14	JL3	428	QSALTQPASVSGSPGQ SITISCTGTSSDVGGYN YVSWYQQHPGKAPKLL TYDVSNRPSGVSNRFS GSKSGNTASLTISGLQA EDEADYYCSSYTNSAT WVFGGGTKLTVL
B1048	Vax3	Singlet	VH1-69	JH6	429	QVQLQQWGAGLLKPSET LSLTCGVFRASLIDFYWT	VK2-28	JK4	430	DIVMTQSPLSLPVTPGE PASISCRSSQSLLHSNG

						WIRQSPGKGPEWIGGIYH NGSADSSPSMKSRVTISI DTSKNQFSLQLTSVTAAD NGVYYCARGLGSWLQMP VAFWGQGNLVTVSS				DTYLDWYLQKPGQSPQ LLIYLGSNRASGVPDRF SGSGSGTDFTLKISRVE AEDVGVYYCMQALQTP AFGGGTKVEIK
B1049	Vax3	Singlet	VH4-31	JH4	431	QVQLQESGPGLVKPSQT LSLTCTVSGGSISSGPYY WSWIRQHPGKGLEWIGYI YYSGSTYYNPSLKSRVTI SVDTSKKQFSLNLNSVTA ADTAVYYCARVWQYYDS TGSFDYWGQGTLVTVSS	VL1-44	JL2	432	QSVLTQSPSASGTPGQ RVTISCSGSSSNIGSNT VNWYQQVPGTAPKLLI YSDNQRPSGVPDRFSA SKSGTSASLAISGLQSE DEADYYCAAWDDGLN GVLFGGGTKLTVL
B1050	Vax3	Singlet	VH4-34	JH4	433	QVQLQQWGAGLLKPSET LSLTCGVFRASLIDFYWT WIRQSPGKGPEWIGGIYH NGSADSSPSMKSRVTISI DTSKNQFSLQLTSVTAAD NGVYYCARGLGSWLQMP VAFWGQGNLVTVSS	VL1-47	JL2	434	QVQLQQWGAGLLKPS ETLSLTCGVFRASLIDF YWTWIRQSPGKGPEWI GGIYHNGSADSSPSMK SRVTISIDTSKNQFSLQL TSVTAADNGVYYCARG LGSWLQMPVAFWGQG NLVTVSS
B1051	Vax3	Singlet	VH3-20	JH5	435	EVQLVESGGGVVRPGGS LRLSCSASGFTFGEYGMS WFRQAPGKGPEWVSGIT WNGGNPTYADSVKGRFM ISRDNAKNSLYLQMNSLR AEDSASYHCARALCGDD CLASMYNWFDPWGQGTL VTVSS	VL1-40	JL1	436	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAGY DVHWYQQFPGTAPKLL IYNNNNRPSGVPDRFS GSKSGTSASLAITGLQA EDEADYYCQSFDSGRS GSEVFGTGTKVTVL
B1052	Vax3	Singlet	VH1-2	JH4	437	QVQLVQSGAEVKKPGAS VKVSCKASGYIFTGYYMH WVRQAPGQGLEWMGWI NPNSGATNYAQKFQGRV TMTRDTSISTVHMDLSRL RSEDTAVYYCARDQAFS MVSGSVDYWGQGTLVTV SP	VL2-23	JL1	438	QSVLTQPASVSGSPGQ SITISCTGASSDVGTYD LVSWYQHHPGKAPKLV IFEVTKRPSGVSNRFSG SKSGNTASLTISGLQAE DEADYYCCSYAGNSAY VFGTGTKVTA

	B1053	Vax3	Singlet	VH1-2	JH4	439	QVQLVQSGAEVKQPGASVKVSCKASGYTFTRYYMHWVRQAPGQGLEWMGWINPNSGGTNYAQKFQGSVTMTRDTPISTAYMELSRLKSDDTAVYYCARSLFYYDRRGYPTPEDHFDYWGQGTLVTVSS	VL1-40	JL3	440	QSVLTQPPSVSGAPGQRVTISCTGSSSNIGANYDVHWYQHLPGTAPKLLIYGNTNRPSGVPDRFSGSKSGTSASLAITGLQAEDEGDYYCQSYDSSPSGPNWVFGGGTKVTVL
	B1054	Vax3	Singlet	VH3-23	JH4	441	EVQLLESGGGLVQPGGSLRLSCAASGFNFSNHAVSWVRQAPGKGLEWVSGFSGSGGTTFYADSVKGRFTISRDNSKNTLYLQMNSLSAEDTAVYYCAKRGVSYYDRSGHYFENSFDSWGQGTLVTVSS	VK1-5	JK4	442	DIQMTQSPSTLSASVGDRVTITCRASQSISSWLAWYQQKPGEAPXXLIYKGSNLESGVPLRFSGSGSGTEFTLIISSLQPEDFATYYCQQYDSYPFTFGRGTKVEIK
	B1056	Vax3	Singlet	VH1-8	JH5	443	QVQLVQSGAEVKKPGASVKVSCKASGYTFTSYDIDWVRQATGQGLEWMGWMNPNSGNTGYAQKFQGRVTMTRNTSISTAYMELSSLRSEDTAVYYCARAIWFGELPSAWGQGTLVTVSS	VL1-47	JL2	444	QSVLTQPPSASGTPGQRVTISCSGSSSNIGSNFVYWYQQLPGTAPKLLIYSNNQRPSGVPDRFSGSKSGTSASLAISGLRSEDEADYYCAAWDDSLSGHVVFGGGTKLTVL
	B1057	Vax3	Singlet	VH3-9	JH5	445	EVQLVESGGGLVQPGRSLRLSCAASGFTFDDFAMHWVRQAPGKGLEWVSGISWESGSIGYADSVKGRFTISRDNGKKTLHLQMTSLRVEDTALYYCAKASNGWFGELLRGFDSWGQGTLVTVS	VL3-21	JL2	446	SYELTQPPSVSVAPGQTARITCGGNNIGSKSVHWYQQKPGQAPVLVVYDDSDRPSGIPERFSGSNSGNTATLTISRVEAGDEADYYCQVWDSTSDHVVFGGGTKLTVL
B001	B601	Delta BT	Clone	VH1-2	JH6	447	QVQLVQSGAEVKKPGASVKVSCKTSGYTLIDYYVHWVRQAPGQGLEWMGRINPNSGGTNYAQKFQGRVTMTGGTSITTAYMELSGL	VL2-14	JL2	448	QSALTQPASVSGSPGQSITISCTGSSSDVGSYNYVSWYQQHPGRAPKLIISEVTNRPSGVSNRFSGSKSGNTASLTISGLQAE

						RSDDTAVYYCATEHYDIV AGHSPGGKYFGMDVWG QGTTVTVSS				DEADYYCSSYTSSSPL VLFGGGTKLT
B602	Delta BT	Clone	VH1-2	JH6	449	QVQLVQSGAEVKKPGAS VKVSCKTSGYTLIDYYVH WVRQAPGQGLEWMGRI NPNSGGTNYAQKFQGRV TMTGGTSITTAYMELSGL RSDDTAVYYCATEHYDIV AGHSPGGKYFGMDVWG QGTTVTVSS	VL2-14	JL2	450	QSALTQPASVSGSPGQ SITISCTGSSSDVGSYN YVSWYQQHPGRAPKLII SEVTNRPSGVSNRFSG SKSGNTASLTISGLQAE DEADYYCSSYTSSSPL VLFGGGTKLTVL
B605	Delta BT	Clone	VH4-31	JH4	451	QVQLQESGPRLVKPSQTL SLTCSVSGGSFSSGGYY WSWIRQHPGKGLEWIGYI YYTGSTYYNPSLKSRVSI SVDTSKNELSLGLSSVTA ADTAVYYCARGPYTTRAF DYWGQGTLVTVSS	VL2-8	JL2	452	QSALTQPPSASGSPGQ SVTISCTGTSSDVGGY NYVSWYQQHPGKAPK LIIYEVSKRPSGVPDRF SGSKSGNTASLTVSGL QAEDEADYYCSSYGGS NNEVFGGGTKLTVL
B606	Delta BT	Clone	VH4-31	JH4	453	QVQLQESGPGLVKPSQT LSLTCSVSGGSVSSGGYY WSWIRQHPGKGLEWVGY IYYTGSTYYNPSLKSRGTI SVDTSKNQFSLKLSSVTA ADTAVYYCARGPYTTRAF DYWGQGTLVTVSS	VL2-8	JL2	454	QSALTQPPSASGSPGQ SVTISCTGTSSDVGDYN YVSWYQQHPGKAPKL MIYEVNKRPSGVPDRF SGSKSGNTASLTVSGL QAEDEADYYCSSYAGS NTEVFGGGTKLTVL
B609	Delta BT	Clone	VH1-69	JH4	455	QVQLVQSGAAVRKPGSS VKVSCKASGGLFSSFAIS WVRQAPGQGLQYMGGII PMFGIPNYAQKFQGRVTI TADESTSTAYMELSSLTS EDTAVYYCARAPVATRPP DYWGQGTLVIVSS	VK3-15	JK4	456	EIVMTQSPATLSVSPGE RATLSCRASQSVSNNL AWYQQKPGQAPRLLIY GASTRATGIPARFSGS GSGTEFTLTISSLQSED FAVYFCQQYNDWPPLT FGGGTKVEIK
B610	Delta BT	Singlet	VH3-53	JH6	457	EVQLVESGGGLIQPGGSL RLSCAASGFPISSNYMNW VRQAPGKGLEWVSIIYSG GTTYYVDSVKGRFTISRD	VK1-9	JK3	458	DIQLTQSPSFLSASVGD RVTITCRASQGISNYLV WYQQKPGKAPKLLIYA ASTLQSGVPSRFSGSG

						DSKNTLYLQMNSLRAEDT AVYYCARDLQNYGMDVW GQGTTVTVSS				SGTEFTLTISSLQPEDF ATYYCQQVNSYPLFGP GTKVDI
B612	Delta BT	Singlet	VH3-53	JH6	459	EVQLVESGGGLIQPGGSL RLSCAASGVIVSSNYMTW VRQAPGKGLEWVSVIYS GGSTYYADSVKGRFTISR DNSKNTLYLQMNSLRAED TAVYYCARDLNYYGMDV WGQGTTVTVSS	VK1-9	JK2	460	DIQLTQSPSFLSASVGD RVTITCRASQGISSSLA WYQQKPGKAPKLLIYA ASTLQSGVPSRFSGSG SGTEFTLTISSLQPEDF ATYYCQQFNSYPHFGQ GTKLEIK
B614	Delta BT	Singlet	VH3-53	JH3	461	EVQLVESGGGLIQPGGSL RLSCAASGIIVSSNYMNW VRQAPGKGLEWLSVFYP GGTTQYADSVKGRFTISR DNSKNTLYLQMNSLRAED TAVYYCARDRWEGAFDI WGQGTMVTVSS	VK1-9	JK4	462	DIQLTQSPSFLSASVGD RVTITCRASQGISNYLA WYQQKPGKAPKLLIYA ASTLQSGVPSRFSGSA SGTEFTLTISSLQPEDF ATYYCQQLNSYPRLTF GGGTKVEIK
B615	Delta BT	Singlet	VH3-53	JH3	463	EVQLVETGGGLMQPGGS LRLSCAASGLTVSANYMS WVRQGPGKGLEWVSVIY PGGSAFYADSVKGRFTIS RDNSKNTLYLQMNSLRVE DTAVYYCARDAREGVLD VWGQGTVVTVSS	VK1-39	JK1	464	DIQMTQSPSSLSASVG DRVTITCRASQSISSYL NWYQQKPGKAPKLLIY AASSLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSYSTPRTF GQGTKVEIK
B618	Delta BT	Singlet	VH3-74	JH5	465	EVQLVESGGGLVQPGGS LRLSCAASGFTFSSYWM HWVRQAPGKGLVWVSR VNGDGSITAYADSVKGRF TISRDNAKKTLYLQMNSL RAEDTAVYYCARELFRTV DPWGQGTLVTVSS	VL6-57	JL2	466	NFMLTQPHSVSESPGK TVTISCTGSRGSIASNY VQWYQQRPGSAPTTVI YEDNQRPSGVPDRFSG SIDSSSNSASLTISGLKT EDEADYYCQSYDSSNG DVIFGGXTKLT
B621	Delta BT	Singlet	VH4-38-2	JH5	467	QVQLQESGPGLARPSETL SLTCGVTGYSISVGYYWG WFRQPPGKGLEWVGSM YHSGPAYYNSSLKSRVSI SIQASKNRFSLSLSSVTAA	VK3-20	JK1	468	EIVLTQSPGTLSLSPGE RATLSCRASQSVSRTY LAWYQQKPGQAPRLLI YGVSSRATGIPDRFSG SGSGTDFTLTISRLEPE

						DSAVYFCAASGVGRAGA LSYDAWGQGTLVLVSS				DFAVYYCQQYRTFGQG TKVEIK
B623	Delta BT	Singlet	VH3-30-3	JH5	469	QVQLVESGGGVVQPGRS LRLSCAASGFTFSSHAMH WVRQAPGKGLEWVAVIL DDGSNKYYADSVKGRFTI SRDNSRNTLYLQMNSLR VEDTAVYYCARDYHVDR VMVTWFDPWGQGTLVTV SS	VK1-39	JK1	470	DIQMTQSPSSLSASVG DRVNIHCRASQSIGTYL NWYQQKPGKAPKLLIY VVSNLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSYSTPPWT FGQGTKVEIK
B624	Delta BT	Singlet	VH1-46	JH4	471	QVQLVQSGAEVKKPGAS VKVSCKASGYTFTSYYMH WVRQAPGQGLEWMGIIN PSGGSTSYAQKFQGRVT MTRDTSTSTVYMELSSLR SEDTAVYYCASSPLFNW GQLYYFDYWGQGTLVTV SS	VL1-40	JL3	472	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAGY DVHWYQQLPGTAPKLL IYGNSNRPSGVPDRFS GSKSGTSASLAITGLQA EDEADYYCQSYDSSLS DNWVFGGGTKLTVL
B625	Delta BT	Singlet	VH4-39	JH6	473	QLQLQESGPGLVKPSETL SLTCTVSGGSISSSSFYW GWIRQPPGKGLEWIGSIY YSGSTYYNPSLKSRVTIS VDTSKNQFSLRLSSVSAA DTAVYYCARHGPRPHYD FLTGDSDYYYYGLDVWG QGTTVTVSS	VK1-39	JK1	474	DIQMTQSPSSLSASVG DRVTITCRASHNIRSYL NWYQQKPGKAPNLLIY VATSLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSFTTPRTF GQGTRVEIK
B626	Delta BT	Singlet	VH3-7	JH4	475	EVQLVESGGDLVQPGGS LRLSCAASGFTFNKYYMN WVRQAPGKGLEWVANIK QDGSEKYYVGSVKGRFTI SRDNAKNSLYLQMSSLRA EDTAVYYCASGEWLRGP FDYWGQGTLVTVSS	VL6-57	JL1	476	NFMLTQPHSVSESPGK TVTISCTGSSGSIASNY VQWYQQRPGSAPTTVI YEDNQRPSGVPDRFSG SIDSSSNSASLTISGLKT EDEADYYCQSYDSTIFY VFGTGTKVTVL
B628	Delta BT	Singlet	VH3-9	JH3	477	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYAMH WVRQYPGKGLEWVSGA	VL3-21	JL1	478	SYVLTQPPSVSVAPGQ TARITCGGNNIGSKSVH WYQQKPGQAPVLVVY

						SWNSGTIGYGDSVKGRFI ISRDNAKNSVYLQMNSLR PEDTALYYCAKSLRRDAY NYDDCAFDIWGQGTMVT VSS				DDSDRPSGIPERFSGS NSANTATLTISRVEAGD EADYYCQVWHSSSEH QVFGTGTKVTVL
B630	Delta BT	Singlet	VH3-13	JH6	479	EVQLVESGGGLVQPGGS LRLSCTASGFTFSRYDMH WVRQPTGKGLEWVSAIG TSGDRYYPDSVKGRFTIS REDAKNSLYLQMNNLRA GDTAVYYCARGDSTTSLL RHYYYMDVWGRGTTVTV SS	VL1-40	JL3	480	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAGY DVHWYQQLPGTAPKLL IYGNSNRPSGVPDRFS GSKSGTSASLAITGLQA EDEADYYCQSYDSSLS DNWVFGGGTKLTVL
B631	Delta BT	Singlet	VH3-9	JH3	481	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYAMH WVRQAPGKGLEWVSGIS WNSGRTAYADSVKGRFTI SRDNAKNSLYLQMNSLR AEDTALYYCAKASCGGD CYSLLLSPDGFDIWGQGT MVTVSS	VL1-40	JL2	482	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAGY DVHWYQQLPGTAPKLL IYDNNNRPSGVPDRFS GSKSGTSASLAITGLQA EDEADYYCQSYDSSLG GLVLFGGGTKLTV
B632	Delta BT	Singlet	VH1-3	JH4	483	QVQLVQSGAEVKKPGAS VKVSCKASGYTFTRYVM HWVRQAPGQRLEWMGW INGGNGDTKYSQKFQGR VTITRDTSASTAHMELRSL RSEDTAVYYCARDLYYYN RSGHYDVDYNLDYWGQ GTLVTV	VL1-40	JL2	484	QSVLTQPPSVSGAPGQ RVTISCTGSSSNTGAG YDVHWYQQLPGTAPKL LIYGNTNRPSGVPDRFS GSKSGTSASLAITGLQA EDEADYYCQSYDSSLS GYVIFGGGTKLTVL
B633	Delta BT	Singlet	VH3-53	JH4	485	EVQLVESGGGLIQPGGSL RLSCAASGFIVSSNYMSW VRQAPGKGLEWVSVIYS GGSTFYADSVKGRFTISR DNSKNTLYLQMNSLRAED TAVYYCARTLPGTTDLFD YWGQGTLVTVSS	VL1-40	JL1	486	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAGY DVHWYQQLPGTAPKLL IYGDSNRPSGVPDRFS GSKSGTSASLAITGLQA EDEADYYCQSFDSSLS GLGVFGTGTKVTVL

	B634	Delta BT	Singlet	VH3-21	JH6	487	EVQLVESGGGLVKPGGSLRLSCSASGFIFTNYNMHWVRQAPGKGLEWVSSISSGSDYIYYSDSLKGRFTISRHNAKNSLYLHMNSLRAEDTAVYYCAREGYHSGLDVWGLGTTVSVSS	VK3-20	JK5	488	EIVLTQSPGTLSLSPGERATLSCRASQSVSSSYLAWYQHKPGQAPRLLIYGASSRAPGIPDRFSGSGSGTDFTLTISRLEPEDFAVYYCQQYGNSPLITFGQGTRLEIK
	B635	Delta BT	Singlet	VH3-53	JH4	489	EVQLVESGGGLIQPGGSLRLSCAASGFIVSSNYMSWIRQAPGKGLEWVSILYPGGSAFYADSVKGRFTISRDNSKSTLYLQMNSLRAEDTAVYYCARYGLWLDWGQGTLVTVSS	VK3-11	JK1	490	EIVLTQSPATLSLSPGERATLSCRASENIVSYLAWYQQKPGQAPRLLIYDASNRATAIPARFSGSGSGTDFTLTISSLEPEDFAIYYCQQRSDWPPLTFGQGTKVEIK
B007	B1076	Delta BT	Clone	VH3-53	JH4	491	EVQLVESGGGLIEPGGSLRLSCTASELIVSRNYMTWVRQAPGKGLEWVSVIYAGGTTYYADSVKGRFTISRDNSKNTLYLQMNRLRAEDTAVYYCARDLVNSGLDCWGQGTLVTVSS	VK1-9	JK2	492	DIQLTQSPSFLSASVGDRVTITCRASQGISSYLAWYQQKPGKAPKLLIYAASTLQTGVPSRFSGSGSGTEFTLTISSLQPEDFATYYCQQLDSYPPYTFGQGTKLEIK
	B1077	Delta BT	Singlet	VH4-59	JH4	493	QVQLQESGPKLVKPSETLSLTCTVSGASISSYYWSWIRQPPGKGLEWIGYIFYNGRTSYNPSLKSRVTLSVDTSKDQFSLKLNSVTAADTAVYFCATDYYDTSGWHYGLDYWGQGALVTVSS	VK1-9	JK5	494	DIQLTQSPSFLSASVGDRVTITCRASQGISSHLGWYQQKPGKAPKLLIYGASTLQSGVPSRFSGSGSGTEFTLTISSLQPEDFATYYCQQLNSYRLFGQGTRLDIK
	B1078	Delta BT	Singlet	VH1-8	JH4	495	QVQLVQSGAEVKKPGASVKVSCKASGYTFTSYDINWVRQATGQGLEWMGWMNPHSGNTGYARTFQGRVTVTRNTSISTAYMELSSLRSEDTAVYYCAITYEAHDILTGCLDSWGQGTLVTVSS	VL3-21	JL1	496	SYVLTQPPSVSVAPGQTARITCGGDYIGSKNVHWYQLRPGQAPVLVVYDDSDRPSGIPERFSGSNSGNTATLTISRVEAGDEADYYCQVWDSSSDQLYVFGAGTKVTVL

B1079	Delta BT	Singlet	VH3-9	JH4	497	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYAMH WVRQAPGKGLEWVSGIS WNSGSTGYADSVKGRFTI SRDNAKNSLYLQMSSLRA EDTAFYYCAKGTIGVPLR ECYFDYWGQGTLVTVSS	VL2-11	JL3	498	QSVLTQPRSVSGSPGQ SVTISCTGTSSDVGGY DYVSWYQQHPGKAPK LMIYDVSERPSGVPDR FSGSKSGNAASLTISGL QAEDEADYYCCSYAGS YLLVFGGGTKLTVL
B1080	Delta BT	Singlet	VH3-9	JH4	499	EVQLVESGRGLVQPGRS LRLSCAASGFTFDDYAMH WVRQAPGKGLEWVSGIS WNSGSIGYVDSVKGRFTI SRDNAKNTLYLQMNSLRA EDTALYYCAKGTIAVPLRE CSLDYWGQGTLVTVSS	VK1-39	JK2	500	DIQMTQSPSSLSTSVG DRVTITCRASQSIYGFL NWYQQRPGKAPKLLIY AASSLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSYITPYTFG QGTKLEIK
B1081	Delta BT	Singlet	VH3-9	JH4	501	EVQLVESGRGLVQPGRS LRLSCAASGFTFDDYAMH WVRQAPGKGLEWVSGIS WNSGSIGYVDSVKGRFTI SRDNAKNTLYLQMNSLRA EDTALYYCAKGTIAVPLRE CSLDYWGQGTLVTVSS	VL2-14	JL1	502	QSVLTQPASVSGSPGQ SITISCTGTSSDVGGYD YVSWYQQHPGKAPKL MIYEVSNRPSGVSNRF SGSKSGNTASLTISGLQ AEDDADYYCSSYTSSIT RYVFGTGTKVTVL
B1082	Delta BT	Singlet	VH3-30	JH4	503	QVQLVESGGGVVQPGRS LRLSCAVSGFTFSRYGMH WVRQAPGKGLEWVGVIL YDGSNEYYADSVKGRFTI SRDNSKNTLYLQINSLRV EDTAVYYCAKASGPYCG GGDCYSAFFDYWGQGTL VTVSS	VK1-5	JK2	504	DIQMTQSPSTLSASVG DRVTITCRASQSISRWL AWYQQKPGKAPKVLIY EASSLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNSYSSFG QGTKLEIK
B1083	Delta BT	Singlet	VH3-30	JH4	505	QVQLVESGGGVVQPGRS LRLSCAVSGFTFSRYGMH WVRQAPGKGLEWVGVIL YDGSNEYYADSVKGRFTI SRDNSKNTLYLQINSLRV EDTAVYYCAKASGPYCG	VK1-33	JK4	506	DIQMTQSPSSLSAYVG DRVTITCQASQDISNYL HWYQQKSGKAPTLLIY DASNLQTGVPSRFRGS GSGTDFTLTISSLQPED FATYYCQQYDNLPPTF GGGTKVEIK

						GGDCYSAFFDYWGQGTL VTVSS				
B1084	Delta BT	Singlet	VH3-30	JH4	507	QVQLVESGGGVVQPGRS LRLSCAASGFTFSSYGMH WVRQAPGKGLEWVAVIS YDGSNKYYADSVKGRFTI SRDNSKNTLYLQMNSLRT EDTAVYYCAKQAGLYCS GGNCYSGYFDYWGQGTL VIXSS	VK1-13	JK4	508	AIQLTQSPSSLSASVGD RVTITCRASQGISSALA WYQQKPGKAPKFLISD ASSLGSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYYCQQFNSHTPLTF GGGTKVEIK
B1085	Delta BT	Singlet	VH3-13	JH3	509	EVQLVESGGGLVQPGGS LRLSCGASGFTFSTYDMH WVRQTTETGLEWVSAIGT AGDTYYRDSVKGRFTISR ENAKNSLYLQMNSLRAG DTAVYYCARGLNSDNYA VWAFDIWGQGTMVTVSS	VK1-39	JK3	510	DIQMTQSPSSLSASVG DRVTITCRARQSIGTYL NWYQQKPGKAPKLLIH AASNLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSYSNPPTT FGPGTKVDIK
B1086	Delta BT	Singlet	VH1-18	JH3	511	QVQLVQSGAEVKKPGAS VKVSCKASGYTFTSNGIS WVRQAPGQGLEWMGWI SVYNGNTNYAQKLQGRL TMTTDTSTSTAYMELRSL RSDDTAVYYCARAVWSS GDYGGDLFDIWGQGTMIT VSS	VK1-33	JK4	512	DIQMTQSPSSLSASVG DRVTITCQASQDISNYL NWYQQKPGKAPKLLIY DASNLESGVSSRFSGS GSGTDFTFTISSLQPED IATYYCQQYQNLPLTFG GGTKVEIK
B1087	Delta BT	Singlet	VH30-3	JH6	513	QVQLVESGGGVVQPGRS LRLSCAASGFTFSNHAMH WVRQAPGKGLEWVASIT YDGSNKYYAGSVKGRFTI ARDNSKNTLHLQMNSLR AEDTAVYYCARDGGSGY DYSFDGLDVWGQGTTVT VSS	VK2-24	JK5	514	DIVMTQTPLSSPVTLGQ PASISCRSSQSLVHRD GNTYLSWLQQRPGQP PRLLIYKISNRFSGVPD RFSGSGTATDFTLKISR VQAEDVGVYFCMQATH PGITFGQGTRLEIK
B1088	Delta BT	Singlet	VH5-51	JH4	515	EVQLVQSGAEVKKPGESL KISCKGSGYSFTNYWIAW VRQMPGKGLEWMGIIYP	VL3-25	JL3	516	SYVLTQPPSVSVSPGQ TARITCSGDALPKPYAY WYQQKPGQAPVLVIYK

						GDSDTRYSPSFQGQITFS ADKSISTAYLQWSSLKAS DTAMYYCARLYPQSYYY DSSGYYYFDYWGQGTLV TVSS				DSERPSGIPERFSGSS SGTTVTLTISGVQAEDE ADYYCQSADITGTYVVF GGGTKLTVL
B1089	Delta BT	Singlet	VH3-9	JH1	517	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYAMH WVRQAPGKGLEWVSGIS WNSGTVDYADSVKGRFTI SRDNAKNSLYLQMNSLR AEDTALYYCTKDSRAHYD ILTGYYSPYTYWGQGTLV TVSS	VK2-28	JK2	518	DIVMTQSPXSLPVTPGE PASISCRSSQSLLHSNG YNYLDWYLQKPGQSP QLLIYMGSNRASGVPD RFSGSGSGTDFTLKISR VEAEDVGVYYCMQALQ TPPYTFGQGTKLEIK
B1090	Delta BT	Singlet	VH3-48	JH6	519	EVQLVESGGGLVQPGGS LRLSCAASGFTFSTYSMN WVRQAPGKGLEWLSYIS SGSSTIKYADSVKGRLTIS RDNAKNSLFLQMNSLRD EDTAVYYCARVQIRSGYY YYYGMDVWGQGTTVTVS S	VL2-11	JL2	520	QSVLTQPRSVSGSPGQ SVTISCTGTSSDIGSYD YVSWYQQHPGTAPKL MIYDVSKRPSGVPDRF SGSKSGNTASLTISGLQ TEDESDYYCCSYAGIW LFGGGTKLTVL
B1091	Delta BT	Singlet	VH1-69	JH4	521	QVQLVQSGAEVKKPGSS LKVSCKASGGSFRNFGIT WVRQAPGQGLEWMGVIS PFYGTADYAQKFQDRVTI TADKSTSTAYLELSSLRS EDTAVYFCARARYYYDRS GSLKADYDFDYWGQGTL VTVSS	VL1-40	JL1	522	QSVLTQPPSVSGAPGQ RVTISCTGNSSNIGAGY DVHWYQQLPRTAPKLLI YGNTNRPSGVPDRFSA SKSGTSASLAITGLLAD DEADYYCQSFDSGLSG SVFGTGTKXTVL
B1092	Delta BT	Singlet	VH3-9	JH5	523	EVQLVESGGGLVQPGRS LRLSCAASGFTFHDYAIH WVRQVPGKGLEWVSGIS WNSDDLGYADSVRGRFTI SRDNAKNSVYLQMNSLR AEDTAIYYCAKDHILGAGT	VK1-39	JK1	524	DIQMTQSPSSLSASVG DRVTITCRASQSIRNYL NWYQQKPGKAPKLLIY GASTLQSGVPARFSGS GSGTDFTLTISSLQPED LATYYCQQTYEIPPWTF GQGTKVEIK

						GWEKRENNFDPWGQGT LVIVSS				
B1093	Delta BT	Singlet	VH3-9	JH5	525	EVQLVESGGGLVQPGRS LRLSCAASGFTFHDYAIH WVRQVPGKGLEWVSGIS WNSDDLGYADSVRGRFTI SRDNAKNSVYLQMNSLR AEDTAIYYCAKDHILGAGT GWEKRENNFDPWGQGT LVIVSS	VK1-5	JK1	526	DIQMTQSPSTLSASVG DRVTITCRASQSVSSW LAWYQQKPGKAPKLLIY KASNLQSGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNTYPWMF GQGTKVEIK
B1094	Delta BT	Singlet	VH3-53	JH6	527	EVQLVESGGGLIQPGGSL RLSCTPSGFTVSGIYWG WVRQAPGKGLEWVSVLY DGGAIYYADAVKGRFTIS RDNSKNTVHLQMNSLRV EDTAVYYCARRSLYVGDF GDLLYPIIWGQGTTVTVS S	VK2-28	JK3	528	DIVMTQSPLSLPVTPGE PASMSCRSSQSLLHGN GYNYLDWYLQKPGQS PQLLIYFGSYRASGVPD RFSGSGSGTDFTLKISR VEAEDVGVYFCMQALR TPFTFGPGTEVDIK
B1095	Delta BT	Singlet	VH1-69	JH4	529	QVQLVQSGAEVRKPGSS VKVACKASGGNFNNSGIS WVRQAPGQGLEWMGGII PLFESEKYAQKFQGRVTI TADESTSTAYMELSSLRS EDTAVYYCARGRVATRR TTVTTLFDDWGQGTLVTV SS	VK4-1	JK2	530	DIVMTQSPDSLAVSLGE RATINCKSSQSVLYSSN NKNYLAWYQQKPGQP PKLLFYWASTRESGVP DRFSGSGSGADFTLTIS SLQAEDVAVYYCLQYY SSPYTFGQGTKLEIK
B1096	Delta BT	Singlet	VH3-13	JH4	531	EVQLVESGGGLVQPGGS LRLSCAASGFTFYTYDMH WVRQTPGKGLEWVSGIG TAGDTYYSGSVKGRFTVS RVDAKNSLYLQMDSLRA GDTAVYYCARGLCDFWS DYVSCYFDYWGQGTLVT VSS	VL1-51	JL2	532	QSVLTQPPSVSAAPGQ KVTISCSGSSSNIGNNY VSWFQQLPGTAPKLLIY DNNKRPSGIPDRFSGS KSGTSATLGITGLQTGD EADYYCGTWDSSVNA GVVFGGGTKLTVL
B1097	Delta BT	Singlet	VH4-39	JH3	533	QLQLQESGPGLVKPSETL SLSCTVSGVSISSRNFYW	VK3-11	JK4	534	EIVLTQSPATLSLSPGE RATLSCRASQSVGNYL

						GWIRQPPGKGLEWIGSIY YSGSTFSNPSLKTRVTISV DTSKKQFSLKLSSVTAAD TAVYYCARALRHFDWSR PNDYHDAFDIWGQGTMV TVSS				AWYQQKPGQTPRLLIS DASDRATGIPARFSGS GSGTDFTLTISSLEPED FAVYYCQQCSNWPLTF GGGTKVEIK
B1098	Delta BT	Singlet	VH4-39	JH3	535	QLQLQESGPGLVKPSETL SLSCTVSGVSISSRNFYW GWIRQPPGKGLEWIGSIY YSGSTFSNPSLKTRVTISV DTSKKQFSLKLSSVTAAD TAVYYCARALRHFDWSR PNDYHDAFDIWGQGTMV TVSS	VL1-40	JL6	536	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGANY DVHWYQHLPGTAPKLLI YGNNNRPSGVPDRFS GSKSGTSASLAITGLRA EDEADYYCQSYDSSLS GIVFGSGTKVTVL
B1099	Delta BT	Singlet	VH3-9	JH1	537	EVQLVESGGGLVQPGGS LRLSCTASGFTFDDYALQ WVRQAPGKGLEWISGIN WNSGSRGYANSVKGRFT ISRDNAKNSLYLQMNSLR ADDTAFYYCAKDRNRRG LTHDFEYFQHWGQGALV TVSS	VK3-15	JK1	538	EIVMTQSPATLSVSPGE RATLSCRASQTVSSNL AWYQQKPGQGPRLLIH GATTRATGIPARFSGS GSGTEFTLTISSLQSED FAIYYCQQYKAWPRTF GQGTKVEIK
B1100	Delta BT	Singlet	VH3-9	JH6	539	EVQLVESGGGLVQPGRS LRLSCAASGFTFDDYAMH WVRQAPGKALEWVSGIT WNSGTIGYADSVKGRFTI SRDNAKNSLYLQMIRLRP EDTALYYCAKDITYGDKH PENYGMDVWGQGTTVTV SS	VL3-21	JL6	540	SYVLTQPPSVSVAPGQ TARMTCGGNNIGSKSV HWYQQKPGQAPVLVV YDDSDRPSGIPERFSG SNSGNTATLTISRVEAG DEADYYCQVWDSSSDL NVFGSGTKVTVL
B1101	Delta BT	Singlet	VH1-69	JH2	541	QVQLVQSGAEMKKPGSS VKVSCKASGGTFSSYSIS WVRQAPGQGLEWMGEI MPILGIPNYAQKFQGRVT LTADQSTSTAYMDLTSLR SEDTAVYYCARVRGYSS	VL1-40	JL2	542	QSVLTQPPSVSGAPGQ RVTISCTGSNSNIGAAY DVHWYQQLPGTAPKLL MYGNNNRPSGVPDRF SGSKSDTSASLAITGLQ

						SSSSWYFDLWGRGTLVS VSA				AEDEADYYCQSYDSSL SGSVFGGGTKLTVL
B1102	Delta BT	Singlet	VH1-69	JH5	543	QVQLVQSGAEVKKPGSS VKVSCKASGGAFSIYAIT WVRQAPGQGLEWMGGII PISGTANYAQKFQGRVTIT ADESTSTAYMELSSLRSE DTAVYYCATDFRYCNNTS CLYWFDPWGQGTLVTVS S	VK1-39	JK1	544	DIQMTQSPSSLSASVG DRVTITCRASQSISSYL NWYQQKPGKAPKLLIY AASSLQSGVPSRFSGS GSGTDFTLTISSLQPED FATYYCQQSYSTPRTF GQGTKVEIK
B1103	Delta BT	Singlet	VH1-46	JH3	545	QVQLVQSGAEVKKPGAS VKVSCKASGYTFISHYMH WVRQAPGQGLEWMGIIN PDGGSTTYAQKFQGRVT MTGDSSTSTLYMELSSLR SEDTAVYYCARDGGFIPA AEVFDIWGQGTVVTVSS	VK1-27	JK4	546	DIQMTQSPSSLSASVG DRVTITCRASQGISNYL AWYQQKPGKVPKLLIY AASTLQSGVPSRFSGS GSGTDFTLTISSLQPED VATYYCQKYNSAPLTF GGGTKVEIK
B1104	Delta BT	Singlet	VH1-46	JH4	547	QVQLVQSGAEVKTPGAS VKLSCKASGYTFSNYYIH WVRQAPGQGLEWMGIIN PSGGGTSYAQKFQGRVA MTRDTSTSTVYMKLSSLT SEDTAVYYCAYTSTTVTT SGFDYWGQGTLVTVSS	VL3-21	JL2	548	SYVLTQPPSVSVAPGQ TARITCGENDIGSKSVH WYQQRPGQAPVLVVY DDSDRPSGIPERFSGS NSGNPATLTISRVEAGD EADYYCQVWDSSSDH GHVVFGGGTKLTVL
B1105	Delta BT	Singlet	VH1-69	JH6	549	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSSYAIS WVRQAPGQGLEWMGGII PISGTAYYAQRFQGRVTIT ADKSTSTAYMDLSSLRSE DTAIYYCATLQIVVPAAVP PDGGYYFYYYGMDVWG QGTTVTVSS	VL1-47	JL2	550	QSVLTQPPSASGTPGQ RVTISCSGSSSNIGSNY VYWYQQLPGTAPKLLIY RNNQRPSGVPDRFSG SKSGTSASLAISGLRSE DEADYYCAAWDDSLSG VVFGGGTKLTVL
B1106	Delta BT	Singlet	VH3-15	JH3	551	EVQLVESGGGLVKPGGS LRLSCAASGFSFSDAWM SWVRQTPGKGLEWVGRI KSKIDGGPADYAAPVKGR	VL1-44	JL1	552	QSVLTQPPSASGTPGQ RVTFSCSGRSXNIGSN TVNWYQQLPGTAPKLLI YSNNQRPSGVPDRFSG

							FTISRDDSKNTLYLQMNS LKAEDTAVYYCTTEATVT TWDAFDIWGQGTMVTVS S				SKSGTSASLAISGLQSE DEADYYCASWDDSLN GFVFGTGTKVTVL
B008	B651	Delta BT	Clone	VH3-23	JH4	553	EVQLLESGGDLVRPGGSL RLSCAASGFMFRRYAMN WVRQAPGKGLEWVSGIS GSGDKTCYAESVKGRFTI SRDNSKNTLYLQMSGLKA EDTAIYYCAKGPRSSFDY FESWGQGTLVTVSS	VK1-5	JK1	554	DIQMTQSPSTLSASVG DRVTITCRASQSISNWL AWYQQKPGKAPKLLIY DASSLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQHYNSCPWTF GQGTKVEIK
	B652	Delta BT	Clone	VH3-23	JH4	555	EVQLLESGGGLVQPGGS LRLSCAASGFTFTRYAMN WVRQAPGKGLEWVSGIG GYGGSTNYADAVKGRFTI SRDDSKNTVYLQMNSLR GEDTAVYHCAKGPRSSF DYFDSWGQGTLVTVSS	VK1-5	JK1	556	DIQMTQSPSTLSASVG DRVTITCRASQTISTWL AWYQQKPGRAPKLLIY DASSLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNSYPWTF GQGTKVDI
	B653	Delta BT	Clone	VH1-2	JH2	557	QVQLVQSGAEVKKPGAS VKVSCTASGYTSIDYFMH WVRQAPGQGLEWMGRI NPNSGGTNYAPKFQGRV TMTRDTSINIAYMELSRLR SDDTAVYYCANTGSWRQ ENWYFELWGRGTLVIVSS	VK2-40	JK3	558	DIVMTQTPLSLPVTPGE PASISCRSSQSLLGSDD GNTYLDWYLQRPGQS PQLLIYSLSYRASGVPD RFSGSGSGTDFTLKISR VEAEDVGVYYCMHRIE FPFTFGPGTKVDI
	B654	Delta BT	Clone	VH1-2	JH2	559	QVQLVQSGAEVKKPGAS VKVSCTSSGYTSIDYFVH WVRQAPGQGLEWMGRV NPNSGGTNYAPKFQGRV TMTRDTSINIVYMELSRLR SDDTAVYYCANTGSWRQ ENWYLQLWGRGTLVIVSS	VK2-40	JK3	560	DIVMTQTPLSLAVTPGE PASISCRSSQSLLRSDD GNTYLDWYLQRPGQS PQLLIYSLSYRASGVPD RFSGSGSGTDFTLKISR VEAEDVGIYYCMHRVE FPFIFGPGTKVDI
	B655	Delta BT	Singlet	VH3-53	JH3	561	EVQLVESGGGLIQPGGSL RLSCVASEIIVSSNYMSW VRQAPGKGLEWVSVIYP GGSTFYADSVKGRFTISR	VK1-9	JK5	562	DIQLTQSPSFLSASVGD RVTITCRASQGISSYLA WYQQKPGKAPKLLIYA ASTLQSGVPSRFSGSG

						DSSKNTLSLQMNSLRDED TAMYYCAREGLVGGMLA FDIWGQ				SGTEFTLTISSLQPEDF AIYYCQRLNSSPAEITF GQGTRLEIK
B656	Delta BT	Singlet	VH1-8	JH4	563	QVQLVQSGAEVKKPGAS VKVSCKASGYTFTSYEIIW VRQATGQGLEWMAWMN PNNPNTAYKQKFRGRITL TRDTSRSTAYMELTSLTS EDTAVYFCARVGGLTGAS DYWGQGTLVTVSS	VL3-21	JL1	564	SYVLTQPPSVSVAPGK TARIPCGGNNLGSKNV HWYQQKPGQAPVLVV YDDSDRPSGIPERFSG SNSGNTATLTISRVEAG DEADYYCQVWDGTTD VFYVFGSGTKVTVL
B657	Delta BT	Singlet	VH1-46	JH4	565	QVQLVQSGAEVKKPGAS VKVSCKASGYSFTSYLMH WVRQAPGQGLEWMGIIN PSGGGRTYAQKFQGRVT MTRDTSTGIVYMELSSLR SEDTALYYCAREHGGNSL FDYWGQGTRVTVSS	VK1-39	JK4	566	DIQMTQSPSSLSASVG DRVTITCRASQSISRYL NWYQQKPGKAPNVLIY AASTLQSGVPSRFSGS GSGTDFTLTISGLQPED FATYYCQQSYNSLGVT FGGGTKVEIK
B658	Delta BT	Singlet	VH1-18	JH6	567	QVQLVQSGAEVKKPGAS VKVSCEASGYNFMSYGIS WVRQAPGQGLEWMGWI SVYNDYTHYAQKLQGRV TMTTDTSTSTAYMELRSL RSDDTAVYYCAREGFCS GSNCYRGTYNYYGMDV WGQGTTVTVSS	VK3-11	JK4	568	EIVLTQSPATLSLSPGE RVTLSCRASQSVSSYL AWYQQKPGQAPRLLIY DASNRATGIPARFSGS GSGTDFTLTISSLEPED FAVYYCQQRRDAGSFG GGTKVEIQ
B659	Delta BT	Singlet	VH3-9	JH4	569	EVQLVESGGGLVQPGRS LRLSCAASGFYFDDYAMH WVRQAPGKGLEWVSGIS WNSGTVVYADSVKGRFTI SRDNAQKSLYLQVNSLTV EDTALYYCAKDTRSHNDI LAGYHGIDYWGQGILVIVS S	VK2-28	JK4	570	DIVMTQSPLSLPVTPGE PASISCRSSQSLLHSNG HTYLDWYLQKPGQSPQ LLIYMGSNRASGVPDR FSGSGSGTDFTLKISRV EAEDVGVYYCMQALQT PPTFGGGTKVEIK
B660	Delta BT	Singlet	VH5-51	JH3	571	EVQLVQSGAEVKKPGESL KISCKTSGYNFNIYWIGW VRQMPGKGLKWMGIIFP	VL1-47	JL2	572	QSVLTQPPSASGTPGQ RVTISCSGGSSNIGSNY VYWYQHLPGTAPKLLIY

						GDSDTRYGPSFQGQVTIS TDKSISTAYLQWSSLKAS DTGMYYCARVASPEGFT TGWNGRGPDEAFDIWGQ GTPVTVS				RNDQRPSGVPDRFSG SKSGTSASLAISGLRSE DETDYYCATWDDSLSA GVFGGGTKLTVL
B661	Delta BT	Singlet	VH3-53	JH6	573	EVQLVESGGGLIQPGGSL RLSCAASGLTVSSNYMN WVRQAPGKGLEWVSIIYS GGTTYYAESVKGRFTISR DNSKNTLYLQMNSLRAED TAVYYCAREAYGMDVWG QGTTVTVS	VK1-9	JK5	574	DIQLTQSPSFLSTSVGD RVTITCRASQGISRSLA WYQQKPGKAPKLLIYE TSTLQSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYYCEHLNSYPTFGQ GTRLEIK
B662	Delta BT	Singlet	VH1-2	JH6	575	QVQLVQSGAEVKKPGAS VKVSCKPSGYSFTDYYIH WVRQAPGQGLEWMGWI NPNSGGTNYAQKFQGWV TMTRDMSSSTAYMEMSR LKSDDTAVYYCARGTATT NRYYHYGMDVWGQGTT VIVSS	VL7-46	JL2	576	QAVVTQEPSLTVSPGG TVTLTCGSSTGAVTSG HYPYWFQQKPGQAPR TLIFDTSNKHSWTPARF SGSLLGDKAALTLSGA QPDDEAEYYCLLSYSG AQVFGGGTKLTVL
B663	Delta BT	Singlet	VH4-30-4	JH6	577	QVQLQESGPGLVKPSQT LSLTCAVSGGSISSGYYS WSWIRQPAGKGLEWIGFI DDSGSTHYNPSLKRRVTI SMDTSKNQFSLKLSSVTA ADTAVYYCARDNWNDQR PDYYGMDVWGQGTTVTV SS	VL3-25	JL2	578	SYELTQPPSVSVSPGQ TARITCSGDALPKQYAY WYQQKPGQAPLLVIYK DTERPSGIPERFSGSSS GTTVTLTISGVQAEDEA DYYCQSADSSLVVFGG GTKLTVL
B664	Delta BT	Singlet	VH3-30-3	JH5	579	QVQLVESGGGVVQPGRS LRLSCAASGFTSSLYTMH WVRQAPGKGLEWVAVLL YDGNNKYYADSVKGRFTI SRDNPKNTLYLQMNSLRA EDTAIYFCARAATVGAGS DDHWFAPWGQGTLVTVS S	VL1-40	JL3	580	QSVLTQPPSVSGAPGQ RVTISCAGGSSNIGAFY DVHWYQLLPRTAPKLLI FANTNRPSGVPDRFSG SKSGTSASLAITGLQAE DEATYYCQSYDSSLSG WVFGGGTKLTVL

B666	Delta BT	Singlet	VH5-51	JH4	581	EVQLVQSGAEVKKPGESL KISCKGSGYQFTRNWIAW VRQMPGKGLEWMGTIDP GDSETRYSPSFQGQVTIS VDKSISTAYLQWSSLKAS DTAKYFCARLFCGGDCPL DSWGQGTLVTVSS	VK1-5	JK1	582	DIQMTQSPSTLSASVG DRVTITCRASQSISTWL AWYQQKPGRAPKLLIY DASNLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNSYWTFG QGTKVEVK
B667	Delta BT	Singlet	VH5-51	JH4	583	EVQLVQSGAEIKRPGESL RISCQGSGYSLTNSWIAW VRQMPGKGLEWMGVIYA ADSDTRYSPSFQGHVTIS ADKSISTAYLQWSSLKAS DTAMYYCVRLSSNWYWG SAYWGQGTLVTVSS	VK1-33	JK4	584	DIQMTQSPSSLSASVG DRVTITCQASQDISNYL NWYQQKPGKAPKLLIY DASNLETGVPSRFSGS GSGTDFSFTISSLQPED IATYYCQQYNNLPPTFG GGTKVEIK
B668	Delta BT	Singlet	VH5-51	JH4	585	EVQLVQSGAEVKKPGESL KISCKGSGYIFNRNWIAW VRQMPGKGLEWMGVIDP GDSETRYSPSFQGQVTIS VDKSISTAYLQWSSLKAS DTAMYYCARQLVGGDSS FDFWGQGTLVTVSS	VK1-5	JK2	586	DIQMTQSPSTLSASVG DRVTITCRASQSISSWL AWYQQKPGKAPKLLIY DASNLETGVPLRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNSYPRTF GQGTTLEIK
B669	Delta BT	Singlet	VH3-23	JH4	587	EVQLLESGGSVVQPGGS LRLSCAASGFTFSRYVMS WVRQAPGKGLECVSVIS GDGDGANYADSVKGRFTI SRDNSKNTLFLQMNSLRA EDTAVYYCAKGPRYNWD YFDNWGQGTLVTVSS	VK1-5	JK2	588	DIQMTQSPSTLSASVG DRVTITCRASQSISTWL AWYQQKPGKAPKLLIY DASSLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNSYSSEA FGQGTKLEIK
B671	Delta BT	Singlet	VH3-23	JH4	589	EVQLLESGGGLVQPGGS LTLSCAVSGFTFTNYAVA WVRQAPGKGPEWVSTIK GGGDVTWYVASVRGRFT ISRDNSMNTAFLQMDSLR AEDTAIYYCARDGDYPTD RFDFWGQGTLVVVSS	VL1-40	JL1	590	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAGY AVHWYQQLPGTAPKLLI YSNNNRPSGVPDRFSG SKSGTSASLAITGLLAE DEADYFCQSYDSSLSG SVFGTGTKVTVL

B672	Delta BT	Singlet	VH4-30-4	JH4	591	QVQLQESGPGLVKPSQTLSLTCTVSGGSISSSDYYWSWIRQSPGKGLEWIGYIFYSGNTYYNPSLKSRLVISVDTSKNQFSLRLSSVTAADTAVYYCARDGAMVQGVFDFWGQGILVTVSS	VK3-11	JK4	592	EIVLTQSPATLSLSPGERATLSCKASQSVRNYLAWYQQRPGQAPRLLIYDASLRATGIPARFSGSGSGTDFTLTISSLEPEDFAVYYCQQRYNWPPLTFGGGTKVEIK
B673	Delta BT	Singlet	VH1-46	JH4	593	QVQLVQSGPEVKKPGASVKVSCKASGYTFSNYFIHWVRQAPGQGLEWVGMISPGGAGTSYAQKFQGRVTMTRDTSTNTVYMELTSLRSEDTAVYYCPRADSGSYHFFDYWGQGTLVTVSS	VK1-39	JK5	594	DIQMTQSPSSLSASVGDRVTITCRASQSISSDLNWYQQKPGKAPQLLIYAASILQSGAPSRFSGSGSGTDFTLTISALQPEDFATYYCQQSYSLFPITFGQGTRLEIK
B674	Delta BT	Singlet	VH1-46	JH4	595	QVQLVQSGAEVKKPGASVKVSCKASGNTFNNHYMHWVRQAPGQGLEWMGIISPSGGSTSYTQNYQGRVTVTRDTSTSTVYMELISLRYEDTAVYYCARADSGSYHFLDYWGQGTLVTVSS	VK1-39	JK5	596	DIQMTQSPSSLSASVGDRVTITCRASQSISSSLNWYQQKPGKAPKLLIYAASILQSGVPSRFSGSGSGTEYTLTIDSLQPEDFATYFCQQSHSIPPITFGQGTRLEIK
B675	Delta BT	Singlet	VH5-51	JH4	597	EVQLVQSGTEVKKPGESLKISCQGSGYRFTSYWIAWVRQMPGKGLEWMGIIYPGDSETRYSPSFQGQVTISVDKSISTAYLHWSSMKASDTAMYYCARSMTTNYFDLCGQG	VL2-14	JL2	598	QSVLTQPASVSGSPGQSITIFCTGTSSDVGGYNYVSWYQQHPGKAPKLMIYDVSNRPSGVSNRFSGSKSGNTASLTISGLQAEDEADYYCSSYTSSSTLVVFGGGTKLTVL
B676	Delta BT	Singlet	VH5-51	JH5	599	EVQLVQSGAEVKKPGESLRISCKGSGYRFTSYWIGWVRRVPGKGLEWMGIIYAGDSETRYSPSFQGQVTMSVDKSISTAYLQWSSLKASDTAMYYCARTQTTGWFDLWGQGTLVTVSS	VK1-5	JK2	600	DIQMTQSPSTLSASVGDRXIITCRASQSVSSWLAWYQQKPGRAPKLLIYDASILETGVPSRFSGSGSGTEFTLTISSLQPDDFATYYCQQYSGYSLYTFGQGTKLEIK

B677	Delta BT	Singlet	VH5-10-1	JH4	601	EVQLVQSGAEVKKPGESL RISCKGSGYSFTSHWISW VRQMPGKGLEWMGRIDP SDSYTNYSPSFQGHVTIS GDKSISTVYLQWSSLKAS DSAMYYCVCTLVVVDHTI DYWGQGTLVTVSS	VK3-11	JK2	602	EIVLTQSPATLSLSPGE RATLSCRASQSVSSFL AWYQQKPGQAPRLLIY DASNRATGIPARFSGS GSGTDFTLSISSLEPED FAVYYCQHRSNWPPYT FGQGTKLEIK
B678	Delta BT	Singlet	VH3-53	JH4	603	EVQLVESGGGLIQPGGSL RLSCAVSGLGVNTNYMS WVRQAPGKGLEWVSLIY GGGSTYYADSVKGRFIIS RDNSENTLYLQMNNLTTE DTAVYYCATSSGWYVLR RGGFDYWGQGTLVTVSS	VK3-20	JK2	604	EIVLTQSPGTLSLSPGE RATLSCRASQSIDSRVL AWYQQKPGQAPRLLIY GASSRATGIPDRFSGS GSGTDFTLTISRLEPED FVVYFCQQYGTSPGTF GQGTKLEIK
B679	Delta BT	Singlet	VH3-9	JH4	605	EVQLVESGGGLVQPGRS LRLSCAASGFTFEDYAMH WVRQAPGKGLEWVSGIS WNGGVIDYADSVKGRFII SRDNAKNSLYLQMRRLTA EDTALYYCAKDIDRGNGY DFPLDYWGQGTLVTVSS	VL1-44	JL2	606	QSVLTQPPSASGTPGQ AVTISCSGSSSNIGSNT VNWYQQLPGTAPKLLIY NNHQRPSGVPDRFSG SKSGTSASLAISGLQSE DEANFYCAAWDDRLN GVVFGGGTKLTVL
B680	Delta BT	Singlet	VH3-13	JH5	607	EVQLVESGGGLVQPGGS LRLSCVASGFTFSSYDMH WVRQTTGKGLEWVSLIG TAGDTYYPDSVKGRFTIS RENAKNSLYLQMNSLRAE DTAVYYCARGGYSFGYG GGFFDPWGQGTLVTVSS	VK1-39	JK2	608	DIQMTQSPSSLSASVG DRVTFTCRASQSISRYL NWYQQKPGKAPKLLIH GASSLQSGVPSRFSGS GSGTEFTLTINSLQPED FATYYCQQSYSTPGYT FGQGTKLEIK
B681	Delta BT	Singlet	VH3-23	JH1	609	EVQLLESGGALVQPGGSL RLSCAASGFAFSNYAMS WVRQAPGKGLEWVSAIS GRGDRTYYADSVKGRFT VSRDNSNNTLYLQMKSLR AEDTAVYYCAKDVDTAM VQAEYFQHWGQGTLVTA SS	VK1-5	JK3	610	DIQMTQSPSTLSASVG DRVTITCRASQSVGRW LAWYQQKPGKAPKLLIS DASSLEAGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQCNGHITFG PGTKVDIK

	B682	Delta BT	Singlet	VH3-30	JH4	611	QVQLVESGGGVVQPGRSLRLSCAASGFNFNTYGMHWVRQAAGKGLEWVALISYDGSNEYYADSVKGRFTISRDISKNTVYLQMNSLRAEDTAVYYCAKSIFSYAYPNQYFDYWGQGTLVTVSS	VK1-13	JK4	612	AIQLTQSPSSLSASVGDRVTITCRTSQGISNALVWYQQKPGKAPKLLIYDASSLESGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQFNSYPLTFGGGTKVEIK
	B684	Delta BT	Singlet	VH1-58	JH3	613	QMQLVQSGPEVKKPGTSVKVSCKASGFTFTTSAVQWVRQARGQRLEWIGWIAVGSGNTDYAQKFQERVTITRDLSTSTAYMELRSLRSEDTAVYYCAAPYCSGGTCSDGFDIWGQGTMVTISS	VK3-20	JK1	614	EIVLTQSPGTLSLSPGERATLSCRASQSVRTGYLAWYQQKPGQAPRLFINGASNRATGIPDRFSGSGSGTDFTLTISRLEPEDFAVYYCQQYGTSPWTFGQGTKVEIK
	B685	Delta BT	Singlet	VH1-2	JH3	615	QVQLVQSGAEVKKPGASVKVSCKASGYTFSGHYIYWVRQAPGQGLEWMGRINPNTGDTDSAQKFQGRVTMTRDTSISTAYMELSRLGSDDTAVYYCARVFSRIRALVQGGVATFDIWGQGTMVTVSS	VK1-39	JK1	616	DIQMTQSPSSLSASVGDRVTITCRASQTVSSNLNWYQHKPGKAPKLLIYTASNLQSGVPSRFSGGGSGTDFTLTIASLQPEDFATYYCQQSYSIPPTFGQGTKVEIK
	B686	Delta BT	Singlet	VH3-30	JH3	617	QVQLVESGGGVVQPGRSLRLSCAASGISFSTSVMHWVRQAPGKGLEWVTVISYDGVNNYYADSVKGRFTISRDNSKNTLYLQMNSLRDEDTAVYYCAKSHPIAAGTLFWNAFDIWGQGTMVTVSS	VK1-13	JK4	618	AIQLTQSPSSLSASVGDRVTITCRASQGISSALAWYQQKPGKAPKLLIYDASSLESGVPSRFSGSGSGTDFTLTISSLQPEDSATYYCQQFNTYLTFGGGTKVEIK
B014	B2067	Delta BT	Clone	VH4-31	JH4	619	QVQLQESGPGLVKPSQTLSLTCTVSGGSISSGGYYWHWIRQHPGKGLEWIGSIYYSGSTYYNPSLKSRVTISVDTSKNQFSLKLSSVTA	VK1-33	JK4	620	IRMTQSPSSLSASVGDRVTITCQASQDINKHLSWYQQKPGKAPKLLIYDASDLEAGVPSRFSGSGSGTDFTFTIRTLQPEDIA

							ADTAVYYCARDFGGNAN YFHFWGQGTLVTVSS				TYYCQQNENLPLTFGG GTKVEIK
	B2068	Delta BT	Singlet	VH3-30	JH2	621	QVQLVESGGGVVQPGGS LRLSCAASGFTFDHFHMH WVRQAPGKGLEWVAFIR YHGVGEYYADSVKGRFTI SRDNSKNTLYVQMNSLR VEDTAVYYCAKGGFGASI ASRPDYYFDLWGRGTLV TVSS	VK1-5	JK2	622	DIQMTQSPSTLSASVG DRVTITCRASQSISSWL AWYQQKPGKAPKLLIY KASSLESGVPSRFSGS GSGTEFTLTISSLQPDD FATYYCQQYNSFPYTF GQGTKLEIK
	B2070	Delta BT	Singlet	VH1-69	JH6	623	QVQLVQSGAEVKKPGSS VKVSCKASGGTFSSNVIS WVRQAPGQGLEWMGAII PIFGPANYAQKFQDRVTIT ADESTSTAYMELSSLRSE DTAVYYCARRSQSSSFG PRYYGMDVWGQGTTVTV SS	VK1-33	JK2	624	DIQMTQSPSSLSASVG DRVTITCQASEDINKYL NWYQQKPGKAPKLLIY DASNLETGVPSRFSGS GSGTDFTFTISSLQPED IATYYCQQYDNLPRTFG QGTKLEIK
	B2071	Delta BT	Singlet	VH5-51	JH1	625	EVQLVQSGAEVKKPGESL KISCKGSGYSFTRYWIGW VRQMPGKGLEWMGIIYP GDSDTRYNPSFQGQVTV SADKSIGTAYLQWRSLKA SDTAMYYCARIPHYYDRF GKARAEEYFQYWGQGTL VTVSS	VL1-40	JL3	626	QSVLTQPPSVSGAPGQ RVTISCTGNTSNIGAGF DVHWYQQLPGTAPKLL IYGNTNRPSGVPDRFS ASKSGTSASLAITGLQP EDEADYYCQSCDSSLS TNWVFGGGTKLTVL
	B2072	Delta BT	Singlet	VH1-69	JH5	627	QVQLVQSGAEVKKPGSS VKVSCKASGGTLSTYAIS WVRQAPGQGLEWMGGII PIFGTENHAQKFQGRVTI NADESTSTAYMELSSLRS EDTGVYYCARMPGATYY FDSTGYPTWFGPWGQGT LVTVSS	VK2-30	JK2	628	DVVMTQSPLSLPVTLG QPASISCRSSQSLVYSD GSTYLNWFQQRPGQS PRRLIYKVSNRDSGVP DRFSGSGSGTDFTLKIS RVEAEDVGVYYCMQG TNWPPTFGQGTKLEIK
	B2073	Delta BT	Singlet	VH4-4	JH4	629	QVQLQESGPGLVKPSGT LSLTCAVSGGSISSSNWW	VL1-40	JL3	630	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAGY

						SWVRQPPGKGLEWIGEIY HSGSSNYNPSLESRVTM SVDKSKNHFSLKLSSVTA ADTAVYYCARASYYYGLG SYSQHPYYFDYWGQGTL VTVSS				DVNWYQQLPGTAPKLL IYDNSNRPSGVPDRFS GSKSGTSASLAITGLQA EDEADYYCQSYDNSLG GFWVFGGGTKLTVL
B2074	Delta BT	Singlet	VH3-23	JH1	631	EVQLLESGGGLVQPGGS LRLSCAASGFTFSNYAMN WVRQAPGKGLEWVSAID GSVGSTYYADSVKGRFTI SRDNSKNTLYLQMNSLRA DDTAVYYCAKRRGYYDSI HYRPGPEYFQNWGQGTL VTVSS	VK1-39	JK5	632	DIQLTQSPSSLSASVGD RVTITCRASQSISRYLN WYQQKPGKAPKLLIYA ASSLQSGVPSRFSGSG SGTNFTLTISSLQPEDF ATYYCQQSYSTPPITFG QGTRLEIK
B2075	Delta BT	Singlet	VH3-23	JH1	633	EVQLLESGGGLVQPGGS LRLSCAASGFTFSNYAMN WVRQAPGKGLEWVSAID GSVGSTYYADSVKGRFTI SRDNSKNTLYLQMNSLRA DDTAVYYCAKRRGYYDSI HYRPGPEYFQNWGQGTL VTVSS	VK1-39	JK1	634	DIQLTQSPSSLSASVGD RVTITCRASQSISEYLN WYQQRPGRAPELLIYA ASTLESGVPSRFSGSG YGTDFTLTISSLQPEDF ATYYCQQSYNTPESFG QGTKVEIK
B2076	Delta BT	Singlet	VH3-49	JH2	635	EVQLVESGGRLVQPGRS LRLSCTASGFTFRDYAMS WFRQAPGKGLEWVGFM RSIAFGATIEYAASVKGRF TISRDDSQGIAYLQMNSL KSEDTAVYYCSCSGSGG TVFGNFDLWGRGTLVTV SS	VK2-28	JK4	636	DIVMTQSPLSLPVTPGE PASISCRSSQSLLHSNG YNYLDWYLQKPGQSP QLLIYLGSNRASGVPDR FSGSESGTDFTLKISRV EAEDVGVYYCMQALQT PLTFGGGTKVEIK
B2077	Delta BT	Singlet	VH4-59	JH4	637	QVQLQESGPGLVKPSETL SLTCTVSVGSISSYYWSW IRQPPGKGLEWIGYIYYS GSTNYNPSLKSRVTISVD TSKNQFSLKLSSVTAADT AVYYCARHVLVPPAALGL	VL1-40	JL2	638	QSVLTQPPSVSGAPGQ RVTISCTGSSSNIGAGC DVHWYQHLPGTAPKLLI YGNTNRPPGVPDRFSG SKSGTSASLAITGLQAE

						TPHTYFDTWGQGTLVTV SS				DEADYYCQSYDTSLSG EVVFGGGTKLTVL
B2078	Delta BT	Singlet	VH3-7	JH2	639	EVQLVESGGGLVQPGGS LRLSCRVSGFTFSNYWM SWVRQAPGKGLEWVANI GQDGNEKYYVDSVKGRF TISRDNAKNSLYLQMNSL RAEDTAVYFCVRGMDDP YCSGGSCYNWYFDLWG RGTLVTVSS	VK3-11	JK3	640	EIVLTQSPATLSLSPGE RATLSCRASQSIYSYLA WYQQKPGQAPRLLIYD ASNRATGIPARFSGSG SGTDFTLTISSLEPEDF AVYYCQQRNNWPPRF TFGPGTKVDIK
B2079	Delta BT	Singlet	VH1-69	JH6	641	QVQLVQSGAEVKKPGSS VKVSCKASGDTLRSYAIS WVRQAPGQGLEWMGRII PTLGVTTYAQRFQGRVTF TADKSTSTAYMELSSLRS DDTAVYYCAAPPPYDWR AGSGFHYYGMDVWGQG TTVTVSS	VK2-28	JK4	642	DIVMTQSPLSLPVTPGE PASISCKSSQSLLHGNG YNYLDWYLQKPGQSP QLLIYLGSNRASGVPDR FSGSGSGTDFTLKISRV EAEDVGVYYCMQALET PLTFGGGTKVEIK
B2080	Delta BT	Singlet	VH1-2	JH1	643	QVQLVQSGAEVKKPGAS VKVSCKASGYTFSGYYM NWVRQAPGQGLEWMGW INPNSGGTNYAQKFQGR VTMTRDTSISTAYMELSR LTSDDTAVYYCARPTGDS QREMGTIIGEYFQHWGQ GTLVTVSS	VL3-25	JL2	644	SYELTQPPSVSVSPGQ TARITCSGDVLPKQHAY WYQQKPGQAPVLVIYK DSERSSGIPERFSGSS SGTTVTLTISGVQAEDE ADYYCQSADSRYVVFG GGTKLTVL
B2081	Delta BT	Singlet	VH4-39	JH3	645	QLQLQESGPGLVKPSETL SLTCTVSGGSITSSSYYW AWIRLPPGKGLEWIGSVF YSGITYYSPSLKSRVTISV DTSKNQFSLNLSSVTAAD TAVYYCARWPRDFSDSS GYYHHAFDIWGHGTMVT VSS	VL2-23	JL2	646	QSALTQPASVSGSPGQ SITISCTGTSSDVGSYD LVSWYQRHPGQAPKL MIYEVTKRPSGVSNRF SGSKSGNTASLTISGLQ AEDEADYYCCSYAGR WFFGGGTKLSVL
B2082	Delta BT	Singlet	VH3-66	JH3	647	EVQLVESGGGLVQPGGS LRLSCAASGITVSSNYMS	VK1-9	JK4	648	DIQLTQSPSFLSASVGD RVTITCRASQGISSYLA

						WVRQAPGKGLERVSVIYS GGSTFYADSVKGRFTISR DNSKNTLYLQMKSLRAED TAVYYCARDVSDAFDIWG QGTMVTVSS				WYQQKPGKAPKLLIYA ASTLQSGVPSRFSGSG SGTEFTLTISSLQPEDL ATYYCQQLNSLPPKLTF GGGTKVEIK
B2083	Delta BT	Singlet	VH1-2	JH6	649	QVQLVQSGAEMKKPGAS VKVSCKASRYTFTGYYIH WVRQAPGQGLEWMGWI NPDSGGVNYAQKFQGRV TMTRDTSINTAYMELSSL RSDDTAVYYCATHVLRSC SGGTCYEYYYYGMDVW GQGTTVTVSS	VL2-23	JL3	650	QSALTQPASVSGSPGQ SITISCTGTNSDVGAYD LVSWYQQHPDKAPKLII YEVTKRPSGVSNRFSG SKSGNTASLTISGLQAD DEADYFCCSFTGRSAS FWVFGGGTKLTVL
B2084	Delta BT	Singlet	VH3-7	JH4	651	EVQLVESGGALVQPGGS LRLSCVTSGFTLSDYWM NWVRQAPGKGLEWVALI KKDGSETKYVDSLRGRFT ISRDNAKNSLYLQMDSLR VDDTAVYYCVAGAGWLP DYWGQGTLVTVSS	VL1-51	JL3	652	QSVLTQPPSVSAAPGQ KVTISCSGSSSNIGNNY VSWYQQLPGTAPKLLIY ENNKRASGIPDRFSGS KSGTSATLGITRLQSGD EADYYCGTWDSNLSAS WVFGGGTKLTVL
B2085	Delta BT	Singlet	VH1-69	JH6	653	QVQLVQSGAEVKKPGSS VKVSCKASGDTFNRYAIS WVRQAPGQGLEWMGRII PISGIANYAQKFQGRVTIT ADKSTSTAYMELSSLRSE DTAVYYCARYPVTTGFYY YAMDVWGQGTTVTVSS	VK1-39	JK2	654	DIQLTQSPSSLSASVGD RVTITCRASQSISSYLN WYQQKPGKAPKLLIYA ASSLQSGVPSRFSGSG SGTDFTLTISSLQPEDF ATYYCQQSYSAPTFGQ GTKLEIK
B2086	Delta BT	Singlet	VH3-33	JH4	655	QVQLVESGGGVVQPGRS LRLSCAVSGFTFSKYGMH WVRQAPGKGLEWVAVIW YDGSNKYYVDSVKGRFT TSRDNSKNTLYLQMSSLR ADDTAVYYCVKAGYSYAY TPYYFDYWGQGTLVTVS S	VK1-33	JK4	656	IRMTQSPSSLSASVGD RITITCQASQDIRKYLN WYQQKPGKAPKLLIYD ASDLETGVPSRFSGSG SGTDFTLTISNLQPEDF ARYYCQQNDNLPLTFG GGTKVEIK

B2087	Delta BT	Singlet	VH3-9	JH4	657	EVQLVESGGGLVQPGRSLRLSCAASGFTFDNHAMHWVRQAPGKGLEWVSGVSWNSGTIGYADSVKGRFIIIRDNAKNSLYLQMNRLRPEDTALYYCAKDGSFLDTDHFYFDYWGQGTLVTVSS	VL1-51	JL2	658	QSVLTQPPSVSAAPGQKVTISCSGTSSNIGNNYVSWYQQLPGIAPKLLIYDNNKRPSGIPDRFSGSKSGTSATLGITGLQTGDEADYYCGTWDSGLSAVVFGGGTKLTVL
B2088	Delta BT	Singlet	VH4-31	JH4	659	QVQLQESGPGLVKPSQTLSLTCTVSGGSISSSDYYWSWVRQRPGKGLEWIGYAYYTGITYYNPSLKSRLTISVDTSKNQFSLRLSSVTAADTAVYYCARIGRPFGVVPGFDNWGQGTLVTVSS	V:2-23	JL2	660	QSALTQPASVSGSPGQSTTISCTGTSGDVGSYDLVSWYQHHPGKAPKLMIYEVTKRPSGVSNRFSGSKSGNTASLTISGLQAEDEADYYCCSYAGSSAVIFGGGTKLTVL
B2089	Delta BT	Singlet	VH3-30	JH4	661	QVQLVESGGGVVQPGRSLRLSCEASGFSFSTHGMHWVRQAPGKGLEWVALIYFDGKKTKYSDSVKGRFTVSRDNSRNTLFLQMTRLRTEDTAVYYCAREGEVTLIVGNYFDYWGQGTLVTVSS	VK1-39	JK2	662	DIQMTQSPSSLSASVGDRVTITCRASQYISNYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQSYTNPLYTFGQGTKLEIK
B2090	Delta BT	Singlet	VH3-13	JH2	663	EVQLVESGGGLVQPGGSLRLSCAASGFTFSSYDMHWVRQETGKGLEWVSAIGTAGDTYYLGSVKGRFTISRENAKNSLYLQMNSLRAGDTAVYYCARAGNGYNLGSWYFDLWGRGTLVTVSS	VK1-39	JK5	664	DIQLTQSPSSLSASVGDRVTITCRASQFISSYLNWYQQKPGKAPKLLIYAASTLQSGVPSRFSGGGSGTDFTLTISSLQREDFATYYCQQSYSMPPISFGQGTRLEIK
B2091	Delta BT	Singlet	VH3-66	JH6	665	EVQLVESGGGLVQPGGSLRLSCAASGITVSSNYMSWVRQAPGKGLEWVSVIYSGGSTFYADSVKGRFSISRDNSNNTLHLQMNSLRVEDTAVYYCARDLVVWGMDVWGQGTTVTVSS	VK1-5	JK1	666	DIQMTQSPSTLSASVGDRVTITCRASQSISSWLAWYQQKPGKAPKLLIYKASSLESGVPSRFSGSGSGTEFTLTISSLQPDDFATYYCQQYNSYTWTFGQGTKVEIK

B2092	Delta BT	Singlet	VH3-48	JH6	667	EVQLVESGGGLVQPGGSLRLSCAASGFTFSSFNMNWVRQAPGKGLEWVSYISTSGSTIYYADSVEGRFSISRDNAKNSLYLQMNSLRDEDTAVYYCARGVGPRSYYYYGMDVWGQGTTVTVSS	VK1-39	JK5	668	DIQMTQSPSSLSASVGDRVTITCRASQSISSFLNWYQQKPGKAPNLLIYAASSLASGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQSYSTLPITFGQGTRLEIK
B2093	Delta BT	Singlet	VH3-33	JH4	669	QVQLVESGGGVVQPGNSLRLSCAASGFTFSTYGMHWVRQAPGKGLEWVAIIWYDGNNKFYGDSVKGRFTISRDNSKNKLYLQMNSLRAEDTAVYYCARSGIRFSEWLLQDYWGQGTLVTVSS	VK3-20	JK2	670	EIVLTQSPGTLSLSPGERATLSCRASQSISISYLAWYQQKPGQAPRLLIYGASSRATGIPDRFSGSGSGTDFTLTISRLEPEDFAVYYCQQFGSTRATFGQGTKLEIK
B2094	Delta BT	Singlet	V4-59	JH2	671	QVQLQESGPGLVKASETLSLTCTVSGDSISRYYWSWIRQPPGKGLEWIGYIYDSRSTNYNPSLKSRVTISIDTSKNHFSLKLSSVTAADTAVYYCARHEVLTAILPYFDLWGRGTLVTVSS	VK1-39	JK3	672	DIQMTQSPSSLSASVGDRVTITCRASQSINRYLNWYQQKPGKAPKLLIYAASTLQSEVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQSYSPRGITFGPGTKVDVK
B2095	Delta BT	Singlet	VH4-59	JH2	673	QVQLQESGPGLVKASETLSLTCTVSGDSISRYYWSWIRQPPGKGLEWIGYIYDSRSTNYNPSLKSRVTISIDTSKNHFSLKLSSVTAADTAVYYCARHEVLTAILPYFDLWGRGTLVTVSS	VL6-57	JL2	674	NFMLTQPHSVSESPGKTVTISCTRSSGSIDSNYVQWYQQRPGSAPTTVIFEDNQRPSGVPDRFSGSIDTSSNSASLTISGLKTEDEADYYCQSYDSSIHVVFGGGTKLTVL
B2096	Delta BT	Singlet	VH3-53	JH4	675	EVQLVESGGGLIQPGGSLRLSCAASGLTVSSNYMSWVRQAPGKGLEWVSVIYSGGSTFYSDSVKGRFTISRDNSKNTLYLQMNSLRAEDTAVYYCARDRKENYFDYWGQGTLVTVSS	VL2-14	JL1	676	QSALTQPASVSGSPGQSIIISCTGTSSDVGGFHYVSWYQQHPGKAPKLMIYDVSNRPSGVSNRFSGSKSGNTASLTISGLQPEDEADYYCSSYTSGSTLFYVFGTGTKVTV

Table 2 (continued)

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
B030	B2000	Omicron BT	Singlet	VH5-51	JH3	677	GAGGTGCAGCTGGTGCAGTCTGGAGCAGAGGTGAAAAAGCCGGGGGAGTCTCTGAAGATCTCCTGTAAGGGTTTTGGATACAGCTTTAGCAACTACTGGATCGCCTGGGTGCGCCAGATGCCCGGGAAAGGCCTGGAGTGGATGGGGATCATCTATCCCGAGGACTCTGATACCAGAGACAGTCCGTCCTCCCAAGGCCAGGTCACCATGTCAGTCGACAAGTCCACCAGTACCGCCTACCTGCAGTGGAGCAGCCTCAAGGCCTCGGACACCGCCATGTACTATTGTGTGAGACGGTCCGGCCATTTGATTTGGCATGGTTTTGATATCTGGGGCCAAGGGACAATGGTCACCGTCTCTTCAG	VK1-16	JK1	678	GACATCCAGTTGACCCAGTCTCCATCCTCACTGTCTGCATCTGTTGGAGACAGAGTCACCGTCACTTGTCGGGCGAGTCAGGGCATTAACTATTTTTTAGCCTGGTTTCAGCAGAAACCAGGAAAAGCCCCTAAGTCCCTGATCTATGCTGCATCCAGTTTGCAAAGTGGGGTCCCATCAAGGTTCAGCGGCAGTGGATCTGGGACAGATTTCACTCTCACCATCAGCAGCCTGCAGCCTGAAGATTTTGCAACTTATTTCTGCCTACAGTATTATAGTTACCCCTGGACGTTCGGCCCAGGGACCAAGGTGGAGATCAAAC
	B2002	Omicron BT	Singlet	VH3-23	JH1	679	GAGGTGCAGCTGTTGGAGTCTGGGGGGGGCCTTGGCACAGCCGGGGGGGTCCCTGAGACTCTCCTGTGCAGCCTCTGGATTCCCCTTTA	VK1-5	JK4	680	GACATCCAGATGACCCAGTCTCCTTCCACCCTGTCTGCCTCTGTAGGAGACAGAGTCACCATCACTTGCCGGGCCAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GCACCTATGCCATGA GCTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC CGGTATTAGTAGTAG GGGTGGTAGAACATA CAACGCAGACTCCGT GAAGGGCCGGTTCA CCATTTCCAGAGACA ATTCCAAGAACACAC TGTATCTGCAAATGA ACAGCCTGAGAGCC GAGGACACGGCCGT ATATTACTGTGCGAG AGATGAAATCCTGCA CGGTGACAACCCGG AATACTTCCAGCACT GGGGCCAGGGCACG CTGGTCACCGTCTCC TCAG				TCAGACTATAAAT AGCTGGTTGGCCT GGTATCAGCAGAA GCCAGGGAAAGC CCCTACCCTCCTG ATCTATGATGCCT CCAGTTTGAAAAG TGGGGCCCCATCT AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCATTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGTCAACAAT ATCACAGTTATTC TCCGCTCACTTTC GGCGGAGGGACC AAGGTGGAGATCA AAC
	B2003	Omicron BT	Singlet	VH3-23	JH4	681	GAGGTGCAGCTGTTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG GGGGTCCCTGACACT CTCCTGTGCAGCCTC TGGATTCAGCTTTAG CAACTATGCCATGAC CTGGGTCCGCCAGC CTCCAGGGAAGGGG CTGGAGTGGGTCTCA GGCATTGGTGGTTAT GGCGGTGACACATAC TACGCAGACTCCGTG AAGGGCCGATTCACC	VK1-5	JK2	682	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAAGAGACA GAGTCTCCATCAC TTGCCGGGCCAG TCAGAGTATTGGT AGTTGGGTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAACTCCTG ATCTATGATGCCT CCAATTTGGAAAG TGGGGTCCCATCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTCTCCAGAGACGAT TCCAAGAACACACTA TATCTGCACATGAAC AACCTGAGAGCCGAG GACACGGCCCTATAT TACTGTGCGAAAGGC GTGAGGAGCAACTCG GACTACTTTGAATACT GGGGCCAGGGAACC CTGGTCACCGTCTCC TCAG				AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCAGATG ATTTTGCAACTTAT TACTGCCAGCACT ATAATAGTTATTC GGCAACTTTTGGC CAGGGGACCAAG CTGGAGATCAAAC
	B2004	Omicron BT	Clone	VH4-30	JH4	683	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CACAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGGCTCCGTCA GAAGTGGTGGTTACT ACTGGAGTTGGATCC GTCAGCCCCCAGGG AAGGGCCTGGAGTG GATTGGGTACATCTA TTACAGTGGGAATAC GTTCTACCTTCCGTC CCTCCAGAGTCGAGT TACCATATCAGTAGA CATGTCCAAGAACCA GTTCTCCCTGAGGCT GAGCTCTGTGACTGC CGCGGACACGGCCG TTTATTACTGTGCCA GGGATCAGCACGAGT CTCACTATGGTTCAG GGCCATCGGGTCGG	Vk1-33	JK4	684	GCCATCCGGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAACA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGGTCCTGA TCTACGATGCGTC CAATTTGGAAACG GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCAGCAACCTA CAGCCTGAAGATA TTGCAACATATTA CTGTCAACAGTAT GATAATCTCCCAC TCACTTTCGGCGG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATTGACTCCTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG				AGGGACCAAGGT GGAAATCAAAC
	B2005	Omicron BT	Singlet	VH3-9	JH3	685	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCGG TGGATTCACCTTTGA TGATTATGCCATGCA CTGGGTCCGGCAAG GTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTATTGCTTGGAAT AGTGGTACCTTAGGC TATGCGGCCTCTGTG CAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAGAAGTCCGTG TATCTGCACATGAAC AGTCTGAGAACTGAG GACACGGCCTTCTAT TTCTGTGTAAAAGATA GGACCAACGGTGAC CCACAAGGCGATGCT TTTGATATGTGGGGC CAAGGGACAATGGTC ACCGTCTCTTCAG	VL3-21	JL2	686	TCCTATGAGCTGA CTCAGCCACCCTC GGTGTCAGGGGC CCCAGGACAGAC GGCCAGGATTACC TGTGGGGGAAAC AACATTGGAAGTA AAAGTGTGCATTG GTACCAGCAGAAG CCAGGCCAGGCC CCTGTTCTGGTCG TCTATGATGACAA CGACCGACCCTCA GGGATCCCTGAG CGATTCTCTGGCT CCAACTCTGGGAA CAGGGCCACCCT GACCATCAGCAG GGTCGAAGCCGA GGATGAGGCCGA TTATTACTGTCAG GTGTGGGATAGTA GTAGTGAACATGT GCTATTCGGCGGA GGGACCAAGCTG ACCGTCCTAG
	B2006	Omicron BT	Clone	VH5-51	JH4	687	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCGG GGGAGTCTCTGAAGA TCTCCTGTAAAGGTT	VK1-5	JK2	688	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TTGGCAGCAGTTTTA CCAACTACTGGATCG GCTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG GGAGCGTCTATGCCG GTGACTCTGATACCA GATATAGTCCGTCCT TCCAAGGCCAGGTCA CCGTGTCAGCCGACA AGTCCATCACCACCG CCTACCTACAATGGA CCAGCCTAAAGGCCT CGGACACCGCCATGT ATTTCTGTGCGCGGG CCAGTCAGGGGAACT ACTTTGACTTCTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				CTGCCGGGCCAG TCAGAGTATTAGT AGGTGGTTGGCCT GGTATCAGCAGAA ACCAGGAAAAGCC CCTAAGCTCCTGA TCTATGATGCCTC CATTTTGGAAAGT GGGGTCCCCTCA AGGTTCAGCGGC AGTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTATGCAACTTAT TACTGCCAACAAT TTTATAGTAATTTG TACACTTTTGGCC AGGGGACCAAGC TGGAGATCAAAC
	B2007	Omicron BT	Singlet	VH3-64D	JH4	689	GAGGTGCAGCTGGT GGAGTCTGGGGGAG ACTTGGTCCAGCCTG GCGAGTCCCTGAGAC TCTCCTGTTCAGACT CTGGACTCACCTTCA GAACACATGGTTTCT ATTGGGTCCGCCAGG CTCCAGGGCAAGAGAC CGGAATATATTTCCG GCATAAGTAATAATG GAGATGCGACATATT ATGCAGACTCAGTGA AGGGCAGATTCACCG	VK1-33	JK5	690	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAGCA ACTCTTTAAATTG GTATCAGCAGAAA CCAGGGAGAGCC CCTAAGCTCCTGA TCTACGATGCATC CCATTTGCAAACA GGGGTCCCATCAA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCTCCAGAGACAATTCCAAGAACACTCTGTTTCTTCAAATGAACAGTCTGAGTGTCGACGACACGGCTGTCTATTATTGTGTGAAGGGTCGGGTTGACTACTGGGGCCAGGGAACCCTGGTCACCGTCTCCTCAG				GGTTCAGTGGAAGTGGATCTGGGACAAATTTTACTTTCACCATCAGCGGCCTGCAGCCTGAAGATATTGCAACATATTACTGTCAAGAGTATTATGATTCAATCACCTTCGGCCAAGGGACACGACTGGAGATTAAAC
	B2008	Omicron BT	Clone	VH1-58	JH3	691	TGCAGCTGGTGCAGTCTGGGCCTGAGATAAAGAAGCCTGGGACCTCAGTGAAGGTCTCCTGCAAGGCCTCTGGATTCACCTTTAGTAACTCTGCTGTGCAGTGGGTGCGACAGGCTCGTGGACAACACCTTGAGTGGATAGGATGGATCGTCGTTGGCAGTGGTGACCCAAACTACGCACAGAAGTTCCAGGAAAGAGTCACCCTTACCAGGGACATGTCCACAGGCACAGCCTACATGGAGCTGAGCAGCCTGAGATCCGAGGACACGGCCTTTTATTACTGTGCGACAAATAATTGTAGTAGAACCATCTGCTCTGATGGTTTTGATATCTGGGGCCAAGGGA	VK1-5	JK1	692	GACATCCAGATGACCCAGTCTCCTTCCACCCTGTCTGCATCTGTGGGAGACAGAGTCACCATCACTTGCCGGGCCAGTCAGAGTTTAACTAGTTGGTTGGCCTGGTATCAGCAGAAACCAGGGAAAGCCCCTAACCTCCTGATCTATGATGCCTCCATTTTGGATAGTGGGGTCCCATCAAGGTTCAGCGGCAGTGGATCTGGGACCGAATTCACTCTCACCATCAGCAGCCTGCAGCCTCAGGATTTTGCAACCTATTACTGCCAACAGTATAAGGGTTATCCGTGGACCTTCG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CAATGGTCACCGTCT CTTCAG				GCCAAGGGACCA AGGTGGAAATCAA AC
	B2009	Omicron BT	Singlet	VH1-8	JH4	693	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTCAAGAAGCCTG GGGCCTCAGTGAAAG TCTCCTGCAAGGCTT CTGGATACGCCTTCA CCAATTATGCGATCA GCTGGGTGCGACAG GCCACTGGACAAGG GCTTGAGTGGATGGG ATGGATGAGCCCTCA AGATGGTGACACTGG CTATGCTCAGAAGTT CCAGGGCAGAGTCA CCATGACCAGCGACA CCTCCATAAGCACTG CCTACATGGAGCTGA GCGGCCTCACATCTG AGGACACGGCCCTTT ATTACTGTGCGAGAG GCCCACGTACCAACT CGGACTACTTTGACT TCTGGGGCCAGGGA ACCCTGGTCACCGTC TCCTCAG	VK1-5	JK3	694	GACATCCAGATGA CCCAGTCTCCTTC CCCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGACTATTAGT ACCTGGTTGGCCT GGTATCAGCAGAA ACCAGGTCAAGCC CCTAAGCTCCTGA TCTATGATGCCTC AAGTTTGGAAAGT GGGGTCCCATCG AGATTCAGCGGCA GTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAGT ATAATAATTATCCC TTTACTTTCGGCC CTGGGACCAAAGT GGATATCAAAC
	B2010	Omicron BT	Singlet	VH1-58	JH3	695	TGCAGCTGGTGCAGT CTGGGCCTGAGATAA AGAAGCCTGGGACCT CAGTGAAGGTCTCCT GCAAGGCCTCTGGAT TCACCTTTAGTAACTC	VK1-39	JK4	696	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCG TCTGTTGGGGACA GAGTCACCATCAG TTGCCGGGCAAGT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TGCTGTGCAGTGGGT GCGACAGGCTCGTG GACAACACCTTGAGT GGATAGGATGGATCG TCGTTGGCAGTGGTG ACCCAAACTACGCAC AGAAGTTCCAGGAAA GAGTCACCCTTACCA GGGACATGTCCACAG GCACAGCCTACATGG AGCTGAGCAGCCTGA GATCCGAGGACACG GCCTTTTATTACTGTG CGACAAATAATTGTA GTAGAACCATCTGCT CTGATGGTTTTGATAT CTGGGGCCAAGGGA CAATGGTCACCGTCT CTTCAG				CAGACCATTAACA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CACTTTGCACAGG GGGGTCCCATCTA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTAGCC CTCCACTCACTTT CGGCGGAGGGAC CAAGGTGGAGATC AAAC
	B2011	Omicron BT	Singlet	VH4-39	JH4	697	CAGCTGCAGCTGCAG GAGTCGGGCCCAAG ACTGGTGAAGCCCTC GGAGACCCTGTCCCT CACCTGCACTGTCTC TGGTGGCCCCACCAT CAGCAGTAGTAACTA CTGGGGCTGGATCC GACAGCCCCCAGGG AAGGGGCTGGAATG GATTGGGAGTGTCTA TTATAGTGGGGACAC CTCCTACAACCCGGC CCTTCAGAGTCGAGT	VK1-5	JK2	698	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT ACCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAGAGC CCCTAAGCTCCTG ATCTATGATGCCT CCAATTTGGAAAG TGGGGTCCCATCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CACCATATCCGTAGA CACCTCCAAGAACCA GTTCTCCATGAAGCT GACCTCCGTGACCGC CGCAGACACGGCTGT CTATTATTGTGCAAAA CTTTTCTGTGGTGGT CATTGCCCCCTTGAG TACTGGGGCCAGGG AACCCTGGTCACCGT CTCCTCAG				AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAATAGC CTGCAGGCTGATG ATTTTGCAACTTAT CACTGCCACCAGT ATAGCAGTTCTTC CCAAACTTTTGGC CAGGGGACCAAG CTGGAGATCAAAC
	B2012	Omicron BT	Singlet	VH1-58	JH3	699	TGCAGCTGGTGCAGT CTGGGCCTGAGATAA AGAAGCCTGGGACCT CAGTGAAGGTCTCCT GCAAGGCCTCTGGAT TCACCTTTAGTAACTC TGCTGTGCAGTGGGT GCGACAGGCTCGTG GACAACACCTTGAGT GGATAGGATGGATCG TCGTTGGCAGTGGTG ACCCAAACTACGCAC AGAAGTTCCAGGAAA GAGTCACCCTTACCA GGGACATGTCCACAG GCACAGCCTACATGG AGCTGAGCAGCCTGA GATCCGAGGACACG GCCTTTTATTACTGTG CGACAAATAATTGTA GTAGAACCATCTGCT CTGATGGTTTTGATAT CTGGGGCCAAGGGA	VK1-33	JK5	700	GCCATCCGGATGA CCCAGTCTCCGTC CTCCCTGTCTGCA TCTGTGGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAATA ATTATTTAAATTGG TATCAGCAGAAAC CAGGGAGAGCCC CTAAGCTCCTGAT CTACGATGCATCC AATTTGGAAACAG GGGTCCCATCAAG GTTCAGTGGAAGT GGATCTGGGACA GAATTTACTTTCA CCATCAGCAGCCT GCAGCCTGAAGAT ATTGCAACATATT ACTGTCAGCAATA TGATAATCTCCCG ATCACCTTCGGCC

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							CAATGGTCACCGTCT CTTCAG				AAGGGACACGACT GGAGATTAAAC
	B2014	Omicron BT	Singlet	VH1-46	JH4	701	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGTTGAAGAGGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCT TCTGGATACACCTTC AGCGACTACCATATG AACTGGGTGCGACAG GCCCCCGGACAAGG GCTTGAGTGGATGGG AATAATCAACCCTAG TGGTGGTGGCGCAA GCTACCCACAGAAGT TCCAGGGCAGAGTCA CCATGACCAGGGACA CGTCCACGAGCACAG TCTTCATGCAACTGA ACAGCCTGACATATG AAGACACGGCCGTTT ATTATTGTGCGAGAG GCACACCCCCTAGCC GTGGCTGGTATGGG GGCTTTGACAATTGG GGCCAGGGAACCCT GGTCACCGTCTCCTC AG	VL1-40	JL1	702	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GATCACCATCTCC TGCACTGGGAGC ACCTCCAACATCG GGGCGGGTTATG ATGTGCAGTGGTA CCAGCAGCTTCCA GGAACAGCCCCC AAACTCCTCATCT TTGATAACAACAA TCGCCCCTCAGG GGTCCCTGACCG ATTCTCTGGCTCC AAGTCTGGCACCT CAGCCTCCCTGG CCATCACTGGTCT CCAGGCTGAGGA TGAGGCTGATTAT TACTGCCAGTCCT TTGACAGTACCCT GAGTGGTTCGACT TTTGTCTTCGGAC CTGGGACCAAGG TCACCGTCCTAG
	B2097	Omicron BT	Singlet	VH3-7	JH4	703	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGCGCAGCC	VK1-39	JK1	704	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCTGGATTCACGTTT AATATGTATTGGATG ACCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTG GCCAACATAGAGCCA GATGGAAGTGACAAA GACTATGGGGAATCT GTGAAGGGCCGATTC ACCATCTCCAGAGAC AACGCCAAGAACTCA CTGTATCTGCAAATG AACAGCCTGAGAGCC GAGGACTCGGCTGT GTATTACTGTGCGAC TGAGGCGATGGGAG TGGGACCTACTTCCG GCGGCTTTGACTCCT GGGGCCAGGGAACC CTGGTCACCGTCTCC TCAG				TTGCCGGGCAAGT GAGGGCATAAGTA GTTATTTAAATTG GTATCAACAGAAA TCAGGGAAAGCC CCTAAGCTCCTGA TGTATGCTGCATC CAGTTTACAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACACTACCC CTCGGACGTTCG GCCAAGGGACCA AGGTGGAAATCAA AC
	B2098	Omicron BT	Singlet	VH3-23	JH4	705	GAGGTGCAGCTGTTG GAGTCGGGGGGAGC CTTGGTACAGCCTGG GGGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTAG CACCTATGCCATGAG CTGGGTCCGCCAGG CTCCAGGGAAGGGG CTGGAGTGGGTCTCA GGTCTTACCAGTAGT GGTGGTCGGCCATAC TACGCAGACTCCGTG	VK4-1	JK5	706	GACATCGTGATGA CCCAGTCTCCAGA CTCCCTGGCTGTG TCTCTGGGCGAGA GGGCCACCATCAA CTGCAAGTCCAGC CAGAGTGTTTTAT ACACCTCCAATAA TAAGAACTACTTA GCTTGGTTCCAGC AGAAACCAGGACA GCCTCCTAAGCTG CTCATTTACTGGG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							AAGGGCCGGTTCACC GTCTCCAGAGACATT TCCAAGAACACACTG TATCTGCAAATGAAC AGCCTGAGAGTCGAG GACACGGCCGTTTAT TATTGTGCGAAAGAT CGAGGGTCCTATAGT GGCTACGATTTTTTG TCTGACTCCTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG				CATCTACGCGGGA ATCCGGAGTCCCT GACCGATTCAGTG GCAGCGGGTCTG GGACAGATTTCAC TCTCACCATCAGC AGCCTGCAGGCT GAAGATGTGGCA GCTTATTACTGTC AGCAATATTACAA TACTCCGATCACC TTCGGCCAAGGG ACACGACTGGAGA TTAAAC
	B2099	Omicron BT	Singlet	VH3-48	JH4	707	GAGGTGCAGCTGGT GGAGTCTGGGGGAG ACTTGGTACACCCTG GGGAGTCCCTGACAC TCTCCTGCGCAGCCT CTGGATTCACCTTCA GTAGCTATAGCATGA ACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTTTC ATACGTCAGTAGTAG TGCTACAACCATATA CTATGCAGAATCTGT GAAGGGCCGATTCAC CATCTCCAGAGACAA TGCCAAGAACTCTCT GTATCTGCAAATGAA CAGCCTGAGAGACGA GGACATGGCTGTTTA TTACTGTGCGAGAGA	VK1-5	JK2	708	GACATCCAGATGA CCCAGTCCCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT AGCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTCTGATGCCT CCAATTTGGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAGTTCACTCT CAGCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TAGGACCCCGTTTTA CGATGCTTGGAATGG TTGGGGTCCACTTGA CTATTGGGGCCAGG GAACGTGGGTCACG GTCTCCTCAG				TACTGCCAACAGT ACAATAGTTATCG GTACACTTTTGGC CAGGGGACCAAG CTGGAGATCAAAC
	B2100	Omicron BT	Singlet	VH3-33	JH6	709	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCCTAGTGCAGCCCT CACAGAGCCTGTCCA TCACCTGCACAGTCT CTGGTTTCTCATTGA CTACCTATGGTGTAC ACTGGGTTCGCCAGT CTCCAGGAAAGGGTC TGGAGTGGCTGGGA GTGAAATGGAGTGGT GGAAGCACAGACTAT AATGCAGCTTTCATAT CCAGACTGAGCATCA CCAAGGACAATTCCA AGAGCCAAGTTTTCT TTAAAATAAACAGTCT GCAAGCTGATGACAC AGCCATATATTACTGT GCCAGAGGGGATTAC GACCCGTATTACTAT GCTATGGACTACTGG GGTCAAGGAACCTCA GTCACCGTCTCCACA GCCATATATTACTGT GCCAGAGGGGATTAC GACCCGTATTACTAT GCTATGGACTACTGG	VL1-40	JL1	710	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATTTCC TGCACTGGGAGC AGCTCCAACATCG GGGCAGGTTCTG ATGTACACTGGTA CCAGCAGTTTCCA GGAACAGCCCCC AAACTCCTCATCT ATGGTAGCACCCA TCGGCCCTCAGG GGTCCCTGACCG ATTCTCTGGCTCC AAGTCTGGCACCT CAGCCTCCCTGG CCATCACTGGGCT CCAGGCTGAGGA TGAGGCTGATTAT TACTGCCAGTCCT ATGACAGCAGCCT GAGTGCCCCTTAT GTCTTCGGAACAG GGACCAAGGTCA CCGTCCTAG

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							GGTCAAGGAACCTCA GTCACCGTCTCC				
	B2101	Omicron BT	Singlet	VH4-38	JH3	711	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGAGACCCTGTCC GTCACGTGCGCTGTC TCAGGTTACTCCATC AGCAGTAGTTACTAC TGGGGCTGGATACG GCAGTCCCCCGGGA GGGGCCTGGAGTGG ATTGGGAGTATCTAT CACAGTGGGACCACC TACCACAACCCGTCC GTCAAGAGTCGACTC ACCATATCAGTAGAC ACGCCCACGAACCAG TTCTCCCTGACCCTG AGGTCTGTGACCGCC GCAGACACGGCCAT GTATTATTGTGCGAG TAATTCCGGCCAAGT GGTGATAGGTGCTTT TGATATCTGGGGCCA AGGGACAATGGTCAC CGTCTCTTCAG	VK3-20	JK4	712	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCTGGGGAA AGAGCCACCCTCT CCTGCAGGGCCA GTCAGAGTGTTCG CAACAGCTACTTA GCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGCATCCCGCAG GGCCACTGACATC CCAGACAGGTTCA GTGGCAGTGGGT CTGGGACAGACTT CACTCTCACCATC AGCAGACTGGAG CCTGAAGATTTTG CAGTGTATTACTG TCAGCACTATGGT GACTCACCTCTCA CTTTCGGCGGAG GGACCAAGGTGG AGATCAAAC
	B2102	Omicron BT	Singlet	VH1-69	JH1	713	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGATGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCGAGGC GTCTGGGAACACCTT	VL1-40	JL2	714	CAGTCTGTGCTGA CGCAGTCGCCCT CAGTGTCTGGGG CCCCAGGTCAGA GGGTCACCATCTC CTGCACTGGGAG

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							CAGCACCTATCCTAT CAGTTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAAGGATCATCCCTA TGCTTGGTATAGCAA ACTACGCACAGAAGT TCCAGGACAGAGTCA CGATTACCGTGGACA AATCCACGAGCACAG CATATATGGAGCTGA CCAGCCTGAGATCTG AGGACACGGCCGTTT ACTACTGTGCGAGAA CCCCTTCTCGCCCCG ATAGTAATACTTGGTA CTTCCACCAGTGGGG CCAGGGCACCCTGG TCACCGTCTCCTCAG				CAACTCCAACATC GGGGCAGGTTAT GATGTTCACTGGT ACCAGCAGCTTCC AGGAACAGCCCC CAAACTCCTCATC TATGCTAACAACA ATCGGCCCTCAG GGGTCCCTGACC GATTCTCTGGCTC CAAGTCTGACACC TCAGCCTCCCTGG CCATCACTGGGCT CCAGGCTGAGGA TGAGGCTGATTAT TACTGCCAGTCCT ATGACAGCAGCCT GAGTGATTCGGTA TTCGGGGGAGGG ACCAAGCTGACCG TCCTAG
	B2103	Omicron BT	Singlet	VH3-48	JH4	715	GAGGTGCAGCTGGT GGAGTCTGGGGGAG ACTTGGTACACCCTG GGGAGTCCCTGACAC TCTCCTGCGGCAGCCT CTGGATTCACCTTCA GTAGCTATAGCATGA ACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTTTC ATACGTCAGTAGTAG TGCTACAACCATATA CTATGCAGAATCTGT	VK4-1	JK2	716	GACATCGTGATGA CCCAGTCTCCAGA CTCCCTGGCTGTG TCTCTGGGCGAGA GGGCCACCATCAA CTGCAAGTCCAGC CAGAGTGTTTTAC GCAGCTCCAACAA TAAGAACTACTTA GCCTGGTACCAG CAGAAACGAGGA CAGCCTCCTAAGT TGCTCATTTACTG

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							GAAGGGCCGATTCAC CATCTCCAGAGACAA TGCCAAGAACTCTCT GTATCTGCAAATGAA CAGCCTGAGAGACGA GGACATGGCTGTTTA TTACTGTGCGAGAGA TAGGACCCCGTTTTA CGATGCTTGGAATGG TTGGGGTCCACTTGA CTACTGGGGCCAGG GAACGCTGGTCACCG TCTCCTCAG				GGCATCTACCCG GGAATCCGGGGT CCCTGACCGATTC AGTGGCAGCGGG TCTGGGACAGATT TCACTCTCACCAT CAGCACCCTGCA GGCTGAAGATGTG GCAGTTTATTACT GTCAGCAGTATTA TGGCCCTCTGTAC ACTTTTGGCCAGG GGACCAAGCTGG AGATCAAAC
	B2104	Omicron BT	Singlet	VH5-51	JH5	717	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTAAGGGTT CTGGATACATGTTTA CCAGCTCCTGGATCG CCTGGGTGCGCCAC ATGCCCGGGAAAGG CCTGGAGTGGATGG GGATCATCCATCCTG GTGACTCTGATACCA GATACAGCCCGTCCT TCCAAGGCCAGGTCA CCTTCTCAGCCGACA AGTCCATCAGCACCG CCTACCTGCAGTGGA GCAGCCTGAAGGCCT CGGACACCGCCATGT ATTACTGTGCGTCCT	VL1-44	JL1	718	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCATTTCT TGTTCTGGAAGCA GCTCCAATATCGG AACTAATCCTGTA AACTGGTACCAGC AACTCCCAGGAAC GGCCCCCAAACTC CTCATCTACAATA ATCATCAGCGGCC CTCAGGGGTCCCT GACCGATTCTCTG GCTCCAAGTCTGC CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCAGTCTGA GGATGAGGCTGAT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATGGTGGCATCTATC ACGGGTGGTTGGAC CCCTGGGGCCAGGG AACCCTGGTCACCGT CTCCTCAG				TATTACTGTGCAA CATGGGATGACAG CCTGAATGGTTAT GTCTTCGGAACTG CGACCAAGGTCAC CGTCCTAG
	B2105	Omicron BT	Singlet	VH4-38	JH3	719	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGAGACCCTGTCC GTCACGTGCGCTGTC TCAGGTTACTCCATC AGCAGTAGTTACTAC TGGGGCTGGATACG GCAGTCCCCCGGGA GGGGCCTGGAGTGG ATTGGGAGTATCTAT CACAGTGGGACCACC TACTACAACCCGTCC GTCAAGAGTCGACTC ACCATATCAGTAGAC ACGTCCACGAACCAG TTCTCCCTGACCCTG AGGTCTGTGACCGCC GCAGACACGGCCAT GTATTATTGTGCGAG TAATTCCGGCCAAGT GGTGATAGGTGCTTT TGATATCTGGGGCCA AGGGACAATGGTCAC CGTCTCTTCAG	VK1-5	JK1	720	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAAT AGCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTGAGCTCCTG ATCTATGATGCCT CCAGTTTGCAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGAGA CAGAATTCACTCT CACCATCAGTAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAAT ATAAAACTTATTC GTGGACGTTCGG CCAAGGGACCAA GGTGGAAATCAAA C
	B2106	Omicron BT	Singlet	VH3-9	JH6	721	GAAGTGCAGCTGGTG GAGTCTGGGGGAGC	VK1-5	JK1	722	GACATCCAGATGA CCCAGTCTCCTTC

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							CTTGCAACAGCCTGG CAGGTCCCTCACACT CTCCTGTGCAGCCTC TGGATTCACTTTTGA GGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGCATTACTTGGACT GGTGGTATGATAGAC TATGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAAAAGTCCCTA TATCTGCACATGCGC GGTCTGAGACCTGAA GACACGGCCTTATAC TACTGTGCAAGAGGG TCTCGTTCGGGGAGT TATCATCTTAGGGAC CACTTCTACGGAATG GACGTCTGGGGCCA AGGGACCACGGTCA CCGTCTCCTCAG				CACCCTGTCTGCG TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAACATTAAT AGCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAGCTCGTG ATCTATGATGCCT CCGATTTGGAAAG TGGGGTCCCATCA AGATTCAGCGGCA GTGGATCTGGAAC AGAATTCACTCTC ACCATCAGCAGCC TGCAGCCTGATGA CTTTGCAACTTATT ACTGCCAACAGTA TAAGGCTTATTGG TCGTTCGGCCAAG GGACCAAGGTGG AAATCAAAC
	B2107	Omicron BT	Singlet	VH4-38	JH3	723	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGAGACCCTGTCC GTCACGTGCGCTGTC TCAGGTTACTCCATC AGCAGTAGTTACTAC TGGGGCTGGATACG GCAGTCCCCCGGGA GGGGCCTGGAGTGG	VK3-20	JK1	724	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCTGAGTCTTA GCAGCACCTACTT AGCCTGGTACCAG CAGAGACCTGGC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATTGGGAGTATCTAT CACAGTGGGACCACC TACTACAACCCGTCC GTCAAGAGTCGACTC ACCATATCAGTAGAC ACGTCCACGAACCAG TTCTCCCTGACCCTG AGGTCTGTGACCGCC GCAGACACGGCCAT GTATTATTGTGCGAG TAATTCCGGCCAAGT GGTGATAGGTGCTTT TGATATCTGGGGCCA AGGGACAATGGTCAC CGTCTCTTCAG				CAGGCTCCCAGG CTCCTCATCTATG GTGCATCCAGCAG GGCTACTGGCATC CCAGACAGGTTCA GTGGCAGTGGGT CTGGGACAGACTT CACTCTCACCATC AGTAGACTGGAGC CTGAAGATTTTGC AGTGTATTACTGT CAGCAATATGGTA GGTCACCGTGGA CGTTCGGCCAAG GGACCAAGGTGG AGATCAAAC
	B2108	Omicron BT	Singlet	VH3-9	JH6	725	GAAGTGCAGCTGGTG GAGTCTGGGGGAGC CTTGCAACAGCCTGG CAGGTCCCTCACACT CTCCTGTGCAGCCTC TGGATTCACTTTTGA GGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGCATTACTTGGACT GGTGGTATGATAGAC TATGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAAAAGTCCCTA TATCTGCACATGCGC GGTCTGAGACCTGAA	VK1-39	JK5	726	GACATCCAGTTGA CCCAGTCTCCATC GTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAACGTAAACT ATTATTTAAATTGG TATCAGCAAAGAC CAGGGAAAGCCC CTGAACTCCTGAT CTATGGTGCATCC AGTTTGCAAAGTG GAGTCCCATCGAG GTTCAGTGGCGGT GGATCTGAGACAG ATTTCACTCTCAC CATCAGCAGTCTG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GACACGGCCTTATAC TACTGTGCAAGAGGG TCTCGTTCGGGGAGT TATCATCTTAGGGAC CACTTCTACGGAATG GACGTCTGGGGCCA AGGGACCACGGTCA CCGTCTCCTCAG				CAACCTGAAGATT TTGCAACTTACTA CTGTCAACAGAGT TACGATTTACCCC CCACCTTCGGCCA AGGGACACGACT GGAGATTAAAC
	B2109	Omicron BT	Singlet	VH4-38	JH3	727	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAGGCCTT CGGAGACCCTGTCC GTCACGTGCGCTGTC TCAGGTTACTCCATC AGCAGTAGTTACTAC TGGGGCTGGATACG GCAGTCCCCCGGGA GGGGCCTGGAGTGG ATTGGGAGTATCTAT CACAGTGGGACCACC TACTACAACCCGTCC GTCAAGAGTCGACTC ACCATATCAGTAGAC ACGTCCACGAACCAG TTCTCCCTGACCCTG AGGTCTGTGACCGCC GCAGACACGGCCAT GTATTATTGTGCGAG TAATTCCGGCCAAGT GGTGATAGGTGCTTT TGATATCTGGGGCCA AGGGACAATGGTCAC CGTCTCTTCAG	VK3D-20	JK2	728	GAAATTGTGTTGA CGCAGTCTCCAGC CACCCTATCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTCTTAGC ACCTACTTAGCCT GGTACCAGCAAAA ACCTGGCCTGGC GCCCAGGCTCCT CATCTATGATACA TCCACGAGGGCC ACTGGCATCCCAG ACAGGTTCAGTGG CAGTGGGTCTGA GACAGACTTCACT CTCACCATCAGCA GACTGGACCCTGA AGATTTTGCAGTG TATTACTGTCAGC AGTATGGTAGCTC ACCTCGAACTTTT GGCCAGGGGACC AAGCTGGAGATCA AAC

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	B2111	Omicron BT	Singlet	VH3-9	JH2	729	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA GGATTATGCCATGCA CTGGGTCCGGCAAGT TCCAGGGAAGGGCC TGGAGTGGGTCTCAG GTCTTACTTGGAATG GTGGAACCATAGGCT ATGCGGACTCTGTGA AGGGCCGATTCTTCA TCTCCAGAGACAACG CCGAGAACTCCCTCT ATCTGCAAATGATGC GTCTGAGACCTGAGG ACACGGCCCTATATT ACTGTGTAAAAGACC GCGGAGACTACGGT GACTCTTCCTGGTAC CTCGATCTCTGGGGC CGTGGCACCCTGGTC ACCGTCTCCTCAG	VL2-11	JL1	730	CAGTCTGCCCTGA CTCAGCCTCGCTC AGTGTCCGGGTCT CCTGGACAGTCAG TCACCATCTCCTG CACTGGAACCAGC AGCGGTGTTGGTT CTTATGACTATGT CTCCTGGTATCAA CAACACCCAGGCA AAGCCCCCAAACT CATGATTTTTGAT GTCAGTAAGCGG CCCTCAGGGGTC CCTGATCGCTTCT CTGGCTCCAAGTC TGGCAACACGGC CTCCCTGACCATC TCTGGGCTCCAG GCTGAGGATGAG GCTGATTATTACT GCTGCTCATATGC AGGCGACTATTAT GTCTTCGGAATTG GGACCAAGGTCA CCGTCCTAG
B039	B001	Omicron BT	Clone	VH1-69	JH4	731	CAGGTCCAGCTGGTG CAGTCTGGGGCTGA GGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGACACCTTCAGC AGCTATCCTACCAGC TGGGTGCGACAGGC	VL1-40	JL3	732	CAGTCTGNCNTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AACTCCAACATCG GGGCAGGTTATGA

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							CCCTGGACAAGGGCT TGAGTGGATGGGAAG GATCATCCCTATAGT TAATATTGCAAACTAC GCGCAGAAGTTCCAG GGCAGAGTCACCATC ACCGCGGACAAATCC ACGAACACAGCCTAT ATAGAACTGAGCAGC CTGAACTCTGAGGAC ACGGCCGTGTATTAC TGTGCGAGAGAGTCC GCGATCACAGGATAT TGTAGTAGTACCGCC TGCTTCCGGGCGTG GGGCCCGGGGAACTG GGGTCACGGTCTCCT CA				TGTACACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT GATAACAACAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGACACCTCAG CTTCCCTGGCCAT CACTGGGCTCCA GGCTGAGGATGA GGCTGATTATTAC TGCCAGTCCTATG ACAGCAGCCTGA GTGATTCGGTGTT CGGCGGAGGGAC CAAGCTGACCGTC CTAG
	B002	Omicron BT	Clone	VH3-30	JH4	733	CAGGTGCAGCTGGT GGAGTCTGGGCGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCACCTT CGGGAAATATGGCAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGCAGGTATATCATA TGATGGAGATTATAA AGATTATGCAGACTC CCTGAAGGGCCGAG TCACCATCTCCAGAG	VK1-33	JK4	734	GACATCCAGATGA CCCAGTCTCCAGT CTCCCTGTCTGCA TCTGTTGGAGACA GAGTCACCATCAC TTGTCAGGCGAGT CATGACATTGCCA ATTCTTTAATTTGG TATCAGCAGAGAC CAGGGAAAGCCC CTAAGTCCCTGAT CTACGATGCATCG AATTTGGAAGCAG GGGTCCCATCAAG GTTCAGTGGAAGT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ACAATTCCAACAACA AGATGTATCTGCAAA TGAATAGTCTGAGAG CCGAGGACACGGCT GTGTATTACTGTGCG AAGAAGATTAGTGAA TATTGTGGTGGTGAC TGCCACACCGCCTAC TTTGACTACTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG				GGATCTGGGACA GATTTTAGTCTCA CCATCAGCAGCCT GCAGCCTGAAGAT CTTGCAACTTATT ACTGTCAACAGTA TCATAATATGCCG CTCACTTTCGGCG GAGGGACCAAGG TGCAAACCAAAC
	B003	Omicron BT	Clone	VH3-66	JH6	735	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCTG GGGGGTCTCTGAGA CTCTCCTGTGCAGCC TCTGAAATCATCGTC GGTCACAACTACATG AGCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCAATTATTTATCCCG GTGGTACCACATACT ACGCAGACTCCGTGA AGGGCAGATTCTCCA TCTCCAGAGACAATT CCAAGAACACGTTGT ATCTTCAAATGAACA GCCTGAGAGTCGAG GACACGGCTGTGTAT TACTGTGCGAGAGAT CTTGGGCCAGCGGG AGGTATGGACGTCTG GGGCCAAGGGACCA	VK1-6	JK2	736	GCCATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTGGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGGACATTGGAA ATGATTTAGGCTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTACGCTGCATC CAGCTTACAAACT GGGGTCCCATCAA GGTTCAGCGGCA GTGGATCTGGGAC AGATTTCACTCTC ACCATCAGCAGCC TGCAGCCTGAAGA TTTTGCAACTTATT ACTGTCTACAAGA TTCCAATTACCCG TACACTTTTGGCC

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							CAGTCACCGTCTCCT CA				AGGGGACCAAGC TGGAGATCAAAC
	B004	Omicron BT	Singlet	VH3-30-3	JH4	737	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCCCCTT CAGTTCCTATGCTAT CCACTGGGTCCGCCA GTCTCCAGGCAAGG GTCTGGAGTGGGTG GCAGTTATTTCATCT GATGGAAACTTTAAA TACTCCGCAGACTCC GTGAAGGGCCGATTC ACCATCTCCAGAGAC AATTCCAAGAGCACG CTGTATCTGCAAATG AACAGCCTGAGAGCT GAGGACACGGCTGTA TATTACTGTGCGAGA GAGGCGGACGACGA CATGGGTATAGTGCC TATCTTTGACTACTG GGGCCAGGGGACCC TGGTCACCGTCTCCT CAG	VL2-23	JL3	738	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCCGGACAGTCG ATCAGCATCTCCT GCACTGGAACCA GCAGTGATGTTGG GAGTTATAACCTT GTCTCCTGGTACC AACATCACCCAGG CAAAGCCCCCAAA TCCATAATTTATGA GGACACTAAGCG GCCCTCAGGGGT TTCTAATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACAAT CTCTGGGCTCCAG GCTGAGGACGAG GGTGATTATTACT GCTGCTCATATGC GGGTAGTCACACT TGGGTGTTCGGC GGAGGGACCAAG GTGACCGTCCTAG
	B005	Omicron BT	Singlet	VH3-30	JH4	739	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCACCTT	VK3-20	JK1	740	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTT TCCTGCAGGGCC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CAGTCACTATGGCAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGCAGTTATATTGTA TGATGGAAGTGATAA ATACTATGCAGACTC CGTGAAGGGCCGATT CACCATCTCCAGAGA CAATTCCAAGAACAT GTTGTATTTGCAAAT GAACAGCCTGAGAGC AGAGGACAGGGCTAT ATATTACTGTGCGAA AGATTTAGGCAGCTA TGCTTACCTTTTCAAC TACTTTGACTACTGG GGCCAGGGAACCCT GGTCACCGTCTCCTC AG				AGTCAGAGTGTTG GCGGCGGCTACT TAGCCTGGTATCA GCAGAAACCTGG CCAGGCTCCCAG GCTCCTCATCTAT GGTGCCTCCAGC AGGGCCACTGGC GTCCCAGACCGG TTCAGTGGCAGTG GGTCTGGGACAG ACTTCACTCTCAC CATCAGCAGACTG GAGCCTGAAGATT TTGCAGTGTATTA CTGTCAACAATAT AGTAGCTCTCGGA CGTTCGGCCAAG GGACCAAGGTGG AAATCAAAC
	B006	Omicron BT	Singlet	VH4-59	JH6	741	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGAGACCCTGTCCC TCACCTGCACTGTGT CTGGTGGCTCCATCA GTAGTTACTACTGGA GCTGGGTCCGGCAG TCCCCGGGGAAGGG ACTGGAGTGGATTGG GTATATCTACTACAGT GGGAGCACCAACTAC AACCCCTCCCTCAAG AGTCGAGTCACCATA	VK1-12	JK4	742	GACATCCAGATGA CCCAGTCTCCATC TTCCGTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGTCGGGCGAGT CAGGGTGTTGCC GGCTGGTTAGCCT GGTATCAGCAGAA ACCTGGGAAAGC CCCTAAACTCCTG ATCTATGCTACAT CCACTTTGCAAAG TGGGGTCCCATCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCAGTAGACACGTCC AAGAGCCAGTTCTCC CTGAAGCTGAGCTCT GTGACCGCTGCGGA CACGGCCGTGTATTA TTGTGCGAGTTATTA CTATGATAGTAGTGG TTATTCCTACGGTCT GGACGTCTGGGGCC AGGGGACCACGGTC ACCGTCTCCTCA				AGGTTCAGCGGC AGTGGCTCTGGG ACAGATTTCACTC TCACCATCAGCAG CCTGCAGCCTGAA GATTTTGCAACTT ACTATTGTCAACA GACTAACAGTTTC CCGCTCACTTTCG GCGGAGGGACCA AGGTTGACATCAA AC
	B007	Omicron BT	Singlet	VH3-66	JH6	743	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCTG GGGGGTCCCTGACA CTCTCCTGTGCAGCC TCTGGACTCACCGTC AGTAGCAACTACATG AGCTGGCTGCGCCA GACTCCAGGGAAGG GGCTGGAGTGGGTC TCAACTATTTATAGCG GTGGCAGCACATATT ATGCAGACTCCGTGA AGGGCAGATTCACCA TCTCCAGAGACAATT CCAAGAACACGCTGT ATCTTCAAATGAACA GCCTGAGAGACGAG GATACGGCTGTGTAT TATTGTGCGAGAGAT CTTCCCCCTGGAACT ACGGCCCCTCATCAC	VK3-11	JK2	744	GAAATTGTGTTGA CACAGTCTCCAGC CACCCTGTCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTGTTAGC AGCTACTTAGCCT GGTACCAACAGAA GCCTGGCCAGGC TCCCAGGCTCCTC ATCTATGATGCAT CCAACAGGGCCA CTGGCTTCCCAGC CAGGTTCAGTGGC AGTGGGTCTGGG ACAGACTTCACTC TCACCATCAACAG CCTAGAGCCTGAA GATTTTGCAGTTT ATTACTGTCAGCA GCGTAGCAACTG

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							TATTACGATATGGAC GTCTGGGGCCAAGG GACCACGGTCATCGT CTC				GCCGTACACTTTT GGCCAGGGGACC AAGCTGGAGATCA AAC
	B008	Omicron BT	Singlet	VH3-53	JH3	745	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCGG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGGCTCATCGTC AGTAGTAACTACATG AGCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCAGTTGTTTATCCC GGTGGTACCACATAC TCCGCAGACTCCGTG AAGGGCCGATTCACC ATCTCCAGAGACAAT TCCAAGAACACGCTG TATCTTCAAATGAACA GCCTGAGCGCCGAG GACACGGCCGTCTAT TACTGTGCGAGAGTA TCGGGGGGGTGCGGT GAAAGTGCTTGAAGA TGCTTTTGATATCTG GGGCCAAGGGACAA TGGTCACCGTCTCTT CAG	VL3-21	JL1	746	TCCTATGAGCTGA CTCAGCCACCCTC ACTGTCAGTGGCC CCAGGAAAGACG GCCAAGATTACCT GTGGGGGAAACG ACATTGGAAGTAG AAGTGTCCATTGG TACCAGCAGAAGC CAGGCCAGGCCC CTGTGTTGGTCAT CTATTATGAGAGT GACCGGCCCTCA GGGATCCCTGAG CGATTCTCTGGCT CCAACTCTGGGAA CACGGCCACGCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTATTGTCAG GTGTGGGACAGTA GTAGTGATCATTA TGTCTTCGGAACT GGGACCAAGGTC ACCGTCCTAG
	B009	Omicron BT	Singlet	VH3-53	JH3	747	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCGG GGGGGTCCCTGAGA	VL3-21	JL3	748	TCCTATGAGCTGA CTCAGCCACCCTC AGTGTCAGTGGCC CCAGGAAAGACG

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							CTCTCCTGTGCAGCC TCTGGGCTCATCGTC AGTAGTAACTACATG AGCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCAGTTGTTTATCCC GGTGGTACCACATAC TCCGCAGACTCCGTG AAGGGCCGATTCACC ATCTCCAGAGACAAT TCCAAGAACACGCTG TATCTTCAAATGAACA GCCTGAGCGCCGAG GACACGGCCGTCTAT TACTGTGCGAGAGTA TCGGGGGGTGCGGT GAAAGTGCTTGAAGA TGCTTTTGATATCTG GGGCCAAGGGACAA TGGTCACCGTCTCTT CAG				GCCAGGATTACCT GTGGGGGAAACA ACATTGGAAGTAA AAGTGTGCACTGG TACCAGCAGAAGC CAGGCCAGGCCC CTGTATTGGTCAT CTATTATGATAGC GCCCGGCCCTCA GGGATCCCTGAG CGATTCTCTGGCT CCAACTCTGGGAA CACGGCCACCCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTCCTGTCAA GTGTGGGATACTA GTAGTGATCGTGG GGTGTTCGGCGG AGGGACCAAGCT GACCGTCCTA
	B010	Omicron BT	Singlet	VH3-30	JH4	749	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAAC CTCTGGTTTCACATTC AGAAGCTATGCCATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGGTG GCAATTATATCACAT GATGGAACCGAGAAA	VK3-20	JK1	750	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTA GGAGCAATTACAT AGCCTGGTACCAA CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCAATGG

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							TTTTATGCAGACTCC GTGAAGGGCCGAATC ACCGTCTCCAGAGAC AATTCCAAGAACACC CTGTATCTGCAACTG AACACCCTGAGACCT GAGGACACGGCTGT GTATTACTGTGCGAG AGATGTTTCTTGTGG AGGTGACTGCTACCC GGGTGGCTTTGACTT CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				TGCATCCAGCAGG GCCACTGGCGTC CCAGACAGGTTCA GTGGCAGTGGGT CTGGGACAGACTT CACTCTCACCATC AGCAGACTGGAG CCTGAGGATTTTG CAGTGTATTACTG TCAGCACTATGAT AAGTCACCTTCAT GGACGTTCGGCC AAGGGACCAAGG TGGAAATGAAAC
	B011	Omicron BT	Singlet	VH3-30-3	JH4	751	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAAC CTCTGGATTCACCTT CAGAAGCTATGCTAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGCAATTATTTCATAT GATGGAAGCGATAAA AACTACGCAGACTCC GTGAAGGGCCGACT CACCATCTCCAGAGA CAACTCCAAGAATAT ACTGTATCTGCAAAT GAACAGCCTGAGACC TGAGGACACGGCTAT ATATTACTGTGCGAG	VK1-6	JK1	752	GCCATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTTGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGGACATTAGAA ATGATTTAGGGTG GTATCAGCAGAAA CCGGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTACAAAAT GGGGTCCCATCTA GGTTCAGCGGCA GTGGATCTGGCAC AGATTTCACTCTC ACCATCAGCAGCC TGCAGCCTGAAGA TTTTGCAACTTATT

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							AGATGTTTCTTGTGG TGGTGACTGTTACCC GGGTGGCTTTGACTA CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				ACTGTCTACAGGA TTACAGTTCCCCG TGGACGTTCGGC CAAGGGACCAAA GTGGAATTCAAAC
	B012	Omicron BT	Singlet	VH3-30	JH4	753	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCGGC CTCTGGATTCACCTT CAGTACCTATGGCAT GCACTGGGTCCGCC AGGCTCCGGGCAAG GGGCTAGAGTGGGT GGCACTTATATCATAT GATGGAAGTGATAAA TACTATGCAGACTCC GTGAAGGGCCGATTC ACCATCTCCAGAGAC AATTCCAAGGACACG CTGTTTCTACGATTG AACAGCCTGAGAGCT GAGGACACGGCTGT GTATTACTGTGCGAA ACAAATATCGCCTTA CTATGCTTCGGGGAG GTCTTACTTTGACTAC TGGGGCCAGGGAGT CCTGGTCACCGTCTC CTCAG	VK3D-20	JK5	754	GAAATTGTGTTGA CGCAGTCTCCAGC CACCCTGTCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCGGGGCCAG TCAGAGTGTTAGC AGCGGCTACTTAG CCTGGTACCAGCA CAAACCTGGCCTG GCGCCCAGGCTC CTCATGTATGATG CATCTACCAGGGC CACTGGCATCCCA GACAGGTTCAGTG GCAGTGGGTCTG GGACAGACTTCAC TCTCACCATCAGC AGACTGGAGCCT GAAGATTTTGCAG TGTATTTCTGTCA GCAGTATGGTAGC TCACCGATCACCT TCGGCCAAGGGA CACGACTGGAGAT TAAAC
	B013	Omicron BT	Singlet	VH3-30	JH4	755	CAGGTGCAGCTGGT GGAGTCTGGGGGAG	VK1-33	JK4	756	GACATCCAGATGA CCCAGTCTCCATC

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							GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCGGC CTCTGGATTCACCTT CAGTACCTATGGCAT GCACTGGGTCCGCC AGGCTCCGGGCAAG GGGCTAGAGTGGGT GGCACTTATATCATAT GATGGAAGTGATAAA TACTATGCAGACTCC GTGAAGGGCCGATTC ACCATCTCCAGAGAC AATTCCAAGGACACG CTGTTTCTACGATTG AACAGCCTGAGAGCT GAGGACACGGCTGT GTATTACTGTGCGAA ACAAATATCGCCTTA CTATGCTTCGGGGAG GTCTTACTTTGACTAC TGGGGCCAGGGAGT CCTGGTCACCGTCTC CTCAG				CTCCCTGTCTGCA ACTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAGCT ACTATTTAGGTTG GTATCAGCAGAAA CCAGGAAAAGCC CCTAAGCTCGTCA TCTACGATGCATC CGATTTGGAAGCA GGGGTCCCATCAA CGTTCAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATA TTGCCACATATTA CTGTCAACAGTAT GATAATCTCCCTC CTACTTTCGGCGG AGGGACCAAGGT GGAGATCAAAC
	B014	Omicron BT	Singlet	VH3-30	JH4	757	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAAGTCCCTGAGA CTCTCCTGCGTAGGC TCTGGATTCACCTTC AGTACCTATGGCATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGGTG	VK1-33	JK4	758	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTATAGGAGACA CAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAATA ACTGTTTAATTTG GTATCAGCAGAAA CCAGGGAAAGCC

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							GCACTTATATCATATG ATGGAAGTGATGAAT ACTATGCAGACTCCG TGAGGGGCCGATTCA CCATGTCCAGAGACA ATTCCAAGAACACCT TGTATCTGCAAATGA ACAGCCTGAGAGTCG AGGACACGGCTGTCT ATTACTGTGCGAAGC AAATATCGACTTATTA TGCTGCGGGAATTTA CTACTTTGACTACTG GGGCCAGGGAACCC TGGTCACCGTCTCCT CAG				CCTAAGATCCTGA TCTACGATGCATC CAATTTGGAAGCA GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACA GACTTTACTTTCA CCATCAGCAGCCT GCATCGTGAAGAT ATTGCTACTTATTA CTGTCAACAATGT AATGGTCTCCCTC CTACTTTCGGCGG AGGGACCAAGGT GGAGATCA
	B015	Omicron BT	Singlet	VH1-69	JH3	759	CAGGTCCAGCTGGTG CAGTCTGGGGCTGA GGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCTTC AGCAATAATGCCATC AGCTGGGTGCGGCA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAAGGATCATCCCTA TCCCTGGTATAACAA ACTACGCACAGGAGT TCCAGGGCAGAGTCA CGATCACCGCGGACA AATCCACGAGAACAG CCTACATGGAGGTGA GCAGCCTGAGATCTG	VK1-27	JK3	760	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTTGGAGACA GAGTCACCATCAC TTGCCGGGCGAG TCAGGGCATTAGC AATTATTTAGCCT GGTATCAGCAGAA AGCAGGGAAAGTT CCTAAGCTCCTGA TCTATGCTGCATC CACTTTGCAATCA GGGGTCCCATCTC GGTTCAGCGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGC

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							AGGACACGGCCATAT ATTACTGTGCGACCG ACGTGGATACAGCTC TGTTTGCTGATGCTTT TGATATCTGGGGCCA AGGGACAATGGTCAT CGTCTCTTCAG				CTGCAGCCTGAAG ATGTTGCAACTTA TTACTGTCAAAAG TATAACAGTGTCC CATTCACTTTCGG CCCTGGGACCAAA GTGGATATCAAAC
	B016	Omicron BT	Singlet	VH3-66	JH6	761	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCTG GGGGGTCCCTGAGA CTCACCTGTGCAGCC TCTGGAATCACCGTC AGTAGCAACTACATG AACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC AGTTCTTTATGCCGG TGGTAGCACATTCTA CGCAGACTCCGTGAA GGGCAGATTCACCAT CTCCAGAGACAATTC CAACAACACACTGTA TCTTCAAATGAACAG CCTGAGAGCCGAGG ACACGGCTGTGTATT ACTGTGCGAGAGATT TGGTGGACTTCGGTA TGGACGTCTGGGGC CAAGGGACCACGGT CACCGTCTCCTCA	VK1-33	JK3	762	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTGGCA ATAATTTAAATTGG TATCAGCAAAAAC CAGGGAAAGCCC CTAAGCTCCTGAT CTACGATGCATCA AATTTGGAAACAG GGGTCCCATCAAG GTTCAGTGGAAGT GGATCTGGGACA GATTTTACTCTCA CCATCAGCAGCCT GCAGCCTGAAGAT TTTGCAACATATTA TTGTCAACAGTAT GATAATCTCCCTC CGATCACTTTCGG CCCTGGGACCAAA GTGGATATCAAAC
	B017	Omicron BT	Singlet	VH1-58	JH4	763	CAAATGCAGCTGGTG CAGTCTGGGCCTGAG	VK3-20	JK2	764	GAAATTGTGTTGA CGCAGTCTCCAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTGAAGAAGCCTGG GACCTCAGTGAAGGT CTCCTGCAAGGCTTC TGGATTCCCCTTTACT ACCTCTGCTGTGCAG TGGGTGCGACAGGC TCGTGGACACCGCCT TGAGTGGATAGGCTG GATCGTCGTTGGCAG TGGTACCACATACTA CGCACAGAAGTTCCA GGAAAGAGTCACCAT TACCAGGGACAGGTC CACATCCACAGCCTA CATGGAACTGACCAG CCTGAGATCCGACGA CACGGCCATCTATTA CTGTGCGGCAGTGA GAGGCTATTACTCTG GTTCGGGGAGTTTTG ACTACTGGGGCCAG GGAACCCTGGTCACC GTCTCCTCAG				GCACCCTGTNTTC GTCTCCTGGAGAA AGAGCCACCCTCT CCTGCAGGGCCA GTCAGAGTGTTAA CAGCAACTACTTA GCCTGGTACCAG CAGAAAGCTGGC CAGGCTCCCAGG CTCCTCATCTATG GTGCATCCAGCAG GGCCACTGGCAT CCCAGACAGGTTC AGCGGCAGTGGG TCTGGGACAGACT TCACTCTCACCAT CAGCAGACTGGA GCCTGAAGATTTT GCAGTGTATCATT GTCAGCAATATGG TAGTTCACCGTAC ACTTTTGGCCAGG GGACCAAGCTGG AGATCAAAC
	B018	Omicron BT	Singlet	VH3-7	JH1	765	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCG GGGGGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCACCTTT AGTAATTATTGGATG ACCTGGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTG	VK1-33	JK4	766	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCATCATCAC TTGCCAGGCGAGT CAGGACATTGGCA ACTTTTTAAATTGG TTTCAGCAGAGAC CAGGGAGAGCCC

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							GCCAGCATAAAGCAA GATGGAAGTGAGACA TTCTATGTGGACTCT GTGAAGGGCCGATTC ACCATCTCCAGAGAC AACGCCAAGAACTCA CTGCATCTGCACATG AACAGCCTGAGACCC GAGGACACGGCTGT CTATTACTGTGCGAG AGCAGAAACGGACTA CATTGCAGCAGGTGG CTCCCCTGAATACTT CCAACACTGGGGCCA GGGCACCCTGGTCA CCGTCTCTTCAG				CTAAGCTCCTGAT CTACGATGCATCC AATTTGGACACAG GGGTCCCAGCAA GGTTCAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCAGCAGTCTG CAGCCTGAAGATA TTGCAACATATTA CTGTCAACACTAT GATAATGTCGCCC TGACTTTCGGCGG AGGGACCAAGGT GGACTTCAAAC
	B019	Omicron BT	Singlet	VH3-30-3	JH4	767	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTTACCTTC AATAGCTATGCTATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGGTG GCGGTTATATCACAT GATGGAAGCATTAAA TACAGCGCAGACGCC CTGAAGGGCCGATTC ACCATCTCCAGAGAC AATTCCAAGAACACG CTCTATCTGCAAATG AAGAGCCTGAGAACT	VK1-39	JK2	768	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA CCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATACTACATC CAGTTTGCAAAGT GGAGTCCCATCAA GGTTCAGTGGCAC TGGATCTGGGACA GATTTCACTCTCA CCATCAGTAGTCT

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							GAGGACACGGCTGT GTATTACTGTGCGAG AGATCTTGATCCGAG GATACAAGTGGTTAT CCCTGGCTACTGGG GCCAGGGAGCCCTG GTCACCGTCTCCTCA G				GCAACCTGAAGAT TTTGCAACTTACT ACTGTCAACAGAG TTACAGTGCCCCG TACACTTTTGGCC AGGGGACCAACC TGGACATCAAAC
	B020	Omicron BT	Singlet	VH3-23	JH6	769	GAGGTGCAGCTGTTG GAGTCTGGGGGAGG CTTGGTTCAGCCTGG GGGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTAAA TACTTTGCCATGAAC TGGGTCCGCCAGGC TCCAGGGAAGGGGC TGGAGTGGGTCTCAG TTATTAGTGGTAGTG GTGATAACACATACT ACGCAGACTCCGTGA AGGGCCGGTTCACCA TCTCCAGAGACAATT CCAAGAACACACTTT ATGTGCAAATGAACA GCCTGAGAGCCGAG GACACGGCCGTATAT TACTGTGCGAAAGAC CGCTATGGTGGCCCC CGGGCTTCCACTATG GACGTCTGGGGCCA AGGGACCACGGTCA CCGTCT	VK1-33	JK4	770	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTACCA CCTATTTAAATTG GTATCAGCAGAAA CCAGGGAACGCC CCTAAGCTCCTGG TCTACGATGCATC CAATTTGGAAACA GGGGTCCCATCTA GGTTCAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCACCAGCCTG CAGCCTGAAGATT TCGCAACATATTT CTGTCAACAGTAT GGTGGTCATCCG CTCACTTTCGGCG GAGGGACCAAGG TGGAGATCAAAC

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	B023	Omicron BT	Singlet	VH1-69	JH6	771	CAGGTGCAGCTGGTGCAGTCTGGGGCTGAGATGAAGAAGCCTGGGTCCTCGGTGAAGGTCTCCTGCAAGGCTTCTGGAGGCACCTTCAGCAGCTATGGTATCAGCTGGGTGCGACAGGCCCCTGGACAAGGGCTTGAGTGGATGGGAGGGATCATCCCTATGTTTGGTGCAGCAAGGTACGCACAGAGGTTCCAGGGCAGAGTCACGATTAGCGCGGACGAATCGACGAGCACAGCCTACATGGAGCTGAGCAGTCTGAGATCTGACGACACGGCCGTTTATTATTGTGCGAGAGATCAGTCCCCGGCAAAAATAGTGGTGGTGCCTGCCTACCGAGCGGACCACTACTACGCTATGGACGTCTGGGGCCAAGGGACCGCGGTCACCGTCTCC	VK2-28	JK1	772	GATATTGTGATGACTCAGTCTCCACTCTCCCTGCCCGTCACCCCTGGAGAGCCGGCCTCCATCTCCTGCAGGTCTAGTCAGAGCCTCCTGCATAGTAATGGAACAATTATTTGGATTGGTACCTGCAGAAGCCAGGGCAGTCTCCACAGCTCCTGATCTATTTGGGTTCTAATCGGGCCTCCGGGGTCCCTGACAGGTTCAGTGGCAGTGGATCAGGCACAGATTTTACACTGAAAATCAGCAGAGTGGAGGCTGAGGATGTTGGGGTTTATTACTGCATGCAAGGTTTACAAACTCCGAGGACGTTCGGCCAAGGGACCAAGGTGGAAATCAAAC
	B024	Omicron BT	Singlet	VH3-21	JH4	773	GAGGTGCAGCTGGTGGAGTCTGGGGGAGGCCTGGTCAAGCCGGGGGGGTCCCTGAGACTCTCCTGTGCAGCCTCTGGAGTCACCTTCATTAGTTATAGCAT	VK1-33	JK2	774	GACATCCAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTTGCCAGGCGAGCCAGGACATAAAT

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							GAACTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCATCCATTAGCAGT AGTAGTGATTACATA GCCTACGCAGACTCA GTGAAGGGCCGCTTC ACCATCTCCAGAGAC AACGCCAAGAACTCA GTGTATCTGCAAATG ACCAGCCTGAGAGCC GACGACACGGCTGT GTATTACTGTGCGAG AAGGGGTGACTACG GTGAATGTTATGACT ACTGGGGCCAGGGA GCCCTGGTCACCGTC TCCTCAG				ATTTATTTAAATTG GTATCAGCAGAAA CTAGGGAAAGCC CCTAAGCTCCTGA TCAACGATGCATC CAATTTGCAACCA GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACA GATTTCACTTTCA CCATCAGCAGCCT GCAGCCTGAAGAT ATTGCAACATACT ACTGTCTACAGTA TGATAATCTCCCT CGAACTTTTGGCC AGGGGACCAAACT GGAGATCAAAC
	B026	Omicron BT	Singlet	VH3-30-3	JH4	775	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCACCTT CAATACCTTTGCTAT GCACTGGGTCCGCC AGGCTCCAGGCAGG GGGCTGGAGTGGGT GGCGGCTATATCATA TGATGGAACCATAAA AACCTACGCAGACTC CGTGAAGGGCCGATT CACCATCTCCAGAGA CACTTCCAAGAGCAC	VK1-39	JK2	776	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTGGGAGACA GAGTCGCCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA ACTATTTAAATTG GTATCAGAAGAAA CCAGGGAAAGCC CCTAACCTCCTCA TCTATACTGCATC CAGTTTACAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GCTGTATCTGCAAGT GAACAGCCTGAGAAC TGAGGACACGGCTCT ATATTACTGTGCGAG AGATTCGGATATAGT GAGAACGGCCCAGTT TGACTACTGGGGCCA GCGAACCCTGGTCAC CGTCTCCTCAG				CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAGCAG AGTTACACTACTC CGTACACTTTCGG CCAGGGGACCCA ACTGGAGAACAAA C
	B028	Omicron BT	Singlet	VH3-53	JH4	777	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGGTTCATCGTC AGTCGGCAACTACATG AGCTGGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCACTGCTTTATGCC GGTGGGAGTACATTC TACGCAGACTCCGTG AAGGGCCGGTTCACC GTCTCCAGAGACAAC TCCAAGAACACGCTG TTTCTGCAGATGGAC AGCCTGAGAGCCGA GGACACGGCCGTGT ATTACTGTGCGCGGG ACTTACAGGACAGGG GAGGACTTGACTACT GGGGCCAGGGAACC	VL7-46	JL3	778	CAGGCTGTGGTG ACTCAGGAGCCCT CGCTGACTGTGTC CCCAGGAGGGAC AGTCACTCTCACC TGTGGCTTCAGCA CTGGAGCTGTCAC CAGTGGTCATTAT CCCTACTGGTTCC AGCAGAAGGCTG GCCAAGCCCCCA GGACACTGATTTA TGATACAATCAAC AAACACTCCTGGA CCCCTGCCCGGTT CTCAGCCTCCCTC CTTGGGGGCAGA GCTGCCCTGACC CTTTCGGGTGCGC AGCCTGAGGATGA GGCTGACTATTAC TGCTTGCTCTCCA ATATTGGTGCTCG GCGGGTGTTCGG

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							CTGGTCACCGTCTCC TC				CAGAGGGACCAA GTTGACCGTCCTA G
	B029	Omicron BT	Singlet	VH3-53	JH4	779	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCGTC AGTGCCAACTACATG ACCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGACTGGGTCT CAGTGATTTATCCCG GTGGTAGCACGTTCT ACGCAGACTCCGTGA AGGGCCGATTCGCCA TCTCCAGAGACAAGT CCAACAACACGCTGT ATCTTCAAATGAACA GCCTGAGAGCCGAG GACACGGCCGTCTAT TACTGTGCCAGAGGG CCTTACCCGCCCAAG GACAGCGGGTTCTG GGGCCAGGGAACCC TGGTCACCGTCTCCT CAG	VK4-1	JK1	780	GACATCGTGATGA CCCAGTCTCCAGA CTCCCTGGCTGTG TCTCTGGGCGAGA GGGCCACCATCAA CTGCAAGTCCAGC CAGAGTGTTTTAT ACAGCTCCAACAA TAAGAACTACTTA GCTTGGTACCAGC AGAAACCAGGACA GCCTCCTAAGTTG CTCATTTACTGGG CATCTACCCGGGA ATCCGGGGTCCCT GACCGACTCAGTG GCAGCGGGTCTG GGACAGATTTCAC TCTCACCATCAGC AGCCTGCAGGCT GAAGATGTGGCA GTTTATTACTGTC AGCAATATTATAG TGCTCCTCCGACG TTCGGCCAAGGG ACCAAGGTGGAAA TCAAAC
	B030	Omicron BT	Singlet	VH4-34	JH4	781	CAGGTGCAGCTACAG CAGTGGGGCGCAGG ACTGTTGAAGCCTTC GGAGACCCTGTCCCT	VL2-14	JL1	782	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA

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							CACCTGCGCTGTCTC TGGTGGGTCCTTCAG TGGTTACTACTGGAG CTGGATCCGCCAGCC CCCAGGGAAGGGGC TGGAGTGGATTGGG GAAATCATTTATAGTG GAGACACCAACTACA ACCCGTCCCTCAAGA GTCGAATCACCCTTT CATTGGACACGGCCA AGAACCAGTTCTCCC TGAAGCTGACGTCTG TGACCGCCGCGGAC ACGGCTGTCTATTAC TGTGCGAGAGGACTT TCTAGTGGCTACGAT TGGGGCTACTGGGG CCAGGGAACCCTGGT CACCGTCTCCTCAG				TCACCATCTCCTG CACTGGAACCAGC AGTGACGTTGGTG GTTATAACTATGT CTCCTGGTACCAA CAGCACCCAGGC AAAGCCCCCAAAC TCATGATTTCTGA TGTCAGTAAGCGG CCCTCAGGGATTT CTAATCGCTTCTC TGGCTCCAAGTCT GGCAACACGGCC TCCCTGACCATCT CTGGGCTCCAGG CTGAGGACGAGG CTGATTATTACTG CAGCTCATATACA AGCAACAACTCTT ATGTCTTCGGAAC TGGGACCAAGGT CACCGTCCTAG
	B031	Omicron BT	Singlet	VH4-34	JH4	783	CAGGTGCAGCTACAG CAGTGGGGCGCAGG ACTGTTGAAGCCTTC GGAGACCCTGTCCCT CACCTGCGCTGTCTC TGGTGGGTCCTTCAG TGGTTACTACTGGAG CTGGATCCGCCAGCC CCCAGGGAAGGGGC TGGAGTGGATTGGG GAAATCATTTATAGTG GAGACACCAACTACA	VL1-47	JL7	784	CAGTCTGCCCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCATCTCT TGTTCTGGAAGCA GCTCCAACATCGG AAGTAATTTTGTAT ACTGGTACCAGCA GCTCCCAGGAAC GGCCCCCAAACTC CTCATCTATAGTA

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							ACCCGTCCCTCAAGA GTCGAATCACCCTTT CATTGGACACGGCCA AGAACCAGTTCTCCC TGAAGCTGACGTCTG TGACCGCCGCGGAC ACGGCTGTCTATTAC TGTGCGAGAGGACTT TCTAGTGGCTACGAT TGGGGCTACTGGGG CCAGGGAACCCTGGT CACCGTCTCCTCAG				ATAATCAGCGGCC CTCAGGGGTCCCT GACCGATTCTCTG GCTCCAAGTCTGG CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCGGTCCG AGGATGAGGCTG ATTATTTCTGTGC AGCATGGGATGAC AGCCTGAGTGGTT ATGCTGTGTTCGG AGGAGGCACCCA GCTGACCGTCCTC G
	B034	Omicron BT	Singlet	VH1-46	JH6	785	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGTTGAAGAAGCCTG GGGCCCCAGTGAAAA TTTCCTGCAAGGCAT CTGGATACATCCTCA CCAACCACTACATAC ACTGGGTGCGACAG GCCCCTGGACAAGG ACTTGAGTGGATGGG AATGATCAACCCCAG TGGCGGTATCACACA TTACGCACAGAACTT CCAGGGCAGAGTCA CTATGACCAGAGACA CGTCCACGAGGACA GTCTACATGGAGGTG AGCAGCCTGAAATCT GAAGACACGGCCGT	VK1-27	JK4	786	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCGAG TCAGGGCATCAGC AATTATTTAGCCT GGTATCAGCAGAA ACCAGGGAAAGCT CCTAAACTCCTGA TCTATGCTGCATC CACTTTGCAATCA GGGGTCNCATCTC GCTTCACCGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGC CTGCAGCCTGAAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTATTACTGTGCGAG AGACCGACTAATGGG GTATTACGAACTTTG GAACACTTATGGCGG TATGGACGTCTGGGG CCAAGGGACCACGG TCA				ATGGTGCAACTTA TTACTGTCAAAAC TATGACAGTGACC CTGCTCCTTTCGG CGGAGGGACCAG GGTGGAGATCAAA C
	B035	Omicron BT	Singlet	VH4-38-2	JH3	787	CAGGTGCAGCTGCA GGAGTCGGGCCCGG GACTGGTGAAGCCTT CGGAGACCCTGTCC GTCACGTGCGCTGTC TCAGGTTACTCCATC AGCAGTAGTTACTAC TGGGGCTGGATACG GCAGTCCCCCGGGA GGGGCCTGGAGTGG ATTGGGAGTATCTAT CACAGTGGGACCACC TACTACAACCCGTCC GTCAAGAGTCGACTC ACCATATCAGTAGAC ACGTCCACGAACCAG TTCTCCCTGACCCTG AGGTCTGTGACCGCC GCAGACACGGCCAT GTATTATTGTGCGAG TAATTCCGGCCAAGT GGTGATAGGTGCTTT TGATATCTGGGGCCA AGGGACAATGGTCAC CGTCTCTTCAG	VK1-33	JK4	788	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAGCA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAACTCCTGA TCTACGGTGCATC CAATTTGGAAACA GGGGTCCCATCAA GATTTAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATA TTGCAACATATTA CTGTCAAAAGTAT GATAATGTCCCGC TCACTTTCGGCGG AGGGACCAAGGT GGAGATCAAAC
B046	B1058	Omicron BT	Clone	VH1-69	JH6	789	CAGGTGCAGCTGGT GCAGTCTGGGGCTG	VK3-20	JK1	790	GAAATTGTGTTGA CGCAGTCTCCAG

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							AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCTTC AGCAGCCATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCCCTA TCTTTGGTACAGCAA ACTACGCACACAACT TCCAGGGCAGAGTCA CGATTACCGCGGACA AATCCACGACCACAG CCTACATGGAGATGA GCAGCCTGAGATCCG AGGACACGGCCGTG TATTACTGTGCGAGA GGAGGGGGATACGA TTTTCGGAGTGGTTA TCCCACTCCTCACTA TTACTACTATTACATG GACGTCTGGGGCAAA GGGACCACGGTCAC CGTCTCCTC				GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTA GCAGCAGCTACTT AGCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGCATCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TGTATTACTGTCA GCAGTATGGTAGC TCACAGGGGACG TTCGGCCAAGGG ACCAAGGTGGAAA TCAAAC
	B1059	Omicron BT	Clone	VH3-11	JH2	791	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCAAACCTG GAGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTC ACCAACTACTACATG ACTTGGATCCGCCAG GCTCCAGGGAAGGG	VK1-12	JK4	792	GACATCCAGATGA CCCAGTCTCCATC TTCCGTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGTCGGGCGAGT CAGGGTATTAGCA GGTCGGTAGCCT GGTATCAGCAGAA

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							GCTGGAATGGGTGTC ATATATTAGGAGTGA AAATGGTAACACATA CTACGCAGACTCTGT GAAGGGCCGATTCAC CATCTCCAGAGACAA CGCCAAGAACTTATT GTATCTGCAAATGAA CAACCTGAGAGTCGA GGACACGGCTGTCTA TTATTGTGCGAGAGA CCTCGATACGGTGAC CCTCAACGGCATCTA CTGGTACTTCGATCT CTGGGGCCGTGGCA CCCTGGTCACCGTCT CCTCAG				ACCAGGGGAAGC CCCTAAGCTCCTG ATCTATGCTGCAT CCAGTTTGCAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGATTTCACTCT CGTCATCAGTAGC CTGCAGCCTGAAG ATTTTGCAACTTA CTATTGTCAACAG TCTAACAGCGTCT ATCTGCTCTCTTT CGGCGGAGGGAC CAAGGTGGAAATC AAAC
	B1060	Omicron BT	Clone	VH1-58	JH3	793	CAGGTGCAGCTGGT GCAGTCTGGGCCTGA GGTGAAGAAGCCTG GGACCTCAGTGAAGG TCTCCTGCAAGTCTT CTGAATTCACCCTCA CTCCCTCTGCTGTGC AGTGGGTGCGACAG GCTCGTGGTCAACGC CTTGAGTGGATAGGA TGGATCGTCGTTGGC AGTGGCAAAACAGAC TACGCAGGGAACTTG CGGGAAAGAGTCACC ATCACCAGGGACACG TCCACAGGCACAGTC TACATGGAGGTGAAC	VK3-20	JK1	794	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTA GCAGCAACTACTT AGCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGCATCCAGCAGG GCCACTGGCATCC CAGACAGGTTCG GTGGCAGTGGGT CTGGGACGGACTT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							AGCCTGAGATCCGAG GACACGGCCGTATAT TTTTGCGCGGCACCA CATTGTAATAGAACC AAGTGCCATGATGGT TTTGATATGTGGGGC CAGGGGACAATGGTC ACCGTCTCTTCAG				CATTCTCACCATC AGCAGACTGGAG CCTGAAGATTTTG CAGTCTATCACTG TCAGCAGTATGGT ATCTCACCGTGGA CGTTCGGCCAAG GGACCAAGGTGG AAATCAAAC
	B1061	Omicron BT	Singlet	VH5-51	JH4	795	GAGGTGCAGCTGGT GCAGTCTGGACCAGA GGTGAAAAAGCCCG GAGAGTCTCTGAAGA TCTCCTGCAGGGCTT CTGGGTACAGCTTTA CCAACTACTGGATCG GCTGGGTGCGCCAG ATACCCGGGAAAGGC CTGGAGTGGCTGGG AATCATCTATCCTGG TGACTCTGATACCAC ATACAGCCCGTCCTT CCAAGACCATGTCAC CCTCTCAGCCGACAA CTCCATCAGCACCGC CTACCTGCAGTGGAA CAGCCTGAAGGCCTC GGACACCGCCATGTA CTACTGCGCGAGACT TGCAGTGGTTATCGA CTTATCCGTCTTTGAC TTTTGGGGCCAGGGA ACCCTGGTCACCGTC TCCTC	VK1-9	JK5	796	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC AAATATTTAGGCT GGTATCAACAAAA GCCAGGGAAAGC CCCTAAGCTCCTT ATCTATGGTGCAT CCACTTTGCACAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACAATCAGGAGC CTGCAGCCTGAAG ATTTTGCAACTTAT TACTGTCAACACC TTAATAGTTACTTG ATCACCTTCGGCC AAGGGACACGACT GGAGATTAAAC

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	B1062	Omicron BT	Singlet	VH5-51	JH4	797	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTAAGGGCT CTGGATACACCTTTG CCAACTACTACATCG GCTGGGTGCGCCAG CTGCCCGGGAAAGG CCTGGATTGGCTGGG GATCATCTATCCTGG TGACTCTGAGACCAT ATACAGTCCGTCCTT CCAAGGCCCGGCCA CCATCTCAGCCGACA AGTCCATCAGTACCG CCTACCTGCAGTGGA GCAGCCTGAGGGCC TCGGACACCGCCATG TATTACTGTGCGAGA CTCGGGGTGGATATT GATGTTCTGCCATTT GACTACTGGGCCCAG GGAACCCTGGTCACC GTCTCCTCAG	VK1-9	JK3	798	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGGACATTAGC AGTTACTTAGCCT GGTATCAGCAAAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATGCTGCAT CCACTTTACACAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGCTCTGGG ACAGAATTCACTC TCACAATCAACAG CCTGCAGCCTGAA GATTTTGCAACTT ATTACTGTCAACA GCTTAATAGTTAC TCTTTCACTTTCG GCCCTGGGACCA AAGTGGATATCAA AC
	B1063	Omicron BT	Singlet	VH4-4	JH6	799	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGGGACCCTGTCC CTCACCTGCGCTGTT TCTGGTGGCTCCATA AGGAGTAGTAATTGG TGGAGTTGGGTCCGC	VK3-11	JK5	800	GAAATTGTGTTGA CACAGTCTCCGGC CACCTTGTCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGACTGTTAGC AGCTACTTAGCCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CAGCCCCCAGGGAA GGGGCTGGAGTGGA TTGGGGAAATCTATC TAAGTGGGAGCACCG ACTACAATCCGTCCC TCAAGAGTCGAGTCA CCATATCAGTAGACA AGTCCAAGAACCGGT TGTCCTTGAACCTGA CCTCTGTGACCGCCG CGGACACGGCCGTG TATTACTGTGCGACT ATGGGCAACACAGAT ATGGTCCCCAAGAAC TACTACATGGACGTC TGGGGCAAAGGGAC CACGGTCACCGTCTC CTCA				GGTACCAGCAGAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTATGATACAT CCGCTAGGGCCA CTGGCATCCCAGC CAGGTTCAGTGGC AGTGGGTCTGGG ACAGACTTCACTC TCACCATCAGCAG CCTAGAGCCTGAA GATTTTGCAGTTT ATTACTGTCAGCA GCGTAGCGACTG GCCTCCGACCTTC GGCCAAGGGACA CGACTGGAGATTA A
	B1064	Omicron BT	Singlet	VH3-23	JH6	801	GAGGTGCAGCTGTTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG GGGGTCCCTGAGACT CTCCTGTAGAGCCTC TGGATTCACCTTCAG TAATTATGCCATGAG CTGGGTCCGCCAGG CTCCAGGGAAGGGC CTGGAGTGCGTCTCA GGTATTAGTGGTAGT GGTGGATTCACAAAT TACGCAGACCCCGTG AAGGGCCGGTTCATC ATCTCCAGAGACGAT TCGAAGAATACGTTG	VK1-5	JK4	802	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATTGC TTGCCGGGCCAG TCAGAGTATTAGT AACTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAACTCCTG ATCTATAAGGCGT CCAGTTTAGAGAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TATCTGCAAATGAACAGCCTGAGAGGCGAGGACACGGCCGTGTATTTCTGTGCGAAAGGGGACTGGTTGTCCCCCAACTTAAACCACTACTACATGGACCTCTGGGGCAAAGGAACCACGGTCACCGTCTCCTCA				CAGAATTCACTCTCACCATCAGCGGCCTGCAGCCTGATGATTTTGCAACGTATTACTGCCAACAGTATAATAGTTTTCCGCTCACTTTCGGCGGAGGGACCAAGGTAGACATCAAAC
	B1065	Omicron BT	Singlet	VH3-15	JH3	803	CAGGTGCAGCTGGTGGAGTCTGGGGGAGGCTTGGTAAAGCCTGGGGGGTCCCTTAGACTCTCTTGTGCAGCTTCTGGCTTCACTTTTAGTAATGCCTGGATGAATTGGGTCCGCCAGGCTCCAGGGAAGGGGCTGGACTGGGTCGGCCCGTATTAAAAATCGACGTGATGGTGGAACAACAGACTATGCTGCACCCGTGAAAGGCAGATTCACCATCTCAAGAGATGATTCAAAAAACACTCTGTATCTGCAAATGAACAGTCTGAAAATCGAGGACACTGCCGTTTATTACTGTACCACCGATCGAGGGGACGTATCACGATTTTTGGACTTGTTCCATGATGCTTTTGATGTCTG	VK1-39	JK4	804	GACATCCAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCTCTTGCCGGGCAAATCAGAGTATCCGTTACTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAAGCTCCTGATCTATGCTGTATCCAGTTTGCACAGTGGGGTCCCATCACGGTTCAGTGGCAGTGGGTCTGACACAGATTTCACTCTCACCATCACTAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGTGTTACACTACCCCTCATTTCGGCGGAG

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							GGGCCAGGGGACAA TGGTCACCGTCTCTT CAG				GGACCAAGGTGG AAATCAAAC
	B1066	Omicron BT	Singlet	VH3-15	JH3	805	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTCGGTAAAGCCG GGGGGGTCTCTTAGA CTCTCCTGTGCAGGC TCTGGTTTAAGTTTCA GTAGAGCCTGGATGA ATTGGGTCCGCCAGG CTCCAGGGAAGGGG CTGGAGTGGGTCGG CCGTATTAAAAGCAA AAATGATGGTGCGGC AATAGACTACGCTGC ACCCGTGAAAGGCAG ATTCACCATCTCAAG AGATGATTCAAGAAG CACGCTGTATCTGCA AATGGACAGCCTGAA AACCGAGGACACAGC CGTGTATTATTGTAC CACAGATCTGACCAG TATAACAATGGTTGA GCATGATGCTTTTGA TATCTGGGGCCAAGG GACAATGGTCACCGT CTCTTCAG	VK1-39	JK2	806	GACATCCAGATGA CCCAGTCTCCATC TTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAGG TCAGAGCGTTAGC ACCTTTTTAAATTG GTATCAGCAGAGA CCAGGAAAAGCC CCTAAACTCCTGA TCTATGCTGCATC CATTTTGCAAAGT GGGGTCCCATCA CGATTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAAT CTGCAACCTGAAG ATTTTGCGACCTA CTACTGTCAACAG AGTTACGGTCCCC TGGGAAGTTTTGG CCAGGGGACCAA GCTGGAGATCAAA C
	B1067	Omicron BT	Singlet	VH3-13	JH4	807	CAGGTGCAGCTGGT GGAGTCGGGGGGAG GCTTGGTACAGCCGG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC	VK1-39	JK4	808	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA ACTGTTGGAGACA GAGTCACCATCAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCTGGATTCCCCTTC AGTCAATACGACATG CACTGGGTCCGCCAA ACTACAACAAAAGGT CTGGAGTGGGTCGC AGTTATTGGTACTGC TGGTGAGGCCTACTA TCCAGACTCCGTGAA GGGCCGAATCACCAT CTCCAGAGACAATGC CAGGAACTCCCTATA TCTTCAAATCAACAG CCTGAGAGCCGAGG ACACGGCCGTCTATT ATTGTGTCAGAGATG TGGGACAAGTTTGGC CCTATTTTGACTCCTG GGGCCAGGGAATCC TGGTCACCGTCTCCT CAG				TTGCCGGGCAAGT CAGACCATTGGTA ATTATTTAAATTGG TATCAACAAAAAC CAGGGAAGGCCC CTAAGCTCCTCAT CTATGCTGCGTCC AGTTTGCAAAGTG GGGTCCCATCAAG ATTCAGTGGCAGT GGGTCTGGGACA GACTTCACTCTCA CCATCAGCAGTCT GCAAGCTGAAGAT TTTGCGACTTACT ACTGTCAACAGAG TTACACTACTCTT GCGCTCACTTTCG GCGGAGGGACCA AGGTGGAGATCAA AC
	B1068	Omicron BT	Singlet	VH1-18	JH3	809	CAGGTTCAGCTGGTG CAGTCTGGAGCTGAG GTGAAGAAGCCTGG GGCCTCAGTGAAAGT CTCCTGCAAGACTTC TGGTTATACCCTTTCC AACTATGGTCTCAGC TGGGTGCGACAGGC CCCTGGACAAGGACT TGAGTGGATGGGATG GATCAGCGCTCATGA TGGGGACACAAAATA TGCTCAGAAATTCCA	VK4-1	JK4	810	GACATCGTGATGA CCCAGTCTCCAGA CTCCCTGGCTGTG TCTCTGGGCGAG CGGGCCACCATC AACTGCAAGTCCA GCCAGAGTGTTTT GTACACCTCCAAC AATCAGGACTACT TAGCTTGGTACCA GCAGAAACCAGG ACAGCCTCCTAAA CTGCTCATTTACT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGGCAGAGTCACCAT GACCACAGACACATC CACGAGCACAGCCTA CATGGAGCTGAGGA GCCTGAGATCTGACG ACACGGCCATGTATT ACTGCGCGAGAGAG GGGGGGTTGACAAC GATGACTTTAAGTGA TGCTTTTGATATCTG GGGCCAAGGGACAA TGGTCATCGTCTCTT CAG				GGGCATCTGCCC GGCAATCCGGGG TCCCTGACCGATT CAGTGGCAGCGG GTCTGGGACAGCT TTCACTCTCACCA TCAGCAGCCTGCA GGCTGAAGATGTG GCAGTTTATTACT GTCAGCAATATTT TCAGACTCCCCTC ACTTTCGGCGGAG GGACCAAGGTGG AGATCAAAC
	B1069	Omicron BT	Singlet	VH1-69	JH2	811	CAGGTCCAGCTGGTG CAGTCTGGGGCTGA GGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCTTC AGCAGCTCTTCTATC ACCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCCCTA CCCTTGGAATAGCGA ACTACGCACAGAAGT TCCAGGACAGACTCA CACTTATCGCGGACA AGTCCACGAGCACAG CCTCCATGGAGCTGA GCAGCCTGAGATCTG ACGACACGGCCGTCT ATTATTGTGCGAGAG	VL1-40	JL3	812	CAGTCTGTGCTGA CGCAGCCGCCCT CAGTGTCTGGGG CCCCAGGGCAGA GGGTCACCATCTC CTGCGCTGGGAC CAACTCCAACATC GGGGCAGGTTAT GATGTGCACTGGT ACCAACAGCTTCC AGGAACAGCCCC CAAACTCCTCATC TATGCTAACAATA ATCGGCCCTCAG GGGTCCCTGACC GATTCTCTGGCTC CAAGTCTGGCACC TCAGCCTCCCTGG CCATCACTGGGCT CCAGGCTGAGGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TTGCGGGATATAGCG GCTACGGGGCAGCC GAGTACTTCGATCTC TGGGGCCGCGGCAC CCTGGTCACTGTCTC CTCAG				TGAGGCTGATTAT TACTGCCAGTCCT ATGACAGCAGCCT GAGTGGTTCGGT GTTCGGCGGAGG GACCAGCCTGAC CGTCCTAG
	B1070	Omicron BT	Singlet	VH4-61	JH5	813	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACCGGTGAAGCCTT CGGAGACCCTGTCCC TCACTTGCACTGTCT CTGGTGCCTCCGTCA CCAGTCATAATTTCTA CTGGAGCTGGATCCG GCAGCCCCCAGGGA AGGGACTGGAGTGG ATTGGGTTTTTCTCTT CCAGGGGGAGTCCC AATTACAACCCCTCC CTCAAGAGTCGAGTC ACCATATCAGTAGAC ATGTCCAAGAGCCAG TTCTCGCTGAGGCTG AGCTCTGTGACCGCT GCGGACACGGCCGT GTATTACTGTGCGAG AGAGACATATTTCTAT GATAGAAATGGGAAT TACTTATCTGATGGTT TCGACTCCTGGGGCC AGGGAACCCTGGTCA CCGTCTCCTC	VK1-5	JK2	814	GACATCCAGATGA CCCAGTCCCCTTC CTCCCTGTCTGCA TCCGTAGGAGACA GTGTCACCATCAC TTGCCGGGCCAG TCAGACTATTAGT ACCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGCAAGC CCCTAAGCTCCTA ATCTATCAGGCGT CTAGTTTAGAAAC TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCGGCAG CCTGCAGCCTGAT GATTTTGCAACTT ATTACTGCCAACA GTATAAGAGTTCT TCTCCGTACACTT TTGGCCAGGGGA CCAAGCTGGAGAT CAAAC

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	B1071	Omicron BT	Singlet	VH1-69	JH4	815	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCTTT AGCAGATATGCTATC CACTGGGTGCGACA GGCCCCTGGAGAAG GGCTTGAGTGGGTG GGTGGGATCATCCCG ATGTTTGGCGCAGCA GACTACGCACAGAAG TTCCAGGGCAGAGTC ACGATTACCGCGGAC AAATCCACAAGTACA GCCTACATGGAGCTG AGCGGCCTGAAATCT GAGGACACGGCCAT CTATTACTGTGCGAG AGGGCAGATCCAGTG GGAACTACTATCGTT TGCAGTAGGAGTCCA CTTTGACTACTGGGG CCAGGGAACCCTGGT CACCGTCTCCTCAG	VK4-1	JK2	816	GACATCGTGATGA CCCAGTCTCCAGA GTCCCTGGCTGTG TCTCTGGGCGAGA GGGCCACCATCAA GTGCAAGTCCAGC CAGAGTGTTTTAT ATAGCTCCAACAA TAAGAACTACTTA GCTTGGTACCAGC AGAAACCAGGACA GCCTCCTAAGCTG CTCATTTACTGGG CATCTTACCGGGA ATCCGGGGTCCCT GACCGATTCAGTG GCAGCGGGTCTG CGACAGATTTCAC TCTCACCATCAGC AGCCTTCAGGCTG AAGATGTGGCAGT TTATTATTGTCAG CAATCTTATCCTG TTCCTCCGTACAC TTTTGGCCAGGGG ACCAAGCTGGAGA TCAAAC
	B1072	Omicron BT	Singlet	VH5-10	JH4	817	GAGGTGCAGCTGGT GCAGTCCGGAGCAG AGGTGAAAAAGCCCG GGAAGTCTCTAATGA TCTCCTGTAAGGCTT CTGGATACAGCTTTA CCGACTATTGGATCA	VL2-23	JL2	818	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CTTGGACAGTCGA TCACCATCTCCTG CACTGGAACCAGC AGTGATGTTGGAA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ACTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG GGAGGATTGATCCTA GTGACTCTTATACCA ACTACAGCCCGTCCT TCCAAGGCCACGTCA CCATCTCAGCTGACA AGTCCATCAATACTG CCTTTCTGCAGTGGA GCAGCCTAAAGGCCT CGGACACCGCCGTG TATTACTGTGCGAGG GGACAGTATCACTTG GATCCTATTGGTCAT TATTTCTTTGACTTTT GGGGCCAGGGAGCC CTGGTCACCGTCTCC TCAG				GTTATGACCTTGT CTCCTGGTACCAA CAATACCCAGGCA AAGCCCCCAAACT CATTATTTATGAG GTCATTAAGCGGC CCTCAGGGGTTTC TAATCGCTTCTCT GGCTCCAAGTCTG GCAACACGGCCT CCCTGACAATCTC TGGGCTCCAGGC TGACGACGAGGC TCATTATTACTGCT GCTCATATGCAGG TATTATTACATATG TGGTGTTCGGCG GAGGGACCAAGC TGACCGTCCTAG
	B1073	Omicron BT	Singlet	VH1-69	JH6	819	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGATGAAGAAGCCGG GGTCCTCGGTGAAG GTCTCCTGCGAGGCC CCTGGAGGCACCTTC ACTAGTTATTCTATCA ACTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG AGGGATCATCCCTAC CCTTGGAACAACAAA CTACGGACAGAAGTT TCAGGGCAGAGTCAC GATTACCGCGGACAA	VK1-33	JK4	820	GACATCCAGATGA CCCAGTCTCCCTC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CACGACATTAGCA GCTGTTTAAATTG GTATCAACAGAAA CCAGGGAAAGCC CCTAAACTCCTGA TCTACGATGCATC CAATTTGGAAACA GGGGTCCCATCAA GGTTCAGTGGAAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATCCACGAGCACCGC CTACATGGAGTTGAG CAGCCTGCGATCTGA GGACACGGCCGTCTA TTACTGTGCGAGAGG GAAGCTGGATTTTCG GAGTGGGTTTTTCTA CAACTTTAGGTCTAT GGACGTCTGGGGCA AAGGGACCACGGTCA CCGTCTCCTCAG				TGGATCTGGGACA GGCTTTACTTTCA CCATCAGCAGTCT GCAGCCTGAAGAT ATTGCAACTTATTA CTGTCAACAGTAT GAGAATCTCCCGC TCACTTTCGGCGG AGGGACCAAGGT GGAAATCAA
	B1074	Omicron BT	Singlet	VH1-69	JH6	821	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCCTC AGCAACTATGCAATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATTATCCCTA TCTTTGGTACAACAA ACTACGCACAGAAGT TCCAGGGCAGAGTCA CGATTACCGCGGACG AATCCACGAGCACAG CCAACATGGAGCTGG ACAGCCTGAGATCTG AGGACACGGCCTTGT ATTTCTGTGCGACCT ACAGCAGTGGCTGGT ACTCGATGGGTGACT TCTACTACTACTACAT	VL2-14	JL1	822	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGTCAGTCGA TCACCATCTCCTG CAGTGGAACCAG CAGTGACGTTGGA GGTTTTAACTATG TCTCCTGGTTCCA ACAGCACCCAGG CAAAGCCCCCAAA CTCATGATTTGTG ATGTCAGTTTTCG GCCCTCAGGGGT TTCTGATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACCAT CTCTGGGCTCCAG GCTGAGGACGAG GCTGATTATTACT GCAGCTCCTTTAC AAGGACCAACACT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGACGTCTGGGGCA AAGGGACCACGGTCA CCGTCTCCTCA				TATGTCTTCGG-AACTGGG-ACCAAGGTCACC
	B1075	Omicron BT	Singlet	VH3-53	JH3	823	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGAGCTCATCGTC AGTTACAACTACATG ACCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCAATTATTTATAGCG GTGGTAGCACATTTT ACGCAGACTCCGTGA AGGGCCGATTCACCA TCTCCAGAGACAATT CCAAGAACACGCTGT ATCTTCAAATGAACA GCCTGAGACCCGAG GACACGGCCGTTTAT TACTGTGCGAGAGTC TTGCCTACGATTTGG GATGCTTTTGATATCT GGGGCCAAGGGACA ATGGTCACCGTCTCT TCAG	VK1-9	JK5	824	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCC TCTATAGGAGACA AAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC AGTTATTTAGCCT GGTATCAGCAAAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATGCTGCAT CCACTTTGCAAAG TGGGGTCCCATCA CGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACAATCGACAGC CTGCAGCCTGAAG ATTTTGCAACTTAT TACTGTCAACAAC TTAATAGTTACCC CGTGGGCACCTTC GGCCAAGGGACA CGACTGGAGATTA AAC
	B1107	Omicron BT	Singlet	VH1-69	JH6	825	CAGGTCCAGCTGGTG CAGTCTGGGGCTGA GGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT	VK1-33	JK4	826	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTATAGGAGACA GAGTCACCATCAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCTGGAGGCACCTTC AGCAGCTATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAAGGATCATCCCTA TCCTTGGTATAGCAA ACTACGCACAGAAGT TCCAGGGCAGAGTCA CGATTACCGCGGACA AATCCACGACCACAG CCTACATGGAGATGA GCAGCCTGAGATCCG AGGACACGGCCGTG TATTACTGTGCGAGA GGAGGGGGATACGA TTTTCGGAGTGGTTA TCCCACTCCTCACTA TTACTACTATTACATG GACGTCTGGGGCAAA GGGACCACGGTCAC CGT				TTGCCAGGCGAGT CAGGACATTACCG ACTATTTAAATTG GTATCACCACGTA CCAGGGACAGCC CCTAAGCTCCTGA TCTACGATGCATC CCATTTGCAAACA GGGGTCTCATCAA GGTTCAGTGGAAG TGGATCTGGGACA CATTTTAATCTCAC CATCAGCAGCCTG CAGCCTGAGGATA TTGCAACATATTA CTGTCAACACTAT GATAATCTCTCCC TCACTTTCGGCGG AGGGACCAAGGT GGAGCTCAAAC
	B1108	Omicron BT	Singlet	VH3-7	JH4	827	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTTCAGCC TCTGGATTCACCTTTA ATAACTATTGGATGA GTTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGATCG CCAACATAAAGCAAG ATGGAAGTGAGAAAT	VK4-1	JK5	828	GACATCGTGATGA CCCAGTCTCCAGA CTCCCTGGCGGT GTCTCTGGGCGA GAGGGCCACCAT CAACTGCAAGTCC AGCCAGAGTGTTT TATACAGTTCCAA CAATAAGAACTAC TTAGCTTGGTACC AGCAGAAACCAG GACAGCCTCCTAA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ACTATGTGGACTCTG TGAAGGGCCGATTCA CCATCTCCAGAGACA ACGCCAAGAACTCAC TCTATCTGCTAATGAA CAGCCTGAGAGCCG ACGACACGGCTGTGT ATTACTGTGCGAGAT TGGAGCCGTGGCTG TGGGGCTACTTTGAC TACTGGGGCCAGGG AAGCCTGGTCACCGT CTCCTCAG				GTTGCTCATTTAC TGGGCATCTACCC GGGAATCCGGGG TCCCTGACCGATT CAGTGGCAGCGG GTCTGGGACAGAT TTCACTCTCACCA TCAACAGCCTGCA GGCTGAAGATGTG GCAGTTTATTACT GTCAGCAATATTA TAGTGGTCCCCCG ATCACCTTCGGCC AAGGGACACGACT GGAGATTAAAC
	B1109	Omicron BT	Singlet	VH3-9	JH6	829	GAAGTGCAGCTGGTG GAGTCTGGGGGAGC CTTGCAACAGCCTGG CAGGTCCCTCACACT CTCCTGTGCAGCCTC TGGATTCACTTTTGA GGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGGAAGGGC CTGGAGTGGGTCTCA GGCATTACTTGGACT GGTGGTATGATAGAC TATGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAAAAGTCCCTA TATCTGCACATGCGC GGTCTGAGACCTGAA GACACGGCCTTATAC	VK1-33	JK2	830	GACATCCAGATGA CCCAGTCTCCANT CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATCAACA AATACTTAAATTG GCATCAACAAAGA CCAGGAAAAGCC CCTAAGCTGCTGA TCTACGATGCATC CAATTTGGAAACA GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACA GATTTTACTCTCA CCATCGACAGCCT GCAGCCTGAAGAT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TACTGTGCAAGAGGG TCTCGTTCGGGGAGT TATCATCTTAGGGAC CACTTCTACGGAATG GACGTCTGGGGCCA A				ATTGCAACATATT ACTGTCATCAGTA TGATAATCTCCCT CAGAGTTTTGGCC AGGGGACCAAGG TGGAGATCAAAC
	B1110	Omicron BT	Singlet	VH3-9	JH6	831	GAAGTGCAGCTGGTG GAGTCTGGGGGAGC CTTGCAACAGCCTGG CAGGTCCCTCACACT CTCCTGTGCAGCCTC TGGATTCACTTTTGA GGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGCATTACTTGGACT GGTGGTATGATAGAC TATGCGGACTCTGTG AAGGGCCGACTCATC ATCTCCAGAGACAAC GCCAAAAAGTCCCTA TATCTGCACATGCGC GGTCTGAGACCTGAA GACACGGCCTTATAC TACTGTGCAAGAGGG TCTCGTTCGGGGAGT TATCATCTTAGGGAC CACTTCTACGGAATG GACGTCTGGGGCCA AGGGACCACGGTTAC CG	VK3-20	JK1	832	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCTTGCAGGGCCA GTCAGAGTGTTAA TAGTAACTACTTA GCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGCATCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGAGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TGTATTACTGTCA GCAGTATGGATTC TCAGCGTGGACGT TCGGCCAAGGGA CCAAGGTGGAAAT CAAAC
	B1111	Omicron BT	Singlet	VH3-9	JH6	833	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG	VL2-14	JL3	834	CAGTCTGCCCTGA CTCAGCCTGCCTC

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							CTTGGTACAGCCTGG CAGGTCCCTCACACT CTCCTGTGCAGCCTC TGGATTCACTTTTGA GGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGCATTACTTGGACT GGTGGTATGATAGAC TATGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAAAAGTCCCTA TATCTGCACATGCGC GGTNTGAGACCTGAA GACACGGCCTTATAN TACTGTGCAAGAGGG TCTCGTTCGGGGAGT TATCATCTTAGGGAC CACTTCTACGGAATG GACGTCTGGGGCCA AGGGACCACGGTCA CCGTCTCCTCA				CGTGTCTGGGTCT CCTGGACAGTCGA TCACCATCTCCTG CACTGGAACCAGC AGTGACGTTGGTG CTTATAACTTTGTC TCCTGGTACCAAC AACACCCAGGCAA AGCCCCCAAACTC ATAATTTTTGATGT CAATAGTCGGCCC TCAGGGGTCTCTA ATCGCTTCTCTGG CTCCAAGTCTGGC AGCACGGCCTCC CTGACCATCTCTG GGCTCCAGGCTG AGGACGAGGCTG ATTATTACTGCAG CTCATATAGAGAC TTCAGCTCCTGGG TGTTCGGCGGAG GGACCAGGCTGA CCGTCCT
	B1112	Omicron BT	Singlet	VH4-59	JH6	835	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCGT CGGAGACCCTGTCCC TCACCTGCTCTGTCT CTGGTGGCTCCATGA ATAATTACTACTGGA GCTGGATCCGGCAG CCCCCAGGGAAGGG ACTGGAGTGGATTGG	VK3-20	JK4	836	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGCGCCACCCTC TCCTGCAGGGCC AGGCACAGTATTA GCAGCAACTACTT AGCCTGGTACCAG CAGAAACCTGGCC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TTATATCGAATACAGT GGGAGCACCAACTAC AACCCCTCCCTCAAA AGTCGAGTCACCATA TCAGTAGACACGGCC AAGAACCAGTTCTCC CTGAAGCTGAGGTCT GTGACCGCTGCGGA CACGGCCGTGTATTA CTGTGCGAGAGTCGC GACCTTTTCGATAAC ATTTGGGGGAGTTAT CACTGACTACTACAA CTACTACATGGACGT CTGGGGCAAAGGGA CCGCGGTCACCGTCT CCTCA				AGGCTCCCAGGC TCCTCATCTATGG TGTATCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TGTATTACTGTCA ACAGTATGCTGGC ACACCGCTCACTT TCGGCGGAGGGA CCAAGGTGGAGAT CAAAC
	B1113	Omicron BT	Singlet	VH1-69	JH4	837	CAGGTCCAGCTGGTG CAGTCTGGGGCTGAA GTGAAGAAGCCTGG GTCCTCGGTGAAGGT CTCCTGCAAGGCTTC TGGAGACACCTTCAG CACCTCTGCTTTCAA CTGGGTGCGACAGG CCCCTGGGCAAGGG CTTGAGTGGATGGGA GAGATCATCCCTACC TTTGATACATCAACCT ACGCACAGAAGTTCC AGGGCAGAGTCACG ATTACCGCGGACAAA TCCACGAGCACAGTC TACATGGAGCTCAGC	VK1-33	JK2	838	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATGAGCA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTACGATGTATT CAATTTGGAAGCA GGGGTCCCATCAA GGTTCAGTGGAAG TAGATCTGGGACA GATTTTACTTTGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							AGCCTTAGATCTGAG GACACGGCCGTATAT TTCTGTGCGAGAGTC CCGGGTTTTTATTCG GGACACTTTGACTCC TGGGGCCAGGGAAC CCTGGTCACCGTCTC CTCAG				CCATCAGCAGCCT GCAGCCCGAAGA TATTGCAACATATT ACTGTCAACATTA TGATAATCTCTCG TCGTACAGTTTTG GCCAGGGGACCA AGCTGGAGATCAA AC
	B1114	Omicron BT	Singlet	VH1-69	JH6	839	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCC TCTGGAGACAGTTTC ACCGCTTATGCGATG AGCTGGGTGCGGCA GGCCCCTGGACGAG GGCTTGAGTGGCTG GGAGGGATCGTCCCT GTTTTCCTTACAACAC AAAGTTCTCAGAAGT TCCAGGGCAGACTCA CGATCACCGCGGACA TGTCCACGAGCACAG TCTACATGGAATTGA ACAGTCTGAGGTCTG ACGACACGGCCGTAT ATTTCTGTGCGAGAG GCCCGGTCGGCAGT CCGAGAAACTACTAC TCCTACCCTCTGGCC GTCTGGGGCCAAGG	VL2-14	JL3	840	CAGTCTGCCCTGA CTCAGCCTGCGTC CGTCTCTGGGTCT CCTGGACAGTCGA TCACCATCTCCTG CACTGGAACCAGC AGTGACATTGGTG CTTATAATTTTGTC TCCTGGTACCAAC AACACCCAGGCAA AGCCCCCAAACTC GTGATTTGTGATG TCCATAATCGGCC CTCAGGAGTTTCT AATCGCTTCTCTG GCTCCAAGTCTGG CACCACGGCCTC CCTGACCATCTCT GGGCTCCAGGCT GAGGACGAGGCT TATTATTACTGCA GCTCTTATAGAGA CATCAGCTCCTGG GTGTTCGGCGGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GACCCCGGTCACCGT CTCCTCA				GGGACCAAGCTG ACCGTCCTA
	B1115	Omicron BT	Singlet	VH3-53	JH6	841	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGGTCCAGCCG GGGGGGTCCCTAAG ACTCTCCTGTGCAGC CTCGGGATTCATCGT CAGTGACAGCTACAT GACCTGGGTCCGCC AGGCTCCAGGGAAG GGGCTGGAGTGGGT CTCACTTATTCATAGT GGTGGCAGTACATAC TACGCAGACTCCGTG AAGGGCCGATTCACC ATCACCAGACACTAT TCAACGAACAATCTG TATCTTCAGATGAAC AGCCTGAGAGTTGAG GACACGGCCGTATAT TACTGTGCGAGAGAT ACGGCTGCGAGTTCC GGATATTACTACAAC GCTCTGGACGTCTGG GGCCAAGGGACCAC GGTCACCGTCT	VK1-39	JK1	842	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTTGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTTTGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTTCTGTCAACAG AGTTACAGTACCC CTCCGACGTTCGG CCAAGGGACCAA GGTGGAAATCAAA
	B1116	Omicron BT	Singlet	VH30-3	JH4	843	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCACCTT CAATAGGCATGCTAT	VK1-39	JK5	844	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATCAGCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CCACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGCTT GGTGTTATATCAAAT GATGGAGCCATTAAA TCCTACCCAGACTCC GTGAAGGGCCGATTC ACCATTTCCAGAGAC AATTCCAGGAACACA CTTTATCTGCAAATGA ACAGCCTGAGAACTG AGGATACGGCTGTGT ATTACTGTGCGAGAG ATCAGGAGGCTCTTA CTCCAATTTTTGACTA CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				GCTATTTAAATTG GTATCATCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATAATGCAGC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAATACTC CCCCGATCACCTT CGGCCAAGGGAC ACGACTGGAGA
	B1117	Omicron BT	Singlet	VH30-3	JH4	845	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC GTCTGGATTCACCTT CAATAACTATGACATA CACTGGGTCCGCCA GGCTCCAGGCAGGG GGCTGGAGTGGGTG GCAGTTATATCATAT GATGGAAGCAGTAAA TTCTACGCAGACTCC GTGAAGGGCCGATTC ACCATCTCCAGAGAC AATTCCAAGAACACG	VK1-39	JK4	846	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGTA GCTATTTAAATTG GTATCAGCAAAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CTGTATCTGCAAATG AACAGCCTGAGAGCT GAGGACACGGCTGT GTATTACTGTACGAA AGATTACGGGGGAC GGGTTCCCATCTTTG ACTCCTGGGGCCAG GGAACCCTGCTCACC GTCTCCTCAG				CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC CCGGGCTCACTTT CGGCGGAGGGAC CAAGGTGGAGATC AAAC
	B1118	Omicron BT	Singlet	VH5-51	JH4	847	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTAAGGCTT CTGGATACAGCTTTA CCACTTATTGGATCG GTTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG GGATCATCTATCCTG GTGACTCTGATGCCA GATACAGCCCGTCCT TCCAAGGCCAGGTCA CCTTCTCAGTCGACA AGTCCATCACCACCG CCTCCCTGCAGTGGA GCAGCCTGAAGGCCT CCGACACCGCCATGT ATTACTGTGCGAGAA GCCGGTCCGGTGAC TACTTTGACTACTGG GGCCAGGGAACCCT GGTCACCGTCTCCTC	VK1-13	JK3	848	GCCATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGGGCATTAGCA ATGGTTTAGCCTG GTATCAGCAGAAA CCAGGGAATGCTC CTAAGCTCCTGAT TTATGATGCCTCC AATTTGGAAAGTG GGGTCCCATCAAG GTTCAGCGGCAGT GGATCTGTGACAG ATTTCACTCTCAC CATCAGCAGCCTG CAGCCTGAAGATT TTGCGACTTATTA CTGTCAACATTTT AAAAGTTACCCAT TCACTTTCGGCCC

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											TGGGACCAAAGTG GATATCAAAC
	B1119	Omicron BT	Singlet	VH3-13	JH6	849	GAGGTGCAGCTGGT GGAGTCTGGGGGGG GCTTGGTACAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTC AGTAACGACGACATG CACTGGGTCCGCCA GGCTTCAGGAAAAGG TCTGAAGTGGGTCTC AGCTATTGGTACTGC TGGTGACAGATACTA TGCAGACTCCGTGAA GGGCCGATTCACCAT CTCCAGAGAAAATGC CAAGAATTCCTTCTAT CTTCAAATGAACGAC CTGAGAGCCGAGGA CACGGCCGTGTATTA CTGTGCAAGAGGGGT ACATGAAAGAATTGA TTATTATTACTACTAC TACATGGACGTCTGG GGCAAAGGGGCCAC GGTCATCGTCTCCT	VK1-39	JK1	850	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGTCGGGCAAGT CAGAGCATTAGTA GGTATTTAAATTG GTATCAACAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCCATGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCC AGGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ACTTTGCAACTTA CTACTGTCAACAG AGTTATAGTTCAC CCCCGTGGACGTT CGGCCCAGGGAC CAAGGTGGAAATC AAAC
	B1120	Omicron BT	Singlet	VH3-13	JH6	851	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTACAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACTTTCA	VK1-39	JK2	852	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAATCACCATCAC TTGCCGGGCAAGT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTAGTGACGACATGC ACTGGGTCCGCCAAG TTACAGGAAAAAGGTC TGGAGTGGGTCTCAG GAATTGGGACTAATA GTGACAAATATTATG CAGGCTCCGTGAAG GCCCGATTCACCATC TTCAGAGAAGATGCC AAGAACTCCTTATATC TTCAAATGAACAGCC TGAGAGCCGAAGACT CGGCTCTGTATTACT GTACAAGAGGGGTG CAAGTGGTTCGGGGA GTTAAGTTTTACTACT CCATGGACGTCTGGG GCAAAGGGACCACG GTCACCGTCTCC				CAGACCATTAGCA GCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCGTC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTAACC CTCCGGAGAGCA GTTTTGGCCAGGG GACCAAGCTGGAA ATCAAAC
	B1121	Omicron BT	Singlet	VH3-53	JH6	853	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGGATCATTGTC AGTTCCAACTACATG ACGTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGCGTCT CACTTATTTATCCCG GTGGTAGCACATTCT ACCCAGACTCCGTGA AGGGCCGCTTCACCA	VK3-15	JK1	854	GAAATAGTGATGA CGCAGTCTCCAGC CACCCTGTCTGTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTGTTAGC AGCAACTTAGCCT GGTACCAGCAGAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTATGGTGCAT CCACCAGGGCCA CTGGTATCCCAGC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCTCCAGAGACAATT CCAAGAACATATTGT ATCTTCAAATGGACA GCCTGAGAGCCGAG GACACGGCCGTGTAT TACTGTGCGAGATCT TACGTTGACTACTAC ATGGACGTCTGGGG CAAAGGGACCACGGT CACCGTCTCCTCA				CAGGTTCAGTGGC AGTGGGTCTGGG ACAGAGTTCACTC TCACCATCAGCAG CCTGCAGTCTGAA GATTTTGCAGTTT ATTATTGTCAGCA CTATAATAACTGG TGGACGTTCGGC CAAGGGACCAAG GTGGAAATCAAAC
B048	B2052	Omicron BT	Clone	VH5-10	JH6	855	GAGGTGCAGCTGGT GCAGTCCGGAGCAG AGGTGAAAAAGCCCG GGGAGTCTCTGAGGA TCTCCTGTAAGGGTT CTGGATACAGCTTTC CCAGTTACTGGATCA CCTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG GGAGGATTGATCCTA GTGACTCTTATACCG ACTACAGCCCGTCCT TCCAAGGCCACGTCA CCATCTCAGTTGACA AGTCCATCAACACTG CCTACCTACAGTGGA GCAGCCTGAAGCCCT CGGACACCGCGAAG TATTACTGTGCGAGG GATCAGCAGCACCTA CTTACGTTCACCGGT ATGGACGTCTGGGG	VK1-5	JK1	856	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT AGCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAACTCCTG ATGTATAAGGCAT CTACTTTAGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGGTCTGGG ACAGAATTCACTC TCACCATCAGCAG CCTGCAGCCTGAT GATTTTGCAACTT ATTACTGCCAACA CTATAATGCTATTT CTCGAACGTTCGG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CCAAGGGACCACGG TCACCGTCTCCTCAG				CCAAGGGACCAA GGTGGAAATCAAA C
	B2053	Omicron BT	Clone	VH3-30	JH4	857	AGGTGCAGCTGGTG GAGTCTGGGGGAGG CGTGGTCCAGCCTG GGATGTCCCTGAGAC TCTCCTGTACAGCCT CTGGATTCACCTTCA GTAACTATGCTGTGC ACTGGGTCCGCCAG GCTCCAGGCAAGGG GCTGGAGTGGGTGG CAATTGTATCCAATG ATGGAAAGATTAAATT CTACGCAGACTCCGT GAAGGACCGATTCAC CATCTCCAGAGACAA TTCCAAGAACACCCT GTTTTTGCAAATGAA CGGCCTGAGATCTGA CGACACGGCTGTTTA TTACTGTGCGAGAGA CCGAGAGGAATTATC ATACTGGAGCCTTGA TTACTGGGGCCAGG GAACCCTGGTCACCG TCTCCTCAG	VK1-39	JK4	858	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCGTCAC TTGCCGGGCAAGT CAGAGCATTAGAA CCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAACTCCTGA TCTATGCTGCATC CAATTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACGTGAG GATTTTGCAACTT ACTTCTGTCAACA GAGTTACAGTACT CCTCCCCTCACTT TCGGCGGAGGGA CCAGGGTGGAGA TCAAAC
	B2054	Omicron BT	Clone	VH3-30	JH4	859	AGGTGCAGCTGGTG GAGTCTGGGGGAGG CGTGGTCCAGCCTG GGAGGTCCCTGAGA CTCTCCTGTGCAGCC	VK1-39	JK2	860	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCCTCAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCTGGATTCACGTTC AGAACCTATGCTATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCCGGAGTGGCTG GCAGTTATATCAGAT GACGGAAGCATTAAG TACTACGCAGACTCC GTGCAGGGCCGCTT CACCATCTCCAGAGA CAATTCCGAGAGCAC TCTGTATCTGCAATT GAACAGCCTGAGAGC TGAGGACACGGCTGT GTATTACTGTGCGAC AGAGGGTATGACAGG GCTGGTGATCTACTT TGACTTCTGGGGCCA GGGAACCCTGGTCAC CGTCTCCTCAG				TTGCCGGGCAAGT CAGAGCATTGGCA ATTATTTAAATTGG TATCAGCAGAAAC CAGGAAAAGCCC CTAAACTCCTGAT CTATGCTGCATCC AGTTTACAAAGTG GGGTCCCATCAAG GTTCAGTGGCAGT GGATCTGGGACA GATTTCACTCTCA CCATCAGCAGTCT GCAACCTGAAGAT TTTGCAACTTACT ACTGTCAACAGAG TTACAGTACCTCT GAGTACACTTTTG GCCAGGGGACCA AGCTGGAGATCAA AC
	B2055	Omicron BT	Clone	VH4-31	JH3	861	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CACAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGTCTCCATCA CCAGTGGTGGTAACT ACTGGACCTGGATCC GTCAGTTCCCAGGGA AGGGCCTGGAGTGG ATCGGATACATCGAT TACAGTGGGAGCGC CTTCTTCAACCCGTC	VK1-33	JK2	862	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACAGTACCA ACTGTTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTACGATGCATC CAATTTGGGAACA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CCTCAAGAGTCGATTTGCCATGTCACTAGACACGTCTAACAATCAGTTCTCCCTGACGGTGAACTCTGTGACTGCCGCGGACACGGCCGTCTACTACTGTGCGAGAGAAATACGACTTTTGGAATTACAAGGGAATGTATTTGATACTTGGGGCCAAGGGACAATGGTCACCGTCTCTTCAG				GGGGTCCCATCAAGGTTCAGTGGCAGGGGATCTGGGACAGATTTTACTCTCACCATCAGTAGCCTGCAGCCTGAAGATATTGCAACATATTACTGTCAACAGTATGAGAATCTCCCGTACACTTTTGGCCAGGGGACCAAGCTGGAGATCAAAC
	B2056	Omicron BT	Clone	VH5-51	JH3	863	GAGGTGCAGCTGGTGCAGTCTGGAGCAGAGGTGAAAAAGCCCGGGGAGTCTCTGAAGATCTCCTGTCAGGGTTCTGGACACATCTTTACCAGATATTGGATCGCCTGGGTGCGCCAGATGCCCGGGAAAGGCCTGGAGTACATGGGGATCATCTATCCTCCTGATTCTGATACCACATACAGCCCGTCCTTCCAAGGCCAGGTCACCATCTCAGCCGACAAGTCCATCAGCACCGCCTTCCTGCAGTGGAGCAGCCTGAAGGCCTCGGACACCGCCATATATTACTGTGCGACCCTCCCCAGGGGTCCTAAA	VK1-39	JK2	864	GACATCCAGTTGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGGGTCACCATCACTTGCCGGGCAAGTGAGAGCATTAGTTCTTATTTAAATTGGTATCAGCAAAAACCAGGGAAAGCCCCTGAGCTCCTGATCTATGCTGCATCCAGTTTGCAAAGTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCTGGGACAGATTTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							AGTGGCGATCCTTTT GATATCTGGGGCCAA GGGACAATGGTCACC GTCTCTTCAG				TTACAGTACCCCT CCGACTTTTGGCC AGGGGACCAAGC TGGAGATCAAAC
	B2057	Omicron BT	Singlet	VH3-15	JH6	865	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGCAAAGCCG GGGGGGTCCCTTAG ACTCTCCTGTGCAGC CTCTGGTTTCAGTTT CAGTGACGCCTGGAT GAACTGGGTCCGCCA GGGTCCAGGGAAGG GGCTGGAGTGGGTC GGCCGTATTAAAACA AAAATTGACGGTGGG ACAATAGACTACGCT GCATCCGTGAAAGGC AGATTCACCATTTCAA GAGATGATTCAAAAA ACACGTTGTATCTGC AAATGAGCCGCCTGA AAACCGACGACACAG CCGTGTATTACTGTA GCACAGATGAGGTGT CTTCGGGCTATGACT TTCCCATGGACGTCT GGGGCCAAGGGACC ACGGTCACCGTCTCC TCAG	VK1-5	JK1	866	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GGGTCACCATCAC TTGCCGGGCCAG TCAGAGTGTTAGT GTCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAACCTCCTG ATCTATAAGGCAT CTAATTTACAAAG TGGGGTCCCGTC AAGGTTCAGCGG CAGTGGATCTGG GACAGAATTCACT CTCACCATCAGCA GCCTGCAGCCTG ATGATTTTGCAAC TTATTACTGCCTA CAGTATAATACTTT ATGGACGTTCGGC CAAGGGACCAAG GTGGAAATCAAAC
	B2058	Omicron BT	Singlet	VH3-53	JH6	867	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GAGGGTCCCTGAGA	VK1-39	JK1	868	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CTCTCCTGTGCGGCC				GAGTCACCATCAC
							TCTGGGCTCACCGTC				CTGCCGGGCAAG
							AGTAGCAACTACATG				TCAGAGCATTAGC
							AGCTGGGTCCGCCA				AGCTATTTAAATT
							GGCTCCAGGGAAGG				GGTATCAGCAAAA
							GGCTGGAGTGGGTC				ACCAGGGAAAGC
							TCAGTTATTTATCCCG				CCCTAAGCTCCTG
							GTGGAAGCACATTCT				ATCTATGCTGCAT
							ACGCAGACTCCGTGA				CCAGTCTGCAAAG
							AGGGCCGATTCACCA				TGGGGTCCCATCA
							TCTCCAGAGACAATT				AGGTTCAGTGGCA
							CCAAGAACACGCTTT				GTGGATCTGGGA
							ATCTTCAACTGAACA				CAGATTTCACTCT
							GCCTGAGAGCCGAC				CACCATCAGCAGT
							GACACGGCCGTGTAT				CTGCAACCTGAAG
							TTCTGTGCGAGAGGA				ATTTTGCAACTTA
							GATGGCTACACTGAC				CTACTGTCAACAG
							TACTACTACGGTTTG				AGGGGGTTCGGC
							GACGTCTGGGGCCA				CAAGGGACCAAG
							AGGGACCACGGTCA				GTGGAAATCAAAC
							CCGTCTCCTCAG				
	B2059	Omicron BT	Singlet	VH4-31	JH4	869	CAGGTGCAGCTGCA	VK1-33	JK4	870	GCCATCCGGATGA
							GGAGTCGGGCCCAG				CCCAGTCTCCATC
							GACTGGTGAAGCCTT				CTCCCTGTCTGCA
							CACAGACCCTGTCCC				TCTGTAGGAGACA
							TCACCTGCACTGTCT				GAGTCACCATCAC
							CTGGTGACTCCATTA				TTGCCAGGCGAGT
							GCAGAGGTGGTTTCT				CAGGACATTAACA
							ACTGGAACTGGATCC				ACTATTTAAATTG
							GCCAGCACCCAGGG				GTATCAGCAGAAA
							AAGGGCCTGGAGTG				CCAGGAAAAGCC
							GATTGGGAACATCTA				CCTAAGCTCCTGA
							TTACAGTGGGAGCAC				TCTACGATGCATC
							CTACTACAACCCGTC				CAATTTGGAAACA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CCTCAAGAGTCGAGT AACCATTTCAGTGGA CACCTCTAAGAACCA GTTCTCCCTGAAGTT GAACTCTGTGACTGC CGCGGACACGGCCG TGTATTACTGTGCGA GGGACTACGGTGGTA ACGCCCAGCAATTTT CGTTCTGGGGCCAG GGAACCCTGGTCACC GTCTCCTCAG				GGGGTCCCATCAA GGTTCACTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATA TTGCAACATATTA CTGTCAACACTAT CATAATTTCCCGC TCACTTTCGGCGG AGGGACCAAGGT GGAGATCAAAC
	B2060	Omicron BT	Singlet	VH1-46	JH3	871	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCA TCTGGAAACACCTTC AGCGTCTACTATATA CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAATATTCAACCCAA GTGGTGGTAGCACGA CCTACGCACAGAAGT TCCAGGGCAGAGTCA CCATGACCAGGGACA CGTCCACGAGCACAG TCTACATGGAGCTGA GCAGCCTGAGATCTG ACGACACGGCCGTCT ATTACTGTGCGAGAG GGGGACTAGTTCCAG CTACTCGTGAACCTT	VK1-5	JK1	872	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT TACTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATAAGGCAT CTAGTTTAGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAGTTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TTCTGCCAACAGT ATAATAGTTTTCCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TTGATATCTGGGGCC AAGGGACAATGGTCA CCGTCTCTTCAG				TGGACGTTCGGC CAAGGGACCAAG GTGGAAATCAAAC
	B2061	Omicron BT	Singlet	VH3-33	JH5	873	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC GTCTGGATTCACCTT CAGTAGCTATGGCAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGCTGTTATATGGTA TGATGGAAGTGGTAA ACACTATGCAGACTC CGCGAAGGGCCGAT TCACCATCTCCAGAG ACAATTCCAAGAACA CGCTGTATCTGCAGA TGAACAGCCTGAGAG CCGAGGACACGGCT GTCTATTACTGTGCG AGAGATGAGAGTGG GAGCTACCCGGTGTC CTGGTTCGACCCCTG GGGCCAGGGAACCC TGGTCACCGTCTCCT CAG	VK1-39	JK1	874	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTGGCA TCTATTTAAATTGG TATCAGCAGAGAC CAGGTAAAGGCC CTAACCTCCTGAT CTACGCTGCATCC AGTTTGCAAAGTG GGGTCCCGTCAA GGTTCAGTGGCA GTGGATCAGGGA CAGAATTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAATACCC CCCCGTGGACGTT CGGTCAAGGGAC CAAGGTGGAAATC AAAC
	B2062	Omicron BT	Singlet	VH4-38	JH3	875	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGAGACCCTGTCC GTCACGTGCGCTGTC	VK1-39	JK2	876	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCGTCAC

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							TCAGGTTACTCCATC AGCAGTAGTTACTAC TGGGGCTGGATACG GCAGTCCCCCGGGA GGGGCCTGGAGTGG ATTGGGAGTATCTAT CACAGTGGGACCACC TACTACAACCCGTCC GTCAAGAGTCGACTC ACCATATCAGTAGAC ACGTCCACGAACCAG TTCTCCCTGACCCTG AGGTCTGTGACCGCC GCAGACACGGCCAT GTATTATTGTGCGAG TAATTCCGGCCAAGT GGTGATAGGTGCTTT TGATATCTGGGGCCG AGGGACAATGGTCAC CGTCTCTTCAG				TTGCCGGGCAAGT CAGAGCATTGACA GCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAAGTCCTAA TCTATGCTGCATC CACTTTGCAAAGT GGAGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGAGTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG ACTTACAGTACCC CTTCGTACACTTT TGGCCAGGGGAC CAAGCTGGAGATC AAAC
	B2063	Omicron BT	Singlet	VH5-10	JH5	877	GAGGTGCAGCTGGT GCAGTCCGGAGCAG AGGTGAAAAAGCCCG GGGAGTCTCTGAGGA TCTCCTGTAAGGGTT CTGGATACCCCTTTA CCACCTTCTGGATCA CCTGGGTGCGCCAG AGGCCCGGGAAAGG CCTGGAGTGGATGG GGAGGATTGACCCTA GTGACTCTGAAACCG ACTACAGTCCGTCCT	VL3-12	JL1	878	TCCTATGTGCTGA CTCAGCCACCCTC AGTGTCAGTGGCC CCAGGAAAGACG GCCAGGATTACCT GTGGGGGAGACA AAATTGGAAGTAA AAGTGTGCACTGG TACCAGCAGAAGC CTGGCCAGGCCC CTGTTCTGGTCAT CTATTATGATAGC GACCGGCCCTCA

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							TCCAAGGCCACGTCA CCATCTCAACTGACA AGTCCATCAACACTG CCTACCTGCACTGGA GCAGCCTGAAGGCCT CGGACACCGCCATGT ATTACTGTGCTACCG CCGTCTCGCCCGGG ACCGGGTGGTTCGC CCCCTGGGGCCAGG GAACCCTGGTCACCG TCTCCTCAG				GGGATCCCTGAG CGATTCTCTGGCT CCAACTCTGGGAA CACGGCCACCCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTACTGTCAG GTGTGGGATAGTG ATAGTGCCGTCTT CGGAACTGGGAC CAAGGTCAGCGTC CTAG
	B2064	Omicron BT	Singlet	VH1-69	JH4	879	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAACCTG GGTCCTCGGTGAACG TCTCCTGCAAGGCTT CTGGAGGCACCCTCA ATATCTATACATTCAG CTGGGTGCGACAGG CCCCTGGACAAGGG CTTGAGTGGGTGGGA ACGATCGTCCCTCTT GTTGGTAAAGCAAAT TACCCACACAAGTTT CAGGGCAGAGTCAC CATTACCGCGGACAA ATCCACGAGTACAGT CAACATGGAGCTGAG CAGCCTGAGATCTGA GGACACGGCCGTGT ATTATTGTGCGAGTG AGGTCTTGGATAACC	VK1-39	JK4	880	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGTCGGGCAAGT CAGAGCGTTAGCA GCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTCA TCTATGCTGTATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG

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							TTAGAGATGGCTACA ACTTCTGGGGCCAGG GAACCCTGGTCACCG TCTCCTCAG				ACTTACAATACCC TCACTTTCGGCGG AGGGACCAAGGT GGAGATCAAAC
	B2065	Omicron BT	Singlet	VH3-13	JH6	881	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGCACAGCCG GGGGGGTCCCTGAG ACTCTCCTGTGGAGG GTCTGGATTCACCTT CGGTAGCCACGACAT GCACTGGGTCCGCC AAGCTACAGGAAAAG GTCTGGAGTGGGTC GCAGCAATTACTACT GCAGGTGACACATAT TATTCAGGCTCCGCG AAGGGCCGATTCACC ATCTCCAGAGATAAT GCCAAGAACTCCTTC TATCTTCAAATGAACA GCCTGAGAGGCGAG GACACGGCCGTCTAT TACTGTGCATTTGTG TCGTGGAACAGATAT TGTAGTCGTTCCAGT TGCCACGGTTTGGGC GTCTGGGGCCAGGG GACCACGGTCACCGT CTCCTCAG	VL3-9	JL2	882	TCCTATGAGCTGA CTCAGTCACTCTC AGTGTCAGTGGCC CTGGGACAGACG GCCACGATTACCT GTGGGGGAGACA ACCTTCGAAATAG AAATGTTCACTGG TACCAGCAGAGG CCAGGCCAGGCC CCTGTTTTGATCC TCTATAGGGATTA CAACCGGCCCTCT GGGATTCCTGAGC GATTCTCTGGCTC CAACTCGGGGAA CACGGCCACCCT GACCATCAGCAGA GCCCAAGCCGGG GATGAGGCTGACT ATTACTGTCAAGT GTGGGACAGCGA CACTGGGGTGGTT TTCGGCGGAGGG ACCAAGCTGACCG TCCTAG
	B2066	Omicron BT	Singlet	VH3-13	JH4	883	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTACAGCCTG GGGGGTCCCTGAGA	VK1-39	JK4	884	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA

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							CTCTCCTGTGCAGCC TCTGGATTCACCTTC AGTACCTACGACATG CACTGGGTCCGCCAA GCTACAGGAAAGGGT CTGGAGTGGGTCTCA ACTATTGGTACTTCT GGTGACACATACTAT TTAGACTCCGTGAAG GGCCGATTCACCATC TCCAGAGAAAATGCC AAGAACTCCTTGTAT CTTCAAATGAACAGC CTGAGAGCCGAGGA CACGGCCGTGTATTA CTGTGCAAGAGGGCA CGCTACATCTATGGT TACCGTCTTTGACTTC TGGGGCCAGGGATC CCTGGTCACCGTCTC CTCAG				GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTTCCA CCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTGCACAGT GGGGTCCCATCAA GGTTCAGTGGCA GAGGATCTGGGA GAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTTCTGTCAACAG AGTTACATTAACC CCCATGTGACTTT CGGCGGAGGGAC CAAGGTGGAAATC AAAC
	B2112	Omicron BT	Singlet	VH5-51	JH5	885	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTAAGGGTT CTGGATACAGCTTTA TCAGTTACTGGATCG GCTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG GGATCATCCATCCTC AGGAGTCTGAGACCA	VL1-44	JL2	886	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCATCTCT TGTTCTGGAAGCA GCTCCAACATCGG AGGTAATGCTGTA AGCTGGTACCAGC AGCTCCCAAGAAC GGCCCCCAAACTC CTCATCTATAATAA

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							GAGGTAGTCAGTCCT TCCAAGGCCAGGTCA CCATCTCAGCCGACA AGTCCATCATCACCG CCTACCTGCAGTGGA GCAGCCTGAAGGCCT CGGACACCGCCATGT ATTACTGTGTGAGAT ACAGTTCGTCCCCAT CCGGCTGGTTCGACC CCTGGGGCCAGGGA ACCCTGGTCACCGTC TCCTCAG				TAATCAGCCGGCCC TCAGGGGTCCCT GACCGATTCTCTG GCTCCAAGTCTGG CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCAGTCTGA AGATGAGGCTGAT TATTACTGTGCAG CATGGGATGACAG CCTGAATGGTGTG GTATTCGGCGGA ACCGTCCTAG
	B2113	Omicron BT	Singlet	VH1-18	JH4	887	CAGGTTCAGCTGGTG CAGTCTGGAGCTGAG GTGAAGAAGCCTGG GGCCTCAGTGAAGGT CTCCTGCAAGGCTTC TGGTTACACCTTTAG TAGCTATGGTATCAG CTGGGTGCGACAGG CCCCTGGACAAGGG CTTGAGTGGATGGGA TGGATCAGCGGTTAC AGTGGTAACACAAAG TATGCACAGAAGCTC CAGGGCAGAGTCAC CATGACCACAGACAC ATCCACGAGCACAGC CTACATGGAGCTGAG GAGCCTGAGATCTGA CGACACGGCCGTGTA TTACTGTGCGAGGAA	VL6-57	JL3	888	AATTTTATGCTGA CTCAGCCCCACTC TGTGTCGGAGTCT CCGGGGAAGACG GTAACCATCTCCT GCACCGGCAGCA GTGGCAGCATTGC CAGCAACTATGTG CAGTGGTACCAGC AGCGCCCGGGCA GTGCCCCCACCA CTGTGATCTATGA GGATAACCAAAGA CCCTCTGGGGTC CCTGATCGGTTCT CTGGCTCCATCGA CAGCTCCTCCAAC TCTGCCTCCCTCA CCATCTCTGGACT GAAGACTGAGGA

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							TAGTGGGAGCTACTA CTTGGGTGTTGAGTA CTGGGGCCAGGGAG CCCTGGTCACCGTCT CCTCAG				CGAGGCTGACTAC TACTGTCAGTCTT CTGATAGCGGCAA TTGGGTGTTCGGC GGAGGGACCAAG CTGACCGTCCTAG
	B2114	Omicron BT	Singlet	VH3-53	JH6	889	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGGTCCAGCCG GGGGGGTCCCTAAG ACTCTCCTGTGCAGC CTCGGGATTCATCGT CAGTGACAGCTACAT GACCTGGGTCCGCC AGGCTCCAGGGAAG GGGCTGGAGTGGGT CTCACTTATTCATAGT GGTGGCAGTACATAC TACGCAGACTCCGTG AAGGGCCGATTCACC ATCACCAGACACTAT TCAACGAACAATCTG TATCTTCAGATGAAC AGCCTGAGAGTTGAG GACACGGCCGTATAT TACTGTGCGAGAGAT ACGGCTGCGAGTTCC GGATATTACTACAAC GCTCTGGACGTCTGG GGCCAAGGGACCAC GGTCACCGTCTCCTC AG	VK1-5	JK2	890	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTTGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT AGCTGGTTGGCCT GGTATCAGCAGAA GCCAGGGAAAGC CCCTAAGCTCCTG ATCTCTGAGGCGT CCATTTTAGAAGG TGGGGTCCCATCA AGGTTCCGCGGC AGTGGATCTGGGA CAGAGTTCACTCT CACCATCAACAGC CTGCAGCCTGATG ACTTTGCAATCTA TTACTGCCAACAG TATCGGAGTTATT CGTACACTTTTGG CCAGGGGACCAA GCTGGAGATCAAA C
	B2115	Omicron BT	Singlet	VH1-24	JH1	891	CAGGTCCAGCTGGTA CAGTCTGGGACTGAG	VK3-20	JK1	892	GAAATTGTGTTGA CGCAGTCTCCAG

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							GTGAAGAAGCCTGG GGCCTCAGTGAAGGT CTCCTGCAAGGTTTC CGGATACACCCTCAC TGAATTATCCATACAC TGGGTGCGACAGGC TCCTGGAAAAGGGCT TGAGTGGATGGGAG GTTTTGATCCTGAAG ATGGTGAAACAATCT TCGCACAGAAGTTCC AGGGCAGAGTCACCA TGACCGAGGACACAT CTACAGACACAGCCT ACATGGATCTGAGCA GCCTGAGATCTGAGG ACACGGCCATATATT ACTGTGCAACAAATC TTCGGGGCCATTTGC TAGAACCAGCTGCTA AGGGCAACTCCCGC GCTGAATACTTCCAG CACTGGGGCCAGGG CACCCTGGTCACCGT CTCCTCAG				GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCGCCCT CTCCTGCAGGGC CAGTCAGAGTGTT ACGAGGAGCTACT TAGCCTGGTACCA GCAGAAACCTGG CCAGGCTCCCAG GCTCCTCATCTTT GATGCATCCAGCA GGGCCACTGGCA TCCCAGACAGGTT CAGTGGCAGTGC GTCTGGGACAGA CTTCACTCTCACC ATCAGCAGACTGG AGCCTGAAGATTT TGCAGTGTATTAC TGTCAGCTGTATG GTACTTCGTCGAC GTTCGGCCAAGG GACCAAGGTGGA GATCAAAC
	B2116	Omicron BT	Singlet	VH1-69	JH6	893	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCGTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCTTC AGTAACTATGGTATC AGCTGGGTGCGACA GGCCCCTGGACAAG	VK3-20	JK1	894	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCCCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTA GCCACACCTACTT AGCCTGGTACCAG

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							GGCTTGAGTGGATAG GAGGGATCGTCCCTA TCTTTGTATCAGCAAA ATACGCACAGAAGTT CCAGGGCAGAGTCA CAATTACCGCGGACA GACTCACGACCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG ACGACACGGCCGTGT ATTACTGTGCGAGAG CCACCGATGAGACAA TTCTCCACAAAATAG ATTGTGGTGGTGACT GCCACTTCTACTACG CTATGGACGTCTGGG GCCAAGGGACCACG GTCACCGTCTCCTCA G				CAGAAACCTGGCC AGGCTCCCGGGC TCCTCATCTATGG TGCATCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGGCTGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TTTATTACTGTCA GCTTTATGGTTCC TCACCCGTGACGT TCGGCCAAGGGA CCAAGGTGGAAAT CAAAC
	B2117	Omicron BT	Singlet	VH1-18	JH3	895	CAGGTTCAGCTGGTG CAGTCTGGAGCTGAC GTGAGGCAGCCTGG GGCCTCAGTGAAGGT CTCCTGCAAGGCTTC TGGTTACATCTTTCC GAACTATGGTATCAG CTGGGTGCGGCAGG CCCCTGGGCAAGGG CTTGAGTGGATGGGA TGGATCAGCGCTCAC GATGATCAGACAAAC TATGCACAGAGGCTC CAGGGCAGAATCACC ATGACCACAGACCCA	VK3-20	JK1	896	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCGCCCT CTCCTGCAGGGC CAGTCAGAGTGTT ACGAGGAGCTACT TAGCCTGGTACCA GCAGAAACCTGG CCAGGCTCCCAG GCTCCTCATCTTT GATGCATCCAGCA GGGCCACTGGCA TCCCAGACAGGTT

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							TCCACGAGCACAGCC TACATGGAGCTGAGG GGCCTCAGATCTGAC GACACGGCCATGTAT TACTGTGCGAGAGAG GGGGCGGGGGCGTT CTTTGCATGGAGCAG CACTTGGCACGGGG AGAGGGCTGCTTTTG ATATTTGGGGCCAAG GGACAATGGTCACCG TCTCTTCAG				CAGTGGCAGTGC GTCTGGGACAGA CTTCACTCTCACC ATCAGCAGACTGG AGCCTGAAGATTT TGCAGTGTATTAC TGTCAGCTGTATG GTACTTCGTCGAC GTTCGGCCAAGG GACCAAGGTGGA AATCAAAC
	B2118	Omicron BT	Singlet	VH1-3	JH4	897	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCT TCTGGATACACCTTC ACTAACTATGCTATAC ATTGGGTGCGCCAG GCCCCCGGACAAAG ACTTGAGTGGATGGG ATGGATCAACGCTGG CAATGGTAACACAAA ATATTCACAGAAGTT CCAGGGCAGAGTCA CCATTACCAGGGACA CATCCGCGAGCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG AAGACACGGCGCTGT ATCACTGTGCGAGAG ATGCCCTATATTGTA GTGGTGGTAACTGCC	VK1-5	JK1	898	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT ACCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATAAGGCAT CTAGTTTAGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAGT ATAATAGTTATTGT

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							TCAAACCGGACTACG TTGACTTCTACTTTGA CTTCTGGGGCCAGG GAACCCTGGTCACCG TCTCCTCAG				ACGTTCGGCCAAG GGACCAAGGTGG AAATCAAAC
	B2119	Omicron BT	Singlet	VH3-30	JH4	899	AGGTGCAGCTGGTG GAGTCTGGGGGAGG CGTGGTCCAGCCTG GGAGGTCCCTGAGA CTGTCCTGTGCAGCC TCTGGCTTCACCTTC AGGAACTATGGCATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGGTG GCCATGATATCATAT GATGGAGATAATAAA TACTATGTAGACTCC GCGAAGGGCCGATT CACCATCTCCAGAGA CAATTCCAAAAACAC ACTTTATCTCCAAATG AGCAGCCTGAGAGCT GACGACACGGCTGT GTATTACTGTGCGAA AGGGGTGGGCCCTT ATTGTAGTGGTGGTA GCTGCTACCCCGGC GCCCTCGACTACTGG GGCCAGGGAACCCT GGTCACCGTCTCCTC AG	VK1-33	JK4	900	GCCATCCGGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTGGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAGAA ACTATGTAAATTG GTATCAGCAACAC CCAGGGAAAGCC CCTAAGCTCCTGA TCTACGATGCATC CAATTTGGAAGCA GGGGTCCCATCG AGGTTCAGTGGAA GTGGATCTGGGA CAGATTTTACTTTC ACCATCAGCGGC CTGCAGCCTGAAG ATTTTGCAACATAT TACTGTCAACAGT ATGACAATTACCC TCCGTTCACTTTC GGCGGAGGGACC AAGGTGGAAATCA AAC
	B2120	Omicron BT	Singlet	VH4-39	JH4	901	CAGCTGCAGCTGCAG GAGTCGGGCCCAGG	VK1-33	JK4	902	CATCCGGATGACC CAGTCTCCATCCT

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							ACTGGTGAAGCCTTC GGAGACCCTGTCCCT CACCTGCACTGTCTC AGGTGGCTCCGTCAG CAGTTATCTTTACTAC TGGGGCTGGATCCG CCAGCCCCCAGGGA AGGGGCTGGAGTGG ATTGGGACTATCTTTT ATAGTGGGACTACCT ACTACAATGTGTCCC TCAAGAGGCGAGGC ACCATATCCATAGAC ACGTCCAAGAACCAG TTCTCCCTGAGGCTG AGCTCTGTGACCGCC GCAGACACGGCTGTC TATTACTGTGCGAGA CTAGGAGGATCTATC GGTCCGCATTTAGCA GCGGCTGGTACACCT GACTACTGGGGCCA GGGAACCCTGGTCAC CGTCTCCTCAG				CCCTGTCTGCATC TGTAGGAGACAGA GTCACCATCACTT GCCAGGCGAGTC AGGACATTAGCAA CTATTTAAATTGGT ATCAGCAGAAACC AGGGAAAGCCCC TAAGCTCCTGATC TACGATGCATCCA ATTTGGAAACAGG GGTCCCATCAAGG TTCAGTGGAAGTG GATCTGGGACAGA TTTTACTTTCACCA TCAGCAGCCTGCA GCGTGAAGATGTT GCAACATATTACT GTCAACAGTATGA TAATCTCCCGCTC ACTTTCGGCGGAG GGACCAAGGTGG AAATCAAAC
	B2121	Omicron BT	Singlet	VH4-39	JH2	903	CAGCTGCAGCTGCAG GAGTCGGGCCCAGG ACTGGTGAAGCCTTC GGAGACCCTGTCCCT CACCTGCAGTCTCTC TGGTGGCTCCATCAG CTACAACCCGTCCCT CAAGAGTCGAGTCTC CATATCCGTAGACAC GTCCAAGAACCAGTT	VL3-25	JL3	904	TCCTATGAGCTGA CACAGCCTCCCTT GGTGTCAGTGTCC CCAGGACAGACG GCCAGGATCACCT GCTCTGGAGACG CATTCCCAAACCA ATATGCTTACTGG TACCAGCAGAAGT CAGGCCAGGCCC

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							CTCCCTGAAGGTGAG GTCTGTGACCGCCGC AGACACGGCTGTCTA TTACTGTGCGAGATT TCACTGTACTACTAA CAGATGCTACGGAGA TGACTGGTACTTCGA TCTCTGGGGCCGTG GCACCCTGGTCACCG TCTCCTCAG				CTGTGTTGGTGAT TTATAAAGACAGT GAGAGGCCCTCA GGGATCCCTGAG CGATTCTCTGGCT CCAGCTCAGGGG CAACAGTCACGTT GACCATCAGTGGA GTCCAGGCAGAA GACGAGGCTGAC TATTACTGTCAAA CAGCAGACAGTAG GGGTACTTTGTTC GGCGGAGGGACC AAGCTGACCGTCC TAG
	B2122	Omicron BT	Singlet	VH3-30	JH4	905	AGGTGCAGCTGGTG GAGTCGGGGGGAGG CGTGGTCCAGCCTG GGAGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTC AGTGACTATGGCATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGTTG GCAGTGATATCATCT GATGGAAGTCTTAAA TACTTTGATGACTCC GTGAAGGGCCGATTC ACCATCTCCAGAGAC AATTCCAAGAACACG CTGTATCTGCAAATG AACAGCCTGAGAGTT	VK1-39	JK5	906	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTGCCA CGTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA GAGATTTCACTCT CACCATCAGCGGT

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							GAGGACACGGCTGTATTACTGTGCGAAAGATCGCGATTTGGAGTCCTTCTTACTCCTTGACTACTGGGGCCAGGGAACCCTGGTCACCGTCTCCTCAG				CTGCAACGTGAAGATTTTGCAACTTACTACTGTCAACAGAGTTATAGTACCCCCCCGATCACCTTCGGCCAAGGGACACGACTGGAGATTAAAC
	B2123	Omicron BT	Singlet	VH1-58	JH3	907	TGCAGCTGGTGCAGTCTGGGCCTGAGATAAAGAAGCCTGGGACCTCAGTGAAGGTCTCCTGCAAGGCCTCTGGATTCACCTTTAGTAACTCTGCTGTGCAGTGGGTGCGACAGGCTCGTGGACAACACCTTGAGTGGATAGGATGGATCGTCGTTGGCAGTGGTGACCCAAACTACGCACAGAAGTTCCAGGAAAGAGTCACCCTTACCAGGGACATGTCCACAGGCACAGCCTACATGGAGCTGAGCAGCCTGAGATCCGAGGACACGGCCTTTTATTACTGTGCGACAAATAATTGTAGTAGAACCATCTGCTCTGATGGTTTTGATATCTGGGGCCAAGGGACAATGGTCACCGTCTCTTCAG	VK1-39	JK1	908	GACATCCAGTTGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTTGCCGGGCAAGTCAGAGCATTAGAAGTTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAAGCTCCTGATCTATGTTGCATCCAGTTTGCAAACTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCTGGGACAGAATTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGAGTTACAGTACCCCTCCATGGACGTTCGGCCAAGGGACCAAGGTGGAGATCAAAC

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	B2124	Omicron BT	Singlet	VH5-51	JH5	909	GAGGTGCAGCTGGT GCAGTCTGGAGCAGT GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTCAGGGTT CTGGCTACAGCTTTC CCTACTACTGGATCG GCTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTACATGGG GGTCGTCTATCCTTC TGACTCTGATACCAA GTACAGCCCGTCCTT CCAAGGCCAGGTCAC CATCTCAGCCGACAA GTCCATCAGCACCGC CTACCTGCAGTGGAA CGGCCTGAAGGCCT CGGACACCGCCATGT ATTACTGTGCGAGAA TTGATCCCCATGATT GTAGTGGTGGTGCCT GCTTTCCGGCAGGGT TCGACCCCTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG	VK1-33	JK3	910	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTGGCA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTACGATGCATC CAATTTGGAAACA GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACT GATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATA TTGCAACATATTA CTGTCAACAGTAT GATAATCTTCTTCT CACTTTCGGCCCT GGGACCAAAGTG GATATCAAAC
	B2125	Omicron BT	Singlet	VH1-58	JH3	911	TGCAGCTGGTGCAGT CTGGGCCTGAGATAA AGAAGCCTGGGACCT CAGTGAAGGTCTCCT GCAAGGCCTCTGGAT TCACCTTTAGTAACTC TGCTGTGCAGTGGGT GCGACAGGCTCGTG	VK3-20	JK2	912	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTA GCAGCAGCTACTT

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							GACAACACCTTGAGT GGATAGGATGGATCG TCGTTGGCAGTGGTG ACCCAAACTACGCAC AGAAGTTCCAGGAAA GAGTCACCCTTACCA GGGACATGTCCACAG GCACAGCCTACATGG AGCTGAGCAGCCTGA GATCCGAGGACACG GCCTTTTATTACTGTG CGACAAATAATTGTA GTAGAACCATCTGCT CTGATGGTTTTGATAT CTGGGGCCAAGGGA CAATGGTCACCGTCT CTTCAG				AGCCTGGCACCAA CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATTTATGG TGCATCCAGTAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TGTATTACTGTCA GCAATATGGTAGC TCACGGGTCACTT TTGGCCCGGGGA CCAAGCTGGAGAT CAAAC
	B2126	Omicron BT	Singlet	VH4-31	JH3	913	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CACAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGCCTCCATCA GCAATGGTGGTTACT ACTGGAGCTGGATCC GCCAGCACCGAGGG CAGGGCCTGGAGTG GATTGGGTACATCTA TTACAGTGGGGACAC CTACTACAACCCGTC CCTCAAGAGTCGACT TATCATGTCAGTTGA CACGTCTAAGAACCA	VK1-39	JK5	914	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA GCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTGGAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA

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							GTTCTCCCTGGAGCT GAGCTCTGTGACTGC CGCGGACACGGCCC TGTATTACTGTGCGA GGATACGAACACCTT TGACCAGGGACACG GAGGGGGAGCATGC TTTTGATATGTGGGG CCAAGGGACAATGGT CACCGTCTCTTCAG				CAGAATTCACTCT CACCATCAGCAGT CTGCAACGTGAG GATTTTGCAACTT ACTACTGTCAACA GAGTCACAGTATC CTCTTCACCTTCG GCCAGGGGACAC GACTGGAGATTAA AC
C018	B2015	Vax3	Clone	VH1-69	JH6	915	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCCTC AGCAGCACTGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCCTGAGTGGATG GGAAGGATTATTCCG ATTTTTGGAACAACA GACTACGCACCGAAT TTCCAGGGCAGAGTC ACGATTACCGCGGAC GAATCTACGAGTACA GTCTACATGGAACTG AGCAGTCTGAGATTT CAGGACACGGCCCT GTATTACTGTGCCAG AGATCACGAGACTGC GCCCCTATACGGTAT GGACGTCTGGGGCC	VK1-39	JK5	916	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGTATTAGTA GGTTTTTAAATTG GTATCAGCAAAAA CCAGGGAAAGCC CCTGAGCTCCTGA TCTATGCTACGTC CACTTTACAAGAT GGGGTCCCACCA AGATTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTATCC CTCCGATCACCTT CGGCCAAGGGAC

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							AAGGGACCACGGTCA CCGTCTCCTCAG				ACGACTGGAGATT AAAC
	B2016	Vax3	Clone	VH3-30	JH6	917	AGGTGCAGCTGGTG GAGTCTGGGGGAGG CGTGGTCCAGCCTG GGAGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTC AGTAACTATGCCATG CACTGGGTCCGCCA GACTCCAGGCAAGG GGCTGGAGTGGGTG GCAGTTATATCATAT GATGGAAGTAAGAAA TACTATGGAGACTCC GTGAAGGGCCGATTC ACCATCTCCAGAGAC AATTCCAAGAACACG CTGTATCTGGAAATG AACAGCCTGAGAGCT GAAGACACGGCTGTG TATTACTGTGCGAAA GCTGAGGGCCCATAT GGTTCGGGGACCTC CCACTACTACTACGG TATGGACGTCTGGGG ACAAGGGAACACGGT CACCGTCTCCTCAG	VK1-39	JK4	918	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATCAGCA CCTATTTACATTG GTATCAACAGAAA CCAGGGAAAGCC CCTAACCTCCTGA TCTATGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCCGTGGCA GTGGATCTGGGG CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAGG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC CGCTCACTTTCGG CGGAGGGACCAA GGTGGAAATCAAA C
	B2017	Vax3	Clone	VH1-69	JH4	919	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAACCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCATCTTC	VK3-20	JK3	920	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							AGCAGCTATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCCCTA TCTTTGGAACAACAA CCTACGCACAGAAGT TCCAGGGCAGAGTCA CGATTACCGCGGACG AATCCACGACCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGC GGTCCGCCGACGTAT AACGATTTTTTGGAGT GGTTATTCATTTGACT ACTGGGGCCAGGGA ACCCTGGTCACCGTC TCCTCAG				AGTCAGAGTGTTA ACAGCGACTTCTT AGCCTGGTACCAG CAGATACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGCATCCAACAGG GCCACTGGCATCC CAGAGAAATTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TGTATTACTGTCA GCAGTATGGTAAC TCCCCTTTCACTT TCGGCCCTGGGA CCAAAGTGGATAT CAAAC
	B2018	Vax3	Clone	VH1-69	JH4	921	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGACT TCTGGCGGCACCTTC AGCAGCTATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCCCTC GCTTTGGTATACCAA ATTACGTACAGAAATT CCAGGGCAGAGTCA	VK3-15	JK5	922	GAAATAGTGATGA CGCAGTCTCCAGC CACCCTGTCTGTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTGTTAGC AGCGACTTAGCCT GGTACCAGCAGAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTCTGGTGCAT CCACCAGGGCCA CTGGTATCCCAGC

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							CGATTACCGCGGACA AATCCACGAGCACAG CCTACATGGAGCTGG CCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGA GTTGGGGACCGATCT ACGGTGCCTTACTTT GACTACTGGGGCCA GGGAATCCTGGTCAC CGTCTCCTCAG				CAGGTTCAGTGGC AGTGGGTCTGGG ACAGAGTTCACTC TCACCATCAGCAG CCTGCAGTCTGAA GATTTTGCAGTTT ATTACTGTCAGCA GTATAATAACTGG CCTATCACCTTCG GCCAAGGGACAC GACTGGAGATTAA AC
	B2019	Vax3	Singlet	VH3-9	JH3	923	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GGTTGGTACAGCCTG GCAGGTCCCTGAGAC TCTCCTGTGCAGCCT CTGGATTTAATATTGC TGACTATGGCATGCA CTGGGTCCGACAAGC TCCAGGGAAGGGCC TGGAGTGGGTCGCA GGTATAAGTTGGAAT AGTGGTAGGATAGGG TATGCGGACTCTGTG AAGGGCCGATTCACC ATCTCCAGAGACAAC GCCAAGAAGTCCCTG TCTCTGCAAATGAAC AGTCTGCGAGCTGAG GACACGGCCTTGTAT TATTGTGCAAAAACAT ATTGTGGTGGTGACT GTTATTCCCTCTTATT	VK1-27	JK3	924	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCGAG TCAGGACATTAGC AATGATTTAGCCT GGTATCAGCAGAA ACCAGGGAAAGTT CCTAAGCTCCTGA TCTATGGTGCATC CACTTTGCAATCA GGGGTCCCATCTC GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGC CTGCAGCCTGAAG ATGTTGCAACTTA TTACTGTCAACAG TATAACAGTGGAG

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							ATATGATCCTCTTGAT ATCTGGGGCCAAGG GACAATGGTCACCGT CTCTTCAG				GCACTTTCGGCCC TGGGACCAAAGTG GATATCAAAC
	B2020	Vax3	Singlet	VH3-30	JH6	925	AGGTGCAGCTGGTG GAGTCGGGGGGAGG CGTGGTCCAGCCTG GGACATCCGTGAGAC TCTCCTGTGCAGCCT CTCGATTCACCTTCA GTAGTTATGGCATGC ATTGGGTCCGCCAGG CTCCAGGCAAGGGG CTGGAGTGGGTGGC AGGTATCTCATTTCAT GGAAGTAATAAGTAC TATGCAGACTCCGTG AAGGGCCGATTCAAC ATCTCCAGAGACAAT TCCAAGAACACATTG TCTCTGCAAATGAAC AGCCTGAGGACTGAG GACACGGCTGTATAT TACTGTGCGAAAGAT CGGGGGGGGGGAAT ATTACGATTTTTGGA GTGGTTATCAGACTA CGACTGCGGTTTGGA CGTCTGGGGCCAAG GGACCACGGTCACC GTCTCCTCAG	VK1-39	JK5	926	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCG TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAACATTAATA GGTATTTAAATTG GTATCAGCAAAAA CCGGGGGAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTGCAAAGT GGAGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCGCTCT CACCATCAGCAGT CTGCAACCTGAAG ACTTTGCAAATTA CTACTGTCAACAG ACTTACAGGACTC CTCCGAGCACCTT CGGCCAAGGGAC ACGACTGGAGATT AAAC
	B2021	Vax3	Clone	VH4-31	JH5	927	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT	VK1-33	JK2	928	GCCATCCGGATGA CCCAGTCTCCATC CTCCCTGTCTGCA

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							CACAGACCCTGTCCC TCACCTGCACTGTCT CTGGAGGCTCCATTA GCAGTTATGGCTACT ACTGGAGCTGGATCC GCCAGCACCCAGAG AAGGGCCTGGAGTG GATTGGGCACATCTA TTACAGCGGGAGCAC CTACTACAACCCGTC CCTCAAGAGTCGAGT TACCATATCAGTAGA CACGTCTAAGAACCA GTTCTCCCTGAAACT GAGTTCTCTGACTGC CGCGGACACGGCCG TATATTACTGTGCGA GAGACCCGCTCGCA GGCAGGGGCCAGTT TGACCGCTGGGGCC AGGGAACCCTGGTCA CCGTCTCCTCAG				TCTGTAGGGGACA GAGTCTCCATCAC TTGCCAGGCGAGT CAAGACATTTCCA ACTTTTTAAATTGG TATCAGCAGAAGC CAGGGCAAGCCC CTAAGCTCCTGAT CTACGATGCATCC AGTTTAGAAACAG GGGTCCCATCAAG GTTCAGTGGAAGT GGATCTGGGACA CATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATA TTGCAACTTATTA CTGTCAACAGTTT GATGATGTCCCTC CCAGTTTTGGCCA GGGGACCAAGCT GGAGATCAAAC
	B2023	Vax3	Singlet	VH3-43	JH4	929	GAGGTGCAGCTGGT GGAGTCTGGGGGAG TCGTGGTACAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTT GATGATTATACCATG CACTGGGTCCGTCAA GCTCCGGGGAAGGG TCTGGAGTGGGTCTC TCTTATTTTTTGGGAT GGTGGTAGCCCATAC	VK1-5	JK1	930	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT GGCTGGTTGGCC TGGTATCAGCAGA AACCAGGGAAAG CCCCTAAGCTCCT GATCTATAAGGCG

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							TATGCAGACTCTGTG AAGGGCCGATTCACC ATCTCCAGAGACAAC AGCAAAAACTCCCTG TATCTGCAAATGAAC AGTCTGAGAATTGAG GACACCGCCTTGTAT TACTGTGCAAAAGCC GCCATGGGGTATTGT AGTGGTGGTGACTGC TACTCATACTACTTTG ACTACTGGGGCCAG GGAACCCTGGTCACC GTCTCCTCAG				TCTAGTTTAGAAA GTGGGGTCCCAT CAAGGTTCAGCG GCAGTGGATCTG GGACAGAATTCAC TCTCACCATCAGC AGCCTGCAGCCT GATGATTTTGCAA CTTATTACTGCCA ACAGTATAATAGT TATTCGACGTTCG GCCAAGGGACCA AGGTGGAAATCAA AC
	B2024	Vax3	Clone	VH1-58	JH3	931	TGCAGCTGGTGCAGT CTGGGCCTGAGGTG AAGAAGCCTGGGACC TCAGTGAAGGTCTCC TGCAAGGCTTCTGGA TTCACCTTCACTACCT CTGCTGTGCAGTGGG TGCGACAGGCTCGTG GACAACGCCTTGAGT GGATAGGTTGGATCG CCGTGGGCAGTGGT AAGACAGAGTATGCA CAGAAGTTCCAGGAA AGAGTCGCCCTTAGC AGGGACACGTCCGC AAACACAGCCTACAT GGATTTGCGCAGCCT GACATCCGAGGACAC GGCCGTTTATTACTG TGCGGCACCCGATTG	VK3-20	JK2	932	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAACCACCCTC TCGTGCAGGGCC AGTCAGAGTGTTA GCCGCAATTACTT AGCCTGGTACCTG CAGAAGCCTGGC CAGGCTCCCAGG CTCCTCATCTATG CTGCATCCAGCAG GGCCACTGGCAT CCCAGACAGGTTC AGTGGCAGTGGG TCTGGGACAGACT TCACTCTCGCCAT CAGCAGACTGGA GCCTGAAGATTTT

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							CAATAGGACCACCTG CCTAGATGGTTTTGA TATCTGGGGCCAAGG GACAATGGTCACCGT CTCTTCAG				GCAGTGTATTACT GTCAGCAGTACG GTACCTCACCTTG GACTTTTGGCCAG GGGACCAAGCTG GAGATCAAAC
	B2025	Vax3	Singlet	VH3-53	JH4	933	GAGGTGCAGCTGGT GGAGACTGGAGGAG GTTTGATCCAGCCGG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGAGATCCTCGTC AGTAGGAACTACATG AGTTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC AGTTCTTTTTCCCGG TGGTAGCACAAACTA CGCAGATCCCGTGAA GGGCCGATTCACCAT CTCCAGAGACAATTC CAAGAACACATTGTA TCTTCAAATGAACAG CCTGAGAGCCGAGG ACACGGCCGTGTATT ACTGTGCGAGAGGG CTATTCGGTGAATGG GGCTACTTTGACTGT TGGGGCCAGGGAAC CCTGGTCACCGTCTC CTCAG	VK1-27	JK1	934	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCG TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCGAG TCAGGGCATTAGC AATTATTTAGCCT GGTATCAGCAGAA ACCAGGGAAAGCT CCAAAGCTCCTGA TCTCTGCTGCATC CACTGTGGAATCA GGGGTCTCGTCTC GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGC CTGCAGTCTGAAG ACGTTGCAACTTA TTACTGTCAGAAG TATAACAGTGCCC CTGGCACGTTCG GCCAAGGGACCA AGGTGGAAATCAA AC
	B2026	Vax3	Clone	VH3-9	JH6	935	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG	VL3-21	JL2	936	TCCTATGAGCTGA CTCAGCCACCCTC

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							CTTAGTACAGCCTGG CAGGTCCCTGAGGCT CTCCTGTGCAGCCTC TGGATTCAGTTTTGA AGACTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTATTAGTGGGAAC AGTGGTACTCTAGGC TACGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAGAACTCCCTG TATCTGCAAATGCGC AGTCTAAGAGTTGAG GACACGGCCTTGTAT TATTGTGCAAAAGAT ATGGCTGGAGTGGTT ATTTTAGGTGTTGAG GAAAAGTATGGTATG GACGTCTGGGGCCA AGGGACCACGGTCA CCGTCTCCTCAG				AGTGTCAGTGGCC CCAGGAAAGACG GCCAAGATTACCT GTGGGGGCGACA ACATTGGAAGTAA AAGTGTACACTGG TATAAGCAGAAGC CAGGCCAGGCCC CTCTCCTGGTCAT ATATTATGATAAC GACCGGCCCTCA CAGATCCCTGAGC GATTCTCTGGCTC CAACTCTGGGAAC ATGGCCACCCTGA CCATCAACAGAGT CGAAGCCGGGGA TGAAGCCGACTAT TACTGTCAGGTGT GGAATAGTGGTAG TGATCATGTGGTT TTCGGCGGAGGG ACCAAGCTGACCG TCCTAG
	B2027	Vax3	Singlet	VH3-30	JH4	937	AGGTGCAGCTGGTG GAGTCTGGGGGAGG GGTGGTCCAGCCTG GTCGGTCCCTCAGAC TCTCCTGTGCAGTCT CTGGATTCGCCTTCA GGAAATATGGCATTC ACTGGGTCCGCCAG GCTCCAGGCAAGGG GCTGGAGTGGGTGG	VK1-13	JK4	938	GCCATCCGGATGA CCCAGTCTCCGTC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGTCGGGCAAGT CAGGGCATTAGCA GTGCTTTAGTGTG GTATCAGCAGAAA CCAGGGAAAGCT

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							CCGTTATATCATATGA TGGAGGTAATATAGA CTATGCAGACTCCGT GAAGGGCCGGTTCA CCATCTCCAGAGACA ATTCCAAGGACACGG TGTATTTGGAAATGA ACAACCTGAGAGCTG AGGACACGGCTGTGT ATTACTGTGCGAAGC AAACCGGGACATATT GTAGTGGTGGTAACT GCTACTCGGGCTACT TTGACTACTGGGGCC AGGGAACCCTGGTCA CCGTCTCCTCAG				CCTAAACTCCTGA TCTACGATGCCTC CAGTTTGGAAAGT GGGGTCCCATCG AGGTTCAGCGGC AGTGGATCTGGG GCAGATTTCACTC TCACCATCAGCAG CCTGCAGCCTGAA GATTTTGCAACTT ATTACTGTCAACA GTTTTATGATTCC CCTCCACTAACTT TCGGCGGAGGGA CCAAGGTGGAAAT CAAAC
	B2028	Vax3	Singlet	VH3-30	JH4	939	AGGTGCAGCTGGTG GAGTCTGGGGGAGG CGTGGTCCAGCCTG GGAGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCATC AGTACCTATGGCATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGGTG GCTGTTATATCATATG ACGGAAGTAATATAT ACTATGCAGACTCCG TGAAGGGCCGATTCA CCATCTCCAGAGACA ATTCCAACAACACGC TGTATCTGCAAATGA ACAGCCTGAGAGCTG	VK3-20	JK4	940	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTA CCAGCAGCTACTT AGCCTGGTACCAG CAAAAACCTGGCC AGGCTCCCAGGC TCCTCATCTCTGG TGCATCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG

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							AGGACACGGCTGTGT ATTACTGTGCGAAAC AAAATGCCCCTTATT GTAGTGGTGGTAGCT GTTACGAGGGCTACT TTGACTACTGGGGCC AGGGAGCCCTGGTC ACCGTCTCCTCAG				CAGACTGGAGCCT GAAGATTTTGCAG TGTATTACTGTCA GCAGTATGGTAGC TCATTGCTCACTT TCGGCGGAGGGA CCAAGGTGGAAAT CAAAC
	B2029	Vax3	Singlet	VH1-69	JH4	941	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCTTT AGAATCTATGCTATC AACTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG AGGGATCATCCCTAT GGTTGGTAAAGCAAA CTACGCTCAGAAGTT CCGGGGCAGAGTCA CGATTACCGCGGACG AATCCACGAGCACAG CCTACATGGAACTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGA GATTTCCGAGAATGT ACTAGTACCAGTTGC TTATACTTCTTTGACT ACTGGGGCCAGGGA ACCCTGGTCACCGTC TCCTCAG	VK1-39	JK1	942	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCG TCTGTTAGAGACA GAGTCACCCTCAC TTGCCGGGCAAG CCAGAACATTACC ACCTATTTAAATTG GTATCAGCAGAAA CCAGGAAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAGCAG AGTTTCAGTGGTC CTCGGACGTTCG GCCTAGGGACCA AGGTGGAGATCAA AC

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	B2030	Vax3	Clone	VH1-69	JH4	943	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AAGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCTTC AGCACCTATGCTATC ATCTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG AGGAATCATCCCTGT CTTTGATGCAGCGAA CTCCGCACAGAAGTT CCAGGGCAGAGTCA CGATTACCGCGGACA AATCCACGAGCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGA GTGAAACGTCTATGG CACGAGTCTGTGGCG CGATACTACTTTGATT ACTGGGACCAGGGA ACCCTGGTCACCGTC TCCTCAG	VK1-33	JK4	944	CATCCGGATGACC CAGTCTCCATCCT CCCTGTCTGCATC TGTAGGAGACAGA GTCACCATCACTT GCCAGGCGAGTC AGGACATTAGCAA CTATTTAAATTGGT ATCAGCAGAAACC AGGGAAAGCCCC TAAGCTCCTGATC TACGATGCATCCA ATTTGGAAACAGG GGTCCCATCAAGG TTCAGTGGAAGTG GATCTGGGACAGA TTTTACTTTCACCA TCAGCAGCCTGCA GCCTGAAGATATT GCAACATATTACT GTCAACAGTATGA AAATCTCCCGGTG CTCAGTTTCGGCG GAGGGACCAAGG TGGAAATCAAAC
	B2031	Vax3	Singlet	VH3-9	JH4	945	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCTCTGAGACT CTCCTGTGCAGCCTC TGGATTCATCTTTGAA GATTATGCCATGCAC TGGGTCCGGCAAGCT	VL1-47	JL2	946	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCGTCTCT TGCTCTGGAAGCA GCTCCAACATCGG AAGTAATTATGTAT

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							CCAGGGAAGGGCCT GGAGTGGGTCTCAG GTGTTAGTTATAATAG TGGAACCATAGGCTA TGCGGACTCTGTGAA GGGCCGCTTCATCAT CTCCAGAGACAACGC CAAGAACTCTCTGTA TCTACAAATGCGCAG TCTGAGACCTGAGGA CACGGCCTTCTATTA TTGTGCAAAAGCTAA AGAACCAAAGGACGC ATACAGCGATGGAGA CGAGTACTGCTTTGA CTCCTGGGGCCAGG GAATCCTGGTCACCG TCTCCTCAG				CCTGGTACCAACA ACTCCCAGGAACG GCCCCCAAACTCC TCGTCTATCGGAG TAATCAGCGGCCC TCAGGGGTCCCT GACCGATTCTCTG GCTCCAAGTCTGG CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCGGTCCG AGGATGAGGCTG ATTATTATTGTGCA GCATGGGATGACA GCCTGAGTGGTGT GCTTTTCGGCGGA GGGACCAAGCTG ACCGTCCT
	B2032	Vax3	Singlet	VH4-39	JH5	947	CAGCTGCAGCTGCAG GAGTCGGGCCCAGG ACTGGCGAAGCCTTC GGAGACCCTGTCCCT CACCTGCAGTGTCTC TGGTGGCTCCATCAG CAGTGTTAATTACTAC TGGGGCTGGATCCG CCAGCCCCCAGGGA AGGGACTGGAGTGG ATTGTGAGTGTTTATT ATGGTGGGAACACCC ACTACAACCCGTCCC TCAAGAGTCGAGTCA CCATCTCTGTTGACA CGTCGAAGAACCAGA	VK1-33	JK4	948	GCCATCCGGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTTGGAGACA GAGTCACTATCAC TTGCCAGGCGAGT CAGGACATTAACA CCTATTTAAACTG GTATCAGCAGAAA CCGGGGAAAGCC CCTAAGCTCCTGA TCTACGATGTCTT CAATTTGGAAACA GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TGTCCCTGAAGTTGA ACTCTGTGACCGCCG CAGACACGGCTGTAT ATTACTGTGCGAGAC ATGAATATTATTATGA TAGAAGAGGTTCACC GCGGCTGGGGTGGT TCGACCCCTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG				GAGTTTACTCTCA CCATCAGCAGCCT GCAGCCTGAAGAT ATTGGCACATATT ACTGTCAACAGTA TAATAATTTCGCG CTCACTTTCGGCG GAGGGACCAAGG TGGAGATCAAAC
	B2033	Vax3	Singlet	VH3-30	JH4	949	AGGTGCAGCTGGTG GAGTCTGGGGGAGG CGTGGTCCAGCCTG GGAGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTC AGTATCTATGGCATG CACTGGGTCCGCCA GGCTCCCGGCGAGG GGCTGGAGTGGGTG GCACTTATATCATATG ATGAAAGTAATAAATA TTATGCAGACTCCGT GAAGGGCCGATTCAC CATCTCCAGAGACAA TTCCAAGAACACACT ATATCTGCAAATGGA CAGCCTGAGAGCTGA GGACACGGCTGTGTA TTACTGTGTGAAACA ACTTGGCACTTATTG TAGTGGTGGTAGCTG CTACTCTGGATTTTTC GACTACTGGGGCCA	VK1-33	JK3	950	CATCCGGATGACC CAGTCTCCATCCT CCCTGTCTGCATC TGTAGGAGGGAG AGTCACCATCACT TGCCAGGGCGAGT CAGGACATTACCA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAACTCCTGA TCTACGATGCATC CAATTTAGAAGCA GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACA CATTTTACTTTCAC CATCAACAGCCTG CAGCCTGAAGATA TTGCAACATATTA CTGTCAACAGTAT GATAATCTCCCAT TCACTTTCGGCCC

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							GGGAACCCTGGTCAC CGTCTCCTCAG				TGGGACCAAAGTG GATATCAAAC
	B2141	Vax3	Singlet	VH1-69	JH1	951	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCG GGGTCCTCGGTGAG GGTCTCCTGCAAGGC TTCTGGAGGCACCCT CATCAACTATGCTGT CAGCTGGGTGCGAC AGGCCCCTGGACAA GGGCTTGAGTTCATG GGAGGGCTCATCCCT ATCCTGGGGACATCA TACTACGCACAGAAG TTCCAGGGCAGAGTC ACGATAATCGCGGAC GAATCCAGGCGTACA GTTTATATGGAGCTG AGCAACCTAAAATCT GAGGACACGGCCGT ATATTACTGTGCGAC AGGTGTCCGAAATTG TCCTGGTGGTGGCTG CTACTCCGCGTACTT CCAACACTGGGGCCA GGGCACCCTGGTCA CCGTCTCCTCAG	VK3-20	JK2	952	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCGGGGGA AAGAGCCACCCTC TCTTGCAGGGCCA GTCAGAGTGTTAG CAGAAGCCACTTA GCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTTTGG TGCTTCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAA TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCCG CAGCCTGGACCG TGAAGATTTTGCA GTGTATTATTGTC ATCATTATGGCGA TTCCACGGGGACT TTCGGCCAGGGG ACCAAGCTGGAGA TCAAAC
	B2143	Vax3	Singlet	VH4-59	JH4	953	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGAGACCCTGTCCC TCGACTGCACTGTCT CTGGTGCCTCCATCA	VK1-33	JK4	954	CATCCGGATGACC CAGTCTCCATCCT CCCTGTCTGCATC TGTAGGAGACAGA GTCACCATCACTT GCCGGGCGAGTC

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							ATTATTACTACTGGAC CTGGATCCGGCAGC CCCCGGGGAAGGGA CTGGAGTGGATTGGG TATGTCTTTTACAGTG GGAGCACCAACTACA ACCCCTCCCTCAAGA GTCGAGTCACCATAT CAGTCGACTCGTCCG CGAACCAGTTCTCCC TGAGGCTGAGCTCTG TGACCGCTGCGGACA CGGCCGTGTATTATT GTGCGAGAGGAGGG ATGGAATATGACGGT CTTTTGACTGGTTATT ATTTGGACTCCTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				AGGACATTAGCAA CTTTTTAAATTGGT ATCAGCAGAAACC AGGGAAAGCCCC TAAACTCCTGATC TACCGTGCATCCA GTTTGGAAACAGG GGTCCCGTCAAG GTTCAGTGGAAGT GGGTCTGGGACA CATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATA TTGCAACATATTA CTGTCAACAATAT GATAATGTCCTGC TCACTTTCGGCGG AGGGACCAAAGT GGATATCAAAC
	B2144	Vax3	Singlet	VH4-31	JH4	955	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GCCTGGTGAAGCCTT CACAGACCATGTCCC TCACCTGCACTGTCT CTGGTGTCGACATTA CTAGTGGTGGTCACT TCTGGAGCTGGATCC GCCACCACCCAGGG AAGGGCCTGGAGTG GATTGGGCACATCTT TTACAGTGGGAGCAC CAACTACAATCCGTC CCTTAAGAGTCGAGT	VK1-33	JK5	956	CATCCGGATGACC CAGTCTCCATCTT CCCTGTCTGCATC TGTAGGAGACAGA GTCACCATCACTT GCCAGGCGAGTC AGGACATTAGCAA CCATTTAAATTGG TATCAGCAGAGAC CAGGGAAAGCCC CTAAGCTCCTGAT CTACGATGCATCC AATTTGGAAGCAG GGGTCCCATCAAG

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							TATGATGTCAGTAGA CACGTCTAAGAACCA GTTCTCCCTGAAGTT GACTTCTGTGACTGC CGGGGACACGGCCG TATATTATTGTGTGAG AGGTGGTTCGGGGA GTTATTATATGGCCG ACTATTGGGGCCAGG GAACCCTGGTCACCG TCTCCTCAG				GTTCAGTGGAAGT GGATCTGGGACA GATTTTACTTTCAC CATTCAGAGCCTG CAGCCTGAAGATA TTGCAACATATTA CTGTCAATCCTAT GATAATCTCCCCC GGCCCTTCTTCGG CCAAGGGACACG ACTGGAGATTAAA C
	B2034	Omicron BT	Clone	VH1-69	JH4	957	CAGGTGCAGCTGGT GCAGTCTGGGCCTGA GGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT CCCGGAGGCACCGC CAGCACATATGCTAT CATCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCCCTC TTTTTGGTGCGACAA GATACACACAGAGGT TCCAGGGCAGAGTCA CGATTACCGCGGACA AATCCACGACCACGG CCTACATGGAGCTGA GCAGCCTGACATCTG AGGACACGGCCGTCT ATTACTGTGCGAGAG TGAAACGTCTATGGC ACGAGTCTGTGGCGC	VK1-33	JK4	958	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAG CCAGGACATTAGC AACTATTTAAATTG GTATCAACAGAAA CCAGGGAAAGCC CCTAAACTCCTGA TCTACGATGCATC CAATGTGGAAACA GGGGTCCCATCC AGGTTCAGTGGAA GTGGATCTGGGA CAGATTTTACTTTC ACCATCAGCAGCC TGCAGCCTGAAGA TATTGCAACATATT ACTGTCAACAGTT TGATAATCTCCCG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GATACTATTTTGATTA CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				GTGGTCACTTTCG GCGGAGGGACCA AGGTGGAGATCAA AC
	B2035	Omicron BT	Singlet	VH1-69	JH4	959	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCGCCCTC AGCACCTATGGCATC AGCTGGGTGCGACA GGCCCCTGGAAAAG GGCTTGAGTGGGTG GGAGGAATCGTCCCT GTGCTTAAAAGAACA AACTACGCACAGAAG TTCCAGGGCAGAGTC ACAATTACCGCGGAC GAATCCACGAACACA GCCTACATGGAGTTA CGCAGCCTGAGATCT GAGGACACGGCCTT GTATTACTGTGCGAG ATGTTTAAATATGGG ATTTTGTAGTGGTGG TAGCTGCTTCGACTA CTGTGACTACTGGGG CCAGGGAACCCTGGT CACCGTCTCCTCAG	VL2-14	JL2	960	CAGTCTGTCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA TCACCATCTCCTG CACTGGAACCAGC AGTGACGTTGGTG GTTATAACTATGT CTCCTGGTACCAA CAACACCCAGGCA AAGCCCCCAAACT CATAATTTTTGATG TCACTGATCGGCC CTCAGGGGTTTCT AATCGCTTCTCTG GCTCCAAGTCTGG CAACACGGCCTCC CTAACCATCTCTG GACTCCAGGCTGA GGACGAGGCTGA TTACTACTGCAGC TCATATACAAGCA GCTACACTCTCGT GGTTTTCGGCGGA GGGACCCACCTG ACCGTCCTAG
	B2036	Omicron BT	Singlet	VH1-18	JH4	961	CAGGTTCAGCTGGTG CAGTCTGGAGCTGAG GTGAAGAAGCCTGG GGCCTCAGTGAAGGT	VL3-27	JL3	962	TCCTATGAGCTGA CTCAGCCATCTTC AGTGTCAGTGTCA CCGGGACAGACA

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							CTCCTGCAAGGTTTC TGGTTACACCTTTATC AACTATGGTATCAGT TGGGTGCGGCAGGC CCCTGGACAAGGGCT TGAGTGGATGGGATG GATCAGCGCTTACGA TGGTTACACAAACTA TGCACAGAAGTTCCA GGGCAGAGTCACCAT GACCACAGACACATC CACGAGCACAGCCTA CATGGACTTGAGGAG CCTGAGATCTGACGA CACGGCCATATATTA CTGTGCGAGAGATCC GGGGGCCACGGATT ACTATGAAAGTACTG CTTTCGAACTGGACT ACTGGGGCCAGGGA AGCCTGGTCACCGTC TCCTCAG				GCCAGGATCACCT GCTCAGGAGATCT ACTGGCAAAAAAA TATGCTCGCTGGT TCCAACAGAAGCC AGGCCAGGCCCC TGTATTGGTGATT TATAGGGACAAAG AGCGGCCCTCAG AGATCCCTGAGCG ATTCTCCGGCTCC AGCTCAGGGACAA CAGTCACCTTGAC CATCAGCGGGGC CCAGGTTGACGAT GAGGCTGACTATT ACTGTTACTGTGC GGCGGCTGAAAA CAATAAGGTGTTC GGCGGAGGGACC AAGTTGACCGTCC TAG
	B2037	Omicron BT	Singlet	VH1-69	JH6	963	CAGGTGCAGCTGGT GCAGTCTGGGGATGA GGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGACT TCTGGAGGCACCCTC ACTAGCTATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCCCTA TTTCTGGTACACCAA	VL3-21	JL3	964	TCCTATGAGCTGA CACAGCCACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGGATTTCC TGTGGGGGAGAC AACATAGGAAGTA AAAATGTGCACTG GTACCAGCAGAAG CCAGGCCAGGCC CCTATACTGGTCG TCTTTGATGATAG

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							GCTACGGAGAGAAGT TCCAGGGCAGAGTCA CGATTACCGCGGACA AATCCACGAGCACAG CCTCCATGGAGCTGA CCAGCCTGAGATATG AGGACACGGCCATGT ATTACTGTGCGAGAG AAACTCCAGCCGCAG TACGATTTTCGGAGA GGCACCCCCAGGGC TTAGGACTCTACGCT ATGGACGTCTGGGG CCAAGGGACCACGG TCACCGTCTCCTCAG				CGACCGGCCCTC AGGGATCCCTGA GCGATTCTCTGGC TCCAACTCTGGGA ACACGGCCACCCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTCCTGTCAG GTGTGGGATAGTA TTAGTGCTCGTCC GTCTTGGGTGTTC GGCGGAGGGACC AAACTGACCGTCC TAG
	B2038	Omicron BT	Clone	VH1-46	JH6	965	CAGGTGCAGCTGGT GCAGTCTGGGTCTGA GGTGAAGAAGCCTG GGGCCTCAGTGAAG GTGTCCTGCAAGGCG TCTGGGTACACCTTC ACCAGCTACACTATA CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGTAATCAACCCTA GTGGTGGTAGTTCAA CCTACGCACAGAGGT TCCATGCCAGAGTCA ACATGACCAGGGACA TGTCCACGACCACAG TCTACATGGACCTGA ACAGCCTGAGATCTG AGGACACGGCCGTAT	VK1-39	JK5	966	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAACT TCTTTTTAAATTGG TATCAGCAAAAAC CAGGGAAAGCCC CTAAGCTCCTGAT CTATGCTGCATCC AGTTTAGATAGAG GGGTCCCATCAAG GTTCGGTGGTAGT GGATCTGGGACA GACTTCACTCTCA CCATCAACAGTCT GCAACCTGAGGAT

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							ATTTTTGTGCGAGAG TATGTAGTACTGTTAA CTGCCCCCCCCGGG CCACGGACGGTCTG GACGTCTGGGGCCA AGGGACCACGGTCA CCGTCTCCTCAG				TTTGCAACCTACT ACTGTCAACAGAG TTACACTCCCTCT ATCACCTTCGGCC AAGGGACACGACT GGAGATTAAAC
	B2039	Omicron BT	Singlet	VH3-53	JH3	967	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGGTTCACCGTC AGTAGCAACTACATG AGCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCACTTATTTATCCCG GTGGTAGCACATTCT ACGCAGACTCCATGA AAGGCCGATTCACCA TCTCCAGAGACAATT CCAAGAACACGCTGT ATCTTCAAATGAACA GCCTGAGAGCCGAG GACACGGCCGTATAT TATTGTGCAAGAGTA GTGGGACCTACCGGT ACTGATGCTTTTGAT GTCTGGGGCCAAGG GACAATGGTCACCGT CTCTTCAG	VK1-33	JK3	968	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAGTA ACTCTTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTACGATGCATC CAATTTGCAAACA GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATA TTGCCACATATTA CTGTCAACAGTTT GATAATCTCCCTT CGTTCACTTTCGG CCCTGGGACCAAA GTGGATATCAAAC
	B2041	Omicron BT	Singlet	VH3-53	JH4	969	GAGGTGCAGCTGGT GGAGTCTGGAGGAAA	VL2-8	JL3	970	CAGTCTGCCCTGA CTCAGCCTCCCTC

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							CTTGATCCAGCCTGG GGGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGGTTCATCGTCAG TAACAGCTACATGAG CTGGGTCCGCCAGG CTCCAGGGAAGGGG CTGGAGTGGGTCTCA GTTATTTATAGCGGT GACAGCACATTCTAC GCAGACTCCGTGAAG GGCCGATTCACCATT TCCAGAGACAATTCC AGGAACACGATGTAT CTTCAAATGAACAGC CTGAGAGCCGAGGA CACGGCCGTGTATTA TTGTGCGAGACTCGG GGGGATACAACTCCA CGATGGGGGGTTTGA CTACTGGGGCCAGG GAACCCTGGTCACCG TCTCCTCAG				CGCGTCCGGGTC TCCTGGACAGTCA GTCACCATCTCGT GCACTGGAACCA GCAGTGACGTTG GTGGTTATAACTA TGTCTCCTGGTAC CAACAGCACCCTG GCAAGGCCCCCA AATTCCTGATTTAT GAGGTCAGTAAGC GGCCCTCGGGGG TCCCTGGTCGCTT CTCTGGCTCCAAG TCTGGCAACACGG CCTCCCTGACCGT CTCTGGGCTCCAG GCTGAGGATGAG GCTTATTATCACT GCTCCTCATATGC AGGCAGTCACCTT TGGGTGTTCGGC GGAGGGACCAAG TTGACCGTCCTAG
	B2042	Omicron BT	Singlet	VH3-13	JH2	971	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCCTGGTGCAGCCT GGGGGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCACCTT CAGTGACTACGACAT GCACTGGGTCCGCC AAAGTACAGAAAAAC GTCTGGAGTGGGTCT	VK1-39	JK5	972	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGACTATTAGGA ACAATTTAATTTG GTATCAGCAAAAA CCAGGGAAAGCC

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							CAACTATTGGTACTT CTGGTGACACATACT ATCCAGACTCCGTGA AGGGCCGATTCACCA TCTCCAGGGAAAATG CCAAGAACTCCTTAT ATCTTCAAATGAACA GCCTGAGCGCCGGC GACACGGCTGTGTAT TACTGTGCAAGAGGC GGGAATCACGATTCT TGGAGTGCTTATTATT CGCGCCTTCCCACGT GGTACTTCGATCTCT GGGGCCATGGCACC CTGGTCACTGTCTCC TCAG				CCTAAACTCCTGA TATATGATGCATC CATTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAGCAG AGTTACACTATGC CTCCGATCACCTT CGGCCAAGGGAC ACGACTGGAGATT AAAC
	B2043	Omicron BT	Clone	VH1-69	JH6	973	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCCTC AGCAGCACTGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCCTGAGTGGATG GGAAGGATCATTCCG ATTTTTGGAACAACA GACTACGCACCGAAT TTCCAGGGCAGAGTC TCGATTACCGCGGAC GAATCTACGACTACA GTCTACATGGAGCTG	VK1-39	JK5	974	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGTATTAGTA GATTTTTAAATTG GTATCAGCAAAAA CCAGGGAAAGCC CCTGAGCTCCTGA TCTATGGTACGTC CACTTTACAAGAT GGGGTCCCACCA AGATTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT

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							AGCAGTCTGACATTT CAGGACTCGGCCCT GTATTACTGTGCGAG AGATCACGAGGTTGC GCCCCTATACGGTAT GGACGTCTGGGGCC AAGGGACCACGGTCA CCGTCTCCTCAG				CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTATCC CTCCGATCACCTT CGGCCAAGGGAC ACGACTGGACATT AAAC
	B2044	Omicron BT	Clone	VH1-58	JH3	975	TGCAGCTGGTGCAGT CTGGGCCTGAGGTG AAGAAGCCTGGGACC TCAGTGAAAGTCTCC TGCAGGTCTTCTGGA TTCACCTTTTTTTCTA TTTCTGCTGTGCAGT GGGTGCGACAGGCT CGTGGACAGCGCCTT GAGTGGATAGGATGG ATCGTCATTGGCAGT GGTAATACCGACTAC GCACAGAATTTCCAG GGCAGAGTCAGCCTT ACCGGGGACTTGTCC ACAAGTACAGCCTAC ATGGAACTGAGCAGC CTGAGATCCGACGAC ACGGCCGTGTACTAC TGTGCGGCACCCGAT TGTAGTCGTACCACT TGCCTAGATGGTTTT GATATCTGGGGCCAA GGGACAATGGTCACC GTCTCTTCAG	VK3-20	JK2	976	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTCA GTAGGAGCTACTT AGCCTGGTACAAG CAAAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGC TGCATCCAGCAGG GCCACTGGCATCC CAGACAGATTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG GAGACTGGAGCC TGAAGATTTTGCA GTGTATTACTGTC AGCAATATGGTAG CTCACCTTGGACT TTTGGCCAGGGG

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											ACCAAGGTGGAG ATCAAAC
	B2045	Omicron BT	Singlet	VH3-53	JH4	977	GAGGTGCAGCTGGT GGAGTCCGGAGGAG GCTTGATCCGGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCCGGATTCAGCGTC AGTAACAACTACATG AGCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCAGTTATTTATAGCG GTGGTACCACATACT ACGCAGACTCCGTGA AGGGCCGATTCAACA TCTCCAGAGACAACT CCAAGAATACGGTGT ATCTTCAAATGAACA GCCTGAGAGCCGAG GACACGGCCGTATAT TATTGTGCGAGAGAA GGGGACGTAGAAGG CTATTACGATTTTTGG AGTGGTTATTCTAGA GACCGTTACTATTTT GACTACTGGGGCCA GGGAGCCCTGGTCA CCGTCTCCTCAG	VK1-39	JK1	978	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GGGTCACCATCAC TTGCCGGGCAAGT CAGAGCGTTGGC AGGCATTTAAGTT GGTATCAGCAAAA ATCAGGGAAAGCC CCTAAACTCCTGA TCTATGATGCATC CACTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCAGTCT CACCATCAGCAAT CTGCGACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACGAAACCC CCCCGTGGACGTT CGGCCAAGGGAC CAAGGTGGAAATC AAAC
	B2046	Omicron BT	Singlet	VH1-69	JH4	979	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTCAAGG TCTCCTGCAAGGCCT	VK1-39	JK1	980	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC

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							CTGGAGGCGCCTTCA GCATCTACGCTATCA GCTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGGTGG GAGAGATCATCCCTA TGTCTGGAACACCAA AATCCGCACCGAAGT TCCAGGGCAGAGTCA CGATTACCGCGGACG AATCTACGACAACAG CCTACATGGAACTGA GCAGCCTGAGATCTG AGGACACGGCCTTTT ATTACTGTGCGAGGC ATTTCCGAGATTGTC GTGAAACCAGCTGCT TATACTACTTTGACTC CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				TTGCCGGGCAACT CATAATATTGTCA ATTATTTAAATTGG TATCAGCAGAAAG TAGGGAATGCCCC GAAACTCCTGATC TACGCTGCGTCCA CTTTGCAGAGTGG GGTCCCTTCGAG GTTCAGTGGCAGT GGGTCTGGGACA GAATTCACTCTCA CCATCAGCAGTCT GCAACCTGAAGAT TTTGCAACTTACT ACTGTCAACAGAG TCACAGTGCCCCC CGGACGTTCGGC CAAGGGACCAAG GTGGAGATCAAAC
	B2047	Omicron BT	Clone	VH1-69	JH4	981	CAGGTGCAGCTGGT GCAGTCTGGGACTGA GGTGAAGAAGCCTG GGTCTTCGGTGAAGG TCTCCTGCAAGACTT CTGGAGGCATCTTCA GCAGTTATGGCAGTT ATGGTATCAGCTGGG TGCGACAGGCCCCT GGACAAGGGCTTGA GTGGATGGGAGGGA TCATCCCTATCTTTGG TTCAACAACCTTCGC	VK3-20	JK3	982	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTA GCAGCACCCACTT AGCCTGGTACCAG CAGCGACCTGGC CAGGCTCCCAGG CTCCTCATCCATG GTGCATCCACCAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ACAGCAGTTCCAGGG CAGAGTCACGATTAC CGCGGACGAATCTAC GACCACAGTCTACAT GGAGCTGAGCAGCC TGAGATCTGATGACA CGGCCTTTTACTACT GTGCGAGCGGTCCG TCGACATATCACGAT TTTTGGAGTGGTTATT CATTTGACTATTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				GGCCACTGGCAT CTCAGAGAGGTTC AGTGGCAGTGGG TCTGGGACAGACT TCACTCTCACCAT CAGCAGACTGGA GCCTGAAGATTTT GCAGTGTATTACT GTCAGCAGTATGG TAATTCCCCTTTC ACTTTCGGCCCTG GGACCAAAGTGG ATATCAAAC
	B2048	Omicron BT	Clone	VH1-18	JH4	983	CAGGTTCAGCTGGTG CAGTCTGGGGCTGA GGTGAGGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGACT TATGGTTACACCTTC ACCAGCTATGGTTTC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GATGGATCAGCGTTT ACAATGGTAACACAA TCTATGCACAGAAGT TCCAGGGCAGAGTCA CCATGACCACAGACA CATCCAAGAGCACAT CTTACATGGAACTGA AGAGCCTGAGGTCTG ACGACACGGCCATAT ATTATTGTACGAGAG	VL6-57	JL3	984	AATTTTATGCTGA CTCAGCCGCACTC TGTGTCGGAGTCT CCGGGGAAGACG GTAACCGTCTCCT GCACCCGCAGCA GTGGCAGCATTGC CAGCAACTATGTG CTGTGGTACCAGC AGCGCCCGGGCA GTGCCCCCACCA CTGTGATCTTTGA GGATGACCAAAGA CCCTCTGGGGTC CCTGGTCGGTTCT CTGGCTCCATCGA CAGCTCCTCCAAC TCTGCCTCCCTCA CCATCTCTGGACT GAAGACTGAGGA

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							TACTGGGTATATATTT CGGGGCAGACTACT GGGGCCAGGGAACC CTGGTCACCGTCTCC TCAG				CGAGGCTGACTAC TACTGTCAGTCTT ATGATGGCACCAA TCGTTCCTGGGTG TTCGGCGGAGGG ACCAAGCTGACCG TCCT
	B2049	Omicron BT	Singlet	VH1-18	JH4	985	CAGGTTCAGCTGGTG CAGTCTAGACCTGAG GCGAAGAAGCCTGG GGCCTCAGTGAGGG TCTCCTGCCAGGCTT CTGGTTACACCTTTA CCACTTATGGCATCC ACTGGGTGCGACAG GCCCCTGGACAAGG CCTTGAGTGGTTGGG ACGAGTCAGCAGTTC CAATGGAAACCCAAT CTATGCACCGAGGTT CCGGGGCAGACTCA CCATGACCACTGACG CATCCACCAGCACAG CATCTATGGAACTGA GGAGCCTGAGATCTG ACGACACGGCCGTCT ATTATTGTGCGAGAG ATCCTACGGTGGTAG CTCCGAGGGACTTCT TTGACTACTGGGGCC AGGGAACCCTGGTCA CCGTCTCCTCAG	VL3-21	JL1	986	TCCTATGAGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGGATTACC TGTGGGGGAGAC AACATTGGAAGTA AAAATGTGCACTG GTACCAACAGAAG CCAGGCCAGGCC CCTGTGCTGGTCG TCTTTGAGGATTC CGACCGGCCCTC ACGGATCCCTGAC CGATTCTCTGGCT CCAACTCTGGGAA CACGGCCACCCT GACCATCAGCAG GGTCGAGGCCGG GGATGAGGCCGA CTATTACTGTCAG GTGTGGGATAGTA GTAGCGATCCTTA TGTCTTCGGAAGT GGGACCAGGGTC ACCGTCCTA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
	B2050	Omicron BT	Clone	VH4-59	JH3	987	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGGCTCCATTA GTACTTATTACTGGA GCTGGCTTCGGCAG CCCCCGGGGAAGGG ACTGGAGTGGATTGG CTATATCTTTAACAGT GGGGGCACCAACTA CCACCCCTCCCTCAG GAGTCGAGTCACCAT GTCAGTAGACACGTC CAACAACCAGTTCTC CCTGACACTGAGGTC TGTGACCGCTGCGGA CACGGCCGTCTATTA CTGTGCGAGAGATTT AGGCTATGATACTAG TGGCCCCGATGCTTT TCAGATCTGGGGCCA AGGGACAATGGTCAC CGTCTCTTCAG	VK3-11	JK1	988	GAAATTGTGTTGA CACAGTCTCCAGC CACCCTGTCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTGTTTAC ACCTACTTAGCCT GGTACCAACACAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTATGATGCAT CCACCAGGGCCA CTGGCATCCCAGC CAGGTTCAGTGGC AGTGGGTCTGGG ACAGACTTCACTC TCACCATCAGCAG CCTGGAGCCTGC AGATTTTGCAGTT TATTACTGTCAGC AGCGTAGCAATTG GCCGGGGACGTT CGGCCAAGGGAC CAAGGTGGAAATC AAAC
	B2051	Omicron BT	Clone	VH3-9	JH6	989	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTATACCATGCA CTGGGTCCGGCAAG	VL3-21	JL3	990	TCCTATGAGCTGA CACAGCCACCCTC AGTGTCAGGGGC CCCAGGAAAGAC GGCCAGGATTACC TGTGGGGGAAAC AACATTGGAAGTA AAAGTGTGCGCTG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTATTACTTCGAAT GGTGGTATCATAGGC TTTGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAGAACTCACTG TATCTGCAAATGAAC AGTCTGAGAGCTGAG GACACGGCCTTCTAT TACTGTGCAAAAGAT ATGGCAGGAGTGGTT CTTTTAGGTGTTGAG GAAAATTACGGCATG GACGTCTGGGGCCA AGGGACCACGGTCA CCGTCTCCTCAG				GTACCAGCAGAAG CCAGGCCAGGCC CCTGTGTTGGTCA TCTATTATGATAG CGACCGGCCCTC AGGGATCCCTGA GCGATTCTCTGGC TCCAACTCTGGGA ACACGGCCACCCT GACCATCGGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTACTGTCAG GTGTGGGATAGTA GTAGTGATCATGT GGTTTTCGGCGGA GGGACCAAGCTG ACCGTCCTAG
	B2127	Omicron BT	Singlet	VH3-13	JH4	991	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTACGGCCTG GGGGGTCCCTGAGA CTCTCCTGTGTAGCC TCTGGATTCTCCTTCA GTAGTTACGACATGC ACTGGGTCCGCCAAT CTGCAGAAAAAGGTC TGGAGTGGGTCTCAA CTATTGGTACTTCTG GCGACACATACTATG CAGACTCTGTGAAGG GCCGGTTCACCATCT CCAGACAAAATGACA AGAACTCCTTGTATC	VK1-39	JK3	992	GACATCCAGATGA CCCAGTCTCCAGT CTCCCTGTCTGCA TCTATAGGAGACA GGGTCACCATCAC TTGCCGGGCAAGT CAGAGTGTTAGTA GATATTTAAATTG GTATCAGGTGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGGTGCGTC CAATTTGCAAAGT GGGGTTTCATCAA GGTTCAGTGGCA GTGGCTCTGGGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TTCAAATGAACGGCC TGACAGCCGGGGAC ACGGCTGTGTATTAC TGTACAAGAGGGAGT CCTGCGGTGACTACG GTCTTTGACTACTGG GGCCAGGGAACCCT GGTCACCGTCTCCTC AG				CAGATTTCACACT CACCATCAGTACT CTGCAGCCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTATGTTAACC CTGGGGTCACTTT CGGCCCTGGGAC CAAACTGGATATC AAAC
	B2128	Omicron BT	Singlet	VH3-15	JH6	993	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGCAAAGCCTG GGGGGTCCCTTAGAC TCTCCTGTGCAGCCT CTGGATTTACTTTCA GAAATGCCTGGATGA GCTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTTG GCCGTATGAAGACCA AAACTCATGGTGGGA CAACAGACTACGCAG CACCCGTGAAAGGCA GATTCACCATCTCAA GAGATGATTCACAAA ACACACTGTATTTGC AAATCAACAGCCTGA AAACCGAGGACACAG CCGTATATTTTTGTAC CGCGACCCTAAAAAG TTCATGGGTACAGGA GTGGTCAAGAGACCA CTATTTCGGTATGGA	VK2-28	JK1	994	GATATTGTGATGA CTCAGTCTCCACT CTCCCTGCCCGTC ACCCCTGGAGAG CCGGCCTCCATCT CCTGCAGGTCTAG TCAGAGCCTCTTG GCCAGTAATGGAT ACAACTATTTGGA TTGGTACCTGCAG AAGCCAGGGCAG TCTCCACAGCTCC TGATTTACTTCGG TTTTAATCGGGCC TCCGGGGTCCCT GGCAGGTTCAGT GGCAGTGGATCA GGCACAGATTTTA CACTGAAAATCAG CAGGGTGGAGGC TGAGGATGTTGGG GTTTATTACTGCA TGCAAGCTCTACA AACTCCGTGGACG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CCTCTGGGGCCGAG GGACCACGGTCACC GTCTCCTCAG				TTCGGCCAAGGG ACCCAGGTGGAAA TCAAAC
	B2129	Omicron BT	Singlet	VH3-13	JH4	995	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTACAGCCTG GGGGGTCCCTGAGA CTGTCCTGTGCAGCC TCTGGATTCACCTTC AGTAGCGACGACATG CACTGGGTCCGCCAA GTTAAAGGAGAAGGA CTGGAGTGGGTCTCA GGGATTGGTACTTCT GGTGACACATACTAT CGAGGCGCCGTGAA GGGCCGCTTCACCAT CTCCAGAGAAGATGC CAAGAACTCCGTGTA TCTTCAAATGAACAG CCTGAGAGCCGGGG ACACGGCTGTGTATT ACTGTGCAAGAGGG GGTTGGGATGGCCG CAATTACTACTTTGAC TACTGGGGCCAGGG AGTCCTGGTCACCGT CTCCTCAG	VK1-39	JK1	996	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGATCATTAACA AATTTTTGAATTG GTATCAGCAGAGA CCAGGGAAAGCC CCTAAACTCCTGA TCTATGGTGCCTC CACCTTGCACAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGTAGT CTGCAACCTGAAG ATTTTGCGACTTA CTACTGTCAGCAG AGCTACAGTAGCC CTCCGTGGACGTT CGGCCCAGGGAC CAAGGTGGAAATC AAAC
	B2130	Omicron BT	Singlet	VH1-2	JH5	997	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGGCT	VL7-46	JL1	998	CAGGCTGTGGTG ACTCAGGAGCCCT CACTGACTGTATC CCCAGGAGGGAC AGTCACTCTCACC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCTGGATACAACTTC CCCGCCTACTACATA CATTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG ATGGATCAACCCTAA CAGTGGTGACACAAA TTCTGCACAGAGGTT TCAGGGCAGGGTCA GCCTGACCAGAAACA CGTCCATCACCACAG CCTACATGGAGCTGA CTGGGCTGAGATCCT ACGACACGGCCGTAT ATTTCTGTGTGAGAG ACCGCCGTACCGCAC CCACGCCCACACGG GCGTGGTTCGACGTC TGGGGCCAGGGAAC CCTGGTCACCGTCTC CTCAG				TGTGGCTCCAGCA CTGGAGCTGTCAC CAGTGGTCATTAT CCCTACTGGATCC AGCAGAAGCCTG GCCAAGCCCCCA GGACACTGATTTA TGATACAGGCAAC AAACACTCCTGGA CCCCTGCCCGGTT CTCAGGCTCCCTC CTTGGGGGCAAA GCTGCCCTGACC CTTTCGGGTGCGC AGCCTGAGGATGA GGCTGAGTATTAC TGCTTGCTCTCCT ACAGTGGTGTCCT TTATGTCTTCGGA ACTGGGACCAAG GTCACCGTCCTAG
	B2131	Omicron BT	Singlet	VH3-53	JH4	999	GAGGTGCAGCTGGT GGAGACTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGTC TCCGAGTTCATCGTC AGTAGCAATTACATG AGTTGGCTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC AGTTATTTATAGTGGT GGTAGCACATTCTAC GCAGACTCCGTGAAG	VK3-20	JK2	1000	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTGAAAGTGTTG GCGGCAGCTACTT AGCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGA TGCATCCAACAGG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGCCGATTCATCATC TCCAGAGACAATTCC AAGAACACACTGTAT CTTCAAATGAACAGC CTGAGACCCGAGGA CACGGCCATATATTA CTGTGCCCGAGATTG GGGGGAATTCTACTT TGATCACTGGGGCCA GGGAACCCTGGTCAC CGTCTCCTCAG				GCCACTGGCATCC CAGACAGGTTTAG TGGCAGTGGGTCT GGCACAGACTTCT CTCTCACCATCAG CAGACTGGAGCCT GTAGATTTTGCAA TCTATTACTGTCA GCAGTATCATAGC TCACCTCGCACTT TTGGCCAGGGGA CCAAGCTGGAGAT CAAAC
	B2132	Omicron BT	Singlet	VH3-7	JH6	1001	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTTA GTAGCTATTGGATGA GCTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTGG CCAACATAAAGCAAG ATGGAAGTGAGAAAT ACTATGTGGACTCTG TGAAGGGCCGATTCA CCATCTCCAGAGACA ACGCCAAGAACTCAC TGTATCTGCAAATGA ACAGCCTGAGAGCC GAGGACACGGCTGT GTATTACTGTGCGAG AGATGCTGCGGACCT	VK1-39	JK1	1002	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA GCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGCTGGTACTGGTAC TCCTCTCTACTACTAC TACGGTATGGACGTC TGGGGCCAAGGGAC CACGGTCACCGTCTC CTCAG				AGTTACAGTACCG TGTGGACGTTCGG CCAAGGGACCAA GGTGGAAATCAAA C
	B2133	Omicron BT	Singlet	VH1-69	JH6	1003	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AAGTGCAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGACT TCCGGAGGCACCTTC GGCAGTTATGGTATC AGTTGGGTGCGACAG GCCTCTGGACAAGG GCTTGAGTGGATGGG AGGAATCATCCCTGT GTTTGGGGCAGTAAA CTACGCACAGAAGTT TCAGGGCAGAGTCAC GATTACCGCGGACAA ATCCACGAGTACAGT GTACATGGAGCTAAG CAGCCTGAGATTTGA GGACACGGCCGTCTA CTACTGTGGGAGAGC AGTTGGGCATGAGTG GGAACTACTTTCATT CGGGCGGGACGCCT ACGGCATGAACGTCT GGGGCCAAGGGACC ACGGTCACCGTCTCC TCAG	VK3-11	JK4	1004	GAAATTGTGTTGA CACAGTCTCCAGC CACCCTGTCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTGTTAGC CGCTACTTAGCCT GGTACCAACAGAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTATGGTGCAT CCGAGAGGGCCA CTGGCATTCCAGC CAGGTTCAGTGGC AGTGGGTCTGGG ACAGACTTCACTC TCACCATCAGCAG CCTAGAGCCTGAA GATTTTGCAGTGT ATTACTGTCAGCA ACGTAGCATCCGG CCTAGTTTCGGCG GAGGGACCAAGG TGGAGATCAAAC

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	B2134	Omicron BT	Singlet	VH1-58	JH6	1005	TGCAGCTGGTGCAGT CTGGGCCTGAGGTG AAGAAGCCTGGGACC TCAGTGAAGGTCTCC TGCAAGGTTCCTAGA CACACCTTTAGTAGC TCTGCTGTGCACTGG GTGCGACAGGCTCG CGGGCAACGCCTTGA GTGGATAGGGTGGAT CGTCGTTGGCAGAG GTACCACAAACTACG CACAGAAGTTTCAGG AAAGAGTCACCATTA CCAGGGACATGTCTG CAAGCACAGTCAACA TGGAACTGAGCAGCC TGACATCCGAGGACA CGGCCGTGTATTTTT GTGCGGCCGGCGAC GGTGACTACGGCCAC TACGGTATGGACGTC TGGGGCCAAGGGAC CACGGTCACCGTCTC CTCAG	VL1-40	JL7	1006	CAGTCTGTCCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AACTCCAACATCG GGGCAGGTTATGA TGTACACTGGTAC CAGCAACTTCCAG GAACAGCCCCCAA ACTCCTCATCCAT GGTAACAGCAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGGCTCCA GCCTGAGGATGA GGCTGATTATTAC TGCCAGTCCTATG ACAGCAGCCTGA GTGGTTCCGTGTT CGGAGGAGGCAC CCAGCTGACCGTC CTAG
	B2135	Omicron BT	Singlet	VH3-33	JH6	1007	CAGGTCCAGCTGGTG GAAAGCGGAGGAGG CGTCGTTCAGCCCGG TCGCTCATTGCGGTT GAGCTGTGCGGCAA GTGGGTTTACTTTCA GTTCATATGGAATGC	VL3-21	JL1	1008	TCCTATGAGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGGATTACC TGTGGGGGAAAC AACATTGGAAGTA

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							ACTGGGTTCGCCAGG CCCCTGGAAAAGGTT TGGAATGGGTGGCTG TGATTTGGTACGACG GTTCTAATAAATACTA TGCTGACAGTGTCAA AGGGAGATTCACGAT AAGCAGAGACAACTC CAAAAATACGCTTTA CCTCCAAATGAACTC CCTTAGGGCCGAGG ATACTGCCGTCTATT ATTGTGCTTCCAACG AGGGGGGCAGAGTT GCCGGGCGGGGTAT GAATTACTATTATTAC GGCATGGACGTTTGG GGGCAGGGTACTAC CGTGACGGTTTCCTC AG				AAAACGTGCACTG GTACCAGCAGAAG CCAGGCCAGGCC CCTGTGCTGGTCG TCCATGATGATAG CGACCGGCCCTC AGGGATCCCTGA GCGATTCTCTGGC TCCAACTCTGGGA ACACGGCCACCCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA GTATTACTGTCAG GTGTGGGGTAGTA GTAGTGATCACCC GTATGTCTTCGGA ACTGGGACCAAG GTCACCGTCCTAG
	B2136	Omicron BT	Singlet	VH3-30	JH4	1009	AGGTGCAGCTGGTG GAGTCTGGGGGAGG CGTGGTCCAGCCTG GGAGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTTACCTTCA GTGTCTATGGCATGC ACTGGGTCCGCCAG GCTCCAGGCTCGGG GCTGGAGTGGGTGG CAGTTATATCATTTGA TGGAAATAAAAAATA CTATGCAGACTCCGT GAAGGGCCGATTCAC	VK1-39	JK1	1010	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTACA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTACCA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTAA TCTATGCTGCATC CACTTTGCGAAGT GGGGTCCCATCAA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CATCTCCAGAGACAA TCCCAAGAACACGCT GTATCTGCAGATGAA CAGCCTGAGACCTAA CGACACGGCTGTGTA TTACTGTGCGAAAGA TGGGATGGCTACAAG TGACCACCTTGACTA CTGGGGCCTGGGGG CCCTGGTCACCGTCT CCTCAG				GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAGCCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC CTGGAACATTCGG CCAAGGGACCAA GGTGGAAATCAAA C
	B2137	Omicron BT	Singlet	VH4-31	JH2	1011	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTTGTGAAGCCTT CAGAGACCCTGTCCC TCACCTGCAGTGTCT CCGGTGGCTCCATCA CCAGTGGTGGTGACT ACTGGAGTTGGATCC GCCAGCGCCCAGGG AAGGGCCTGGAGTG GATTGGTTACATCGA TTACAGTGGGAGCAC CTACTACAACCCATC CATCACGAATCGAGT TTCCATATCACTAGA CACGTCTAAGAACGA GTTTTACTTGAGTCT GACCTCTGTGACGGC CGCGGACACGGCCG TTTTTTACTGTGCGA GAGGAGGAGGTGGA TACAGTTACGAGGAC	VL4-69	JL1	1012	CAGTCTGTCCTGA CTCAGCCGCCCTC TGCCTCTGCCCGC CTGGGAGCCTCG GTCAAGCTCACCT GCACTCTGAGCAG CGACCACAACAAC TACGCCGTCGCGT GGCATCAGCAGC AGCCAGGGAAGG GCCCTCGGTGCTT GATGAAAGTTTAC AGTAATGGCAGCC ACATCAAGGGGG ACGGGTTCCCTGA TCGCTTCTCAGGC TCCAGTTCTGGGG CTGAGCGCTACCT CACCATCTCCAAC CTCCAGTCTGAGG ATGAGGCTGACTA TTACTGTCAGACC

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							TACTGGTATTTCGGT CTCTGGGGCCGTGG CACCCTGGTCACCGT CTCCTCAG				TGGGGGAATGTCT TCGGAGCTGGGA CCAAGCTCACCGT CCTAG
	B2138	Omicron BT	Singlet	VH1-69	JH1	1013	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAGG GTCTCCTGCAAGGCT TCTGGAGGCACCTTC ATCAACTTTGCTGTC AGCTGGGTGCGACA GGCCCCTGGAGAAG GCCTTGAGTACATGG GAGGGCTCATCCCTA TCTTGCGTACATCAC ACCACGCACAGAAGT TCCAGGGCAGACTCA CGATCACCGCGGAC GAATCCGCGAGCACA GCCTACATGGAGCTG AGCAGCCTGAAATCT GAGGACACGGCCGT GTATTACTGTGCGAC AGGTGTCCGATATTG TGGTGGTGGTGGCT GCTACTCCGCGTACT TCCAGCAATGGGGCC AGGGCACCCTGGTCA CCGTCTCCTCAG	VK3-20	JK1	1014	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCTTC TCTTGCAGGGCCA GTCAGAGTGTTAG TAGCAGCCACTTA GCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TACATCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCG TGAAGATTTTGCA GTGTATTATTGTC ATCATTATGGCAG TTCAACGGGGAC GTTCGGCCAAGG GACCAAGGTGGA AATCAAAC
C023	B1001	Omicron BT	Clone	VH1-69	JH4	1015	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG	VL2-23	JL3	1016	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTCTCCTGCAAGGCT TCTGGAGGCACCTTC AGCAACTATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCCCTA TGTTTGCTATAGCAA ACTACGCACAGAAGT TCCAGGGCAGAGTCA CGATTTCCGCGGACA AATCCACGAGCACGG CCCACATGGAGCTGA GCAGCCTGAGCTCTG AGGACACGGCCGTG TATTATTGTGCGAGT CTTGGGAACGGCATT ACTATCGTTCGGGGA GCTCCCATCACAGAT CACCACTTTGCTTTCT GGGGCCAGGGAACC CTGGTCACCGTCTCC TCAG				TCACCATCTCCTG CACTGGAACCAGC AGTGATGTTGGGA ATTATAACCTTGT CTCCTGGTACCAA CACCACCCAGGC AAAGCCCCCAAAC TCATGATTTATGA GGTCAGTAAGCG GCCCTCAGGGGT TTCTAATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACAAT TTCTGGGCTCCAG GCTGAGGACGAG GCTGATTATTTCT GCTGCTCATTTGC AGCTAGTAGCACT GGCCATTGGGTGT TCGGCGGAGGGA CCAAGCTGGCCG TCCT
	B1002	Omicron BT	Clone	VH1-69	JH4	1017	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCACCTGCAGGGCT TCTGGAGGCACCTTC AGCAACTTGGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAAGTATCATCCCGA	VL2-23	JL3	1018	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCG GTCACCATCTCCT GCACTGGAACCA GCAGTGATGTTGG GACTTATAACCTT GTCTCCTGGTACC AACAACACCCAGG CAAGGCCCCCAAA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TGTTTACTATATCAAA CTACGCACAGAAATT GAAGGGCAGAGTCA CAATTACCGCGGACA AATCCACCAGCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG GGGACACGGCCGTG TACTTTTGTGCGAGT CTTGGGAGCAATATT ACTGTGGTTCGGGG GGCTCCCATAACAGA TCACCACTTTCACTAC TGGGGCCAGGGAAC CCTGGTCACCGTCTC CTCAGC				CTCATGATTTATG AGGTCAGTAAGCG GCCCTCAGGGGT TTCTAATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACAAT TTCTGGGCTCCAG GCTGAGGACGAG GCTGACTATTACT GCTGCTCATATGC AGCTAGTAGCACC ACCCATTGGGTGT TCGGCGGAGGGA CCAAGCTGGCCG TCCT
	B1003	Omicron BT	Clone	VH4-61	JH6	1019	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGCTGAAGCCCT CGGAGACCCTGTCCC TCACCTGCAGTGTCT CTGGTGGCTCCCTCA GCAGTGCTAATTTCC GCTGGAACTGGATCC GGCAGCCCCCAGGG AAGGGACTGGAGTG GATTGGGAATTTTAT CTACAGTGTGAGTAC CAATTACAACCCCTC CCTCAAGAGTCGACT CACCATATCAATGGA CACGTCCAAGAATCA GTTCTCCCTGAAACT GACCTCTGTGACCGC	VK1-5	JK2	1020	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT AACTGGTTGGCCT GGTATCAGCAGAA ACCAGGGCAAGC CCCTAGGCTCCTG ATCTATGAGGCGT CTACTTTAGAAAG AGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCCGC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TGCGGACACGGCCG TGTATTTCTGTGCGA GAGACACCCGTTATT ATGATAGGAGTGGTT CTGTCACGTCCGACG GTATGGACGTCTGGG GCCAAGGGACCACG GTCACCGTCTCCTCA				CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAAT GTGGTGGTGATTC GGTGACTTTTGGC CAGGGGACCAAG CTGGAGATCAAAC
	B1004	Omicron BT	Clone	VH4-61	JH6	1021	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGCTGAAGCCTT CGGAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGGCTCCGTCA GCAGTGCTAATTTCC ACTGGAGCTGGATCC GGCAGCCCCCAGGG AAGGGACTGGAGTG GATTGGGAATTTCTT CTACAGTGGGAGCAC CAACTACAACCCCTC CCTCAAGAGTCGACT CACCATATCAGTAGA CACGTCCAAGAATCA GTTCTCCCTGAAACT GACCTCTGTGACCGC TGCGGACACGGCCG TCTATTACTGTGCGA GAGACACCCGTTACT ATGATAGGAGTGGTT ATGTCAGGTCCGACG GTATGGACGTCTGGG GCCAAGGGACCACG GTCACCGTCTCCTCA	VK1-5	JK2	1022	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGACTATTAGT AACTGGTTGGCCT GGTATCAGCAGAA ACCAGGGCAAGC CCCTAGACTCCTG ATCTATGAGGCGT CTACTTTAGAACG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGCTCTGGG ACAGAATTCACTC TCACCATCACCGG CCTGCAGCCTGAT GATTTTGCAACTT ATTACTGCCAACA ATTTGATGGTGAT TCGGTGACTTTTG GCCAGGGGACCA AGCTGGAGATCAA AC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
	B1005	Omicron BT	Clone	VH1-69	JH4	1023	CAGGTGCAGCTGGTGCAGTCTGGGGCTGAGGTGAAGAAGCCTGGGGCCTCGGTGAAGGTCTCCTGCAAGGCTTCTGGAGATACCTTCAGTAACTATGCTATCAGTTGGGTGCGACAGGCCCCCGGACAAGGGCTTGAGTGGATGGGAAACATCATCCCTATGTTTGATATTGCCACCTACGCACAGAAGTTCCAGGGCAGAGTCACGATTTCCGCGGACAAATCCACGAGCACAGCCTACATGGAGCTGAGCAGCCTGAGCTCTGAGGACACGGCCGTGTATTTTTGTGCGAGTCTTGGGAACGGTATTACTTTGGTTCGGGGAGTTCCCATAACAGATCACCACTTTGACTACTGGGGCCAGGGAACCCTGGTCACCGTCTCCTCAG	VL2-23	JL3	1024	CAGTCTGTGCTGACTCAGCCTGCCTCCGTGTCTGGGTCTCCTGGACAGTCGATCACCATCTCCTGCACTGGAACCAGCAGTGATATTGGGACTTATAACCTTGTCTCCTGGTACCAACAGCACCCAGGCAAAGCCCCCAAACTCATGATTTATGAGGTCAGTAAGCGGCCCTCAGGGGTGTCTAATCGCTTCTCTGGCTCCAAGTCTGGCAACACGGCCTCCCTGACAATTTCTGGGCTCCAGGCTGAGGACGAGGCTGATTATTACTGCTGCTCATATGCAGCTAGTACTACCCATTGGGTGTTCGGCGGAGGGACCAAGCTGGCCGTCCT
	B1006	Omicron BT	Clone	VH1-69	JH4	1025	CAGGTGCAGCTGGTGCAGTCTGGGACTGAAGTGAAGAAGCCTGGGGCCTCGGTGAAGGTCTCCTGCATGGCTTCTGGTAATTCCTTCAGTAACTATGCTATCA	VL2-23	JL3	1026	CAGTCTGTCCTGACTCAGCCTGCCTCCGTGTCTGGGTCTCCTGGACAGTCGATCACCATCTCCTGCACTGGAACCAGCAGTGATATTGGGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GCTGGGTGCGACAG GCCCCCGGACAAGG GCTTGAGTGGATGGG AAACATCATCCCTAT GTTTGATATTGCCAC CTACGCACAGAAGTT CCAGGGCAGAGTCA CGATTTCCGCGGACA AATCCACGAGCAAAG TCTTCATGGACCTGA ACAGCCTGAGCTCTG AGGACACAGGCGTGT ATTTTTGTGCGAGTC TTGGGAACGGTATTA CTTTGGTTCGGGGAG CTCCCATAACAGATC ACCACTTTGACTACT GGGGCCAGGGAGCC CTGGTCACCGTCTCC TCAG				GTTATAACCTTGT CTCCTGGTACCAA CAGCACCCAGGC AAAGCCCCCAAAC TCATGATTTATGA GGTCAGTAAGCG GCCCTCAGGGAT GTCTAATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACAAT TTCCGGGCTCCAG GCTGAGGACGAG GCTGATTATTACT GCTGCTCATATGC AGCTGGTACTACC CATTGGGTGTTCG GCGGAGGGACCA CGCTGGCCGTCC T
	B1007	Omicron BT	Clone	VH1-46	JH6	1027	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAGGAAGCCT GGGGCCTCAGTGAC GGTTTCCTGCAAGGC ATCTGGATACACCTT CACCAACTACTATATT CATTGGGCGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAATGATGAACCCTA GTGGTGGTAACACAA ACTACGCACAGAAGT TTCAGGGCAGAGTCA	VL3-21	JL3	1028	TCCTATGAGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGAAAGAC GGCCAGGATTACC TGTGGGGGAAAC AACATTGGAATTA AAAGTGTGCACTG GTACCAGCAGAAG TCAGGCCAGGCC CCTGTGCTGGTCA TGTTTTCTGATCG CGACCGGCCCTC AGGGATTCCTGTG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CCATGACCAGGGACA CGTCCACGAGCACAG TGTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGA GACCGCCTAATGGG GTATTACGACTTATG GAATGCTTATGGCGG CATGGACGTCTGGG GCCAAGGGACCACG GTCACCGTCTCCTCA				CGATTCTCTGGCT CCAACTCTGGGAA CACGGCCACCCT GACCATCAGCGG GGTCGAAGCCGG GGATGAGGCCGA CTATTACTGTCAG GTGTGGGATAATA GTAGTGCCTGGGT GTTCGGCGGAGG GACCAAGCTGACC GTCCTAG
	B1008	Omicron BT	Clone	VH1-46	JH6	1029	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCCCAGTGAAAA TTTCCTGCAAGGCAT CTGGATACATCCTCA CCAACCACTACATAC ACTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG AATGATCAACCCTAG TGGTGGTAGCGCACA TTACGCACAGAACTT CCAGGGCAGAGTCA CTATGACCAGAGACA CGTCCACGAGCACAG TCTCCATGGAGTTGA GCAGCCTGAAATCTG AAGACACGGCCGTGT ATTACTGTGCGAGAG ACCGACTAATGGGGT ATTACGAACTTTGGA	VL3-21	JL3	1030	TCCTATGAGCTGA CACAGCCACCCTC GGTGTCAGTGGC CCCAGGAAAGAC GGCCAGGATTAG CTGTGGGGGAAA CGACATTGGAAGT AAACGTGTGCACT GGTACCAACAGAA GCCAGGCCTGGC CCCTGTACTGGTC ATCTATTATGATG GCGACCGGCCCT CAGGGATACCTGA GCGATTCTCTGCC TCCAACTCTGGGT TCACGGCCACCCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTACTGTCAG GTGTGGGATAATA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATGCTTATGGCGGTATGGACGTCTGGGGCCAAGGGACCACGGTCACCGTCTCCTCA				CTAGTGCCTGGGTGTTCGGCGGAGGGTCCAAGCTGACCGTCCTAG
	B1009	Omicron BT	Clone	VH4-59	JH3	1031	CAGGTGCAGCTGCAGGAGTCGGGCCCAGGCCTGGTGAAGCCTTCGGAGACCCTGTCCCTCACCTGCACTGTCTCTGGTGTCTCCGTCATCAGTAACTACTGGAGCTGGATCCGGCAGCCCCCAGGGAAGGGACTGGAATGGATTGGATATATCTTTTACAGTGGGAACACCAAGTACAACCCCTCCCTCAAGAGTCGAGTCACCATATCACGAGACATGTCCAAGAACCAGTTCTCCCTGAAGTTGAGCTCTGTGACCACTGCGGACACGGCCGTGTATTATTGTGCGAGAGAGGGGGGGGCATATTGTGGTGGTGACTGCTTAGACGGTTTTGATATCTGGGACCATGGGACAATGGTCACCGTCTCTTCAG	VL1-40	JL2	1032	CAGTCTGTCNTGACTCAGCCGCCCTCAGTGTCTGGGGCCCCAGGGCAGAGGGTCACCATCTCCTGCACTGGGAGCAGCTCCAACATCGGGGCAGGTTATGATGTACACTGGTACCAGCAGCTTCCAGGAACAGCCCCCAAACTCCTCATCTTTAGTAACAACAATCGGCCCTCAGGGGTCCCTGACCGATTCTCTGGCTCCAAGTCTGGCACCTCAGCCTCCCTGGCCATCACTGGGCTCCAGGTGGAGGATGAGGCTGACTATTACTGCCAGTCCTATGACAGCAGCCTGAGTGTCCTATTCGGCGGAGGGACCAAGCTGACCGTCCTAG
	B1010	Omicron BT	Clone	VH1-8	JH6	1033	CAGGTGCAGCTGGTGCAGTCTGGGGCTGAGGTGAAGAAGCCTG	VK2-28	JK3	1034	GATATTGTGATGACTCAGTCTCCACTCTCCCTGCCCGTC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGGCCTCAGTGAAG GTCTCCTGCAAGGCT GCTGGATACACCTTC ACCAGTTCTGATATC AACTGGGTGCGACAG GCCACTGGACAAGG GCTTGAGTGGATGGG ATGGATGAACCCTAA CACTGGTAACACAGA CTATGCACAGAAGTT CCAGGGCAGAGTCA CCATGACCAGGGACA CCTCCATAAGCACAG CCTACATGGAGTTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGC CGATCACTAATTACA ATGGTCCCGGGAAGGT ATCAAATACCACTACT ATGTTATGGACGTCT GGGGCCCAGGGACC ACGGTCACCGTCTCC TCAG				ACCCCTGGAGAG CCGGCCTCCATCT CCTGCAGGTCTAG TCAGAGCCTCCTG CATACTAATGGAT ACAACTATTTGGA TTGGTACCTGCAG AAGCCAGGGCAG TCTCCACACCTCC TGATCTATTTGGG TTCTAATCGGACC TCCGGGGTCCCT GACAGGTTCAGTG GCAGTGGATCAG GCACAGATTTTAC ACTGAAAATCAGC AGAGTGGAGGCT CAGGATGTTGGG GTTTATTACTGCA TGCAAGCTCTACA AACTCCTCCGACT TTCGGCCCTGGG ACCAAGGTGGATA TCAAAC
	B1011	Omicron BT	Clone	VH1-46	JH5	1035	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCA TCTGGATACACTTTC ATCAGCTACTATACG CACTGGGTGCGACA GGCCCCCGGACAAG GGCTTGAGTGGATGG	VK1-33	JK2	1036	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCCGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTTACA ATTATTTAAATTGG TATCAGCAGAAAC CAGGGAAAGCCC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GAATAATCAACCCTA				CTAAGCTCCTGAT
							GTGATGGTTACACAA				CTTCGATGCAATT
							GCTACGCACAGAAAT				AACTTGGAAACAG
							TCCAGGGCAGAGTCA				GGGTCCCATCAAG
							CCATGACCAGGGACA				GTTCAGTGGAAGT
							CGTCCGCGAGCACA				GGATCTGGGACA
							GTCTACATGGAGCTG				GATTTTACTTTCAC
							AGCAGCCTGAGATCT				CATCAGCAGCCTG
							GAGGACACGGCCGT				CAGCCTGAAGATA
							GTATTACTGTGCGAG				TTGCAACATATTA
							AGATTCGAGTATTGC				CTGTCAACAGCAT
							AGCTCGAGTAGTCGC				GATAATCTCCCGT
							CTGGGCCCAGGGAA				ACTCTTTTGGCCA
							CCCTGGTCACCGTCT				GGGGACCAAGCT
							CCTCAG				GGAGATCAAAC
	B1012	Omicron BT	Clone	VH1-46	JH5	1037	CAGGTGCAGCTGGT	VK1-33	JK2	1038	GACATCCAGATGA
							GCAGTCTGGGGCTG				CCCAGTCTCCATC
							AGGTGAAGAAGCCTG				CTCCCTGTCTGCA
							GGGCCTCAGTGAAG				TCTGTAGGCGACA
							GTTTCCTGCAAGGCA				GAGTCACCATCAC
							TCTGGATACACTTTC				TTGCCAGGCGAGT
							ATCAGCTACTATACG				CAGGACATTGGCA
							CACTGGGTGCGACA				ACTATTTAAATTG
							GGCCCCCGGACAAG				GTATCAGCAGAAA
							GGCTTGAGTGGATGG				CCAGGGAAAGCC
							GAATAATCAACCCTA				CCTAAACTCCTGA
							GTGATGGTTACACAA				TCTTCGATGCATC
							GCTACGCACAGAAAT				CAATTTGGAAGCA
							TCCAGGGCAGAGTCA				GGGGTCCCATCAA
							CCATGACCAGGGACA				GGTTCAGTGCAAG
							CGTCCGCGAGCACA				TGGATCTGGGACA
							GTCTACATGGAGCTG				GATTTTACTTTCG
							AGCAGCCTGAGATCT				CCATCAGCAGCCT
							GAGGACACGGCCGT				GCAGCCTGAAGAT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTATTACTGTGCGAG AGATTCGAGTATTGC AGCTCGAGTAGTCGC CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				ATTGCAGCATATT ACTGTCAACAGCA TGATGATCTCCCG TACAGTTTTGGCC AGGGGACCACCC TGGAGATCAAAC
	B1013	Omicron BT	Clone	VH3-9	JH6	1039	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTATGCCATACA CTGGGTCCGGCAAC CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTACTAGTTGGAAT AGTGGTACCATAGGC TATGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAGAACTCCCTG TATCTGCAAATGAAC AGTCTGAGAGCTGAG GACACGGCCTTATAT TACTGTGCAAAAGAT ATCCGGCGGTCTGGA TATTGTAGTGGTGGT ATCTGCTACACGGAA TATTATGCTATGGAC GTCTGGGGCCAAGG GACCACGGTCACCGT CTCCTCA	VL2-14	JL2	1040	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA TCACCATCTCCTG CACTGGAACCAGC AGTGACGTTGGTG GTTATAACTATGT CTCCTGGTACCAA CAGCTCCCAGGC AAAGCCCCCAAAC TCATGATTTATGAT GTCAGTACGCGG CCCTCAGGAGTTT CTAATCGCTTCTC TGGCTCCAAGTCT GGCAACACGGCC TCCCTGACCGTCT CTGGGCTGCAGG CTGAGGACGAGG CTAATTATTACTG CACCTCATATACA AGCGACAGCATC GTGGTATTCGGCG GAGGGACCAAACT GACCGTCCTAG

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	B1014	Omicron BT	Clone	VH3-9	JH6	1041	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCGTC TGGATTCACCTTTGA TGATTATGCCATACA CTGGGTCCGGCAAC CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTGTTAGTTGGAAT AGTGGTACCATAGGC TATGCGGACTCTGTG AAGGGCCGATTCATT ATTACCAGAGACAAC GCCAAGAACTCCCTG TATCTGCAAATGAAC AGTCTGAGAGCTGAG GACACGGCCTTGTAT TACTGTGCAAAAGAT ATCCGGCGGTCTGGA TATTGTAGTGGTGGT CTCTGTAACACGGAA TACTACGCTATGGAC GTCTGGGGCCAAGG GACCACGGTCACCGT CTCCTCA	VL2-14	JL2	1042	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA TCACCGTCTCCTG CACTGGAACCACC AGTGACGTTGGC GGTTATAACTATG TCTCCTGGTACCA ACAACACCCAGGC AAAGCCCCCGAAC TCATGATTTATGAT GTCAATAAGCGGC CCTCAGGGATTTC TAATCGCTTCTCT GGCTCCAAGTCTG GCAACACGGCCT CCCTGACCATCTC TGGGCTCCAGGC TGAGGACGAGGC TGATTATTACTGC ACCTCATATGCAA GCAGCAGCATCGT GGTATTCGGCGG AGGGACCAAGCT GACCGTCCTAG
	B1015	Omicron BT	Clone	VH3-30	JH4	1043	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTACAGT CTCTGGATTCACCTT CAGGCATTATGGCAT	VK1-33	JK4	1044	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAGTA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGCAGTTATATTATAT GATGGAAGTGATAAA CAGTATGCAGACTCC GTGAAGGGCCGATTC ACCATCGCCAGAGAC AACTCCAAGAACACG CTGTATCTGCAAATG AACAGCCTGAGAGCT GAGGACACGGCTGT GTATTATTGTGTGAAA AGGAGGGGGTCATAT TGTGGTGGCGACTGC TATTCGGGGGAATTT GACTACTGGGGCCA GGGAACCCTGGTCAC CGTCTCCTCAGC				CTTACTTAAATTG GTTTCAGCAGAAA CCAGGGAAAGCC CCTAACCTCCTGA TCTCCGATGCATC CAATTTGGAAACA GGGGTCCCATCAA GATTCAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATG TTGCAACATATTA CTGTCAACAGTAT CATAATCTCCCCA CTTTCGCCGGAG GGACCAAGGTGG AGCTCAAAC
	B1016	Omicron BT	Clone	VH3-9	JH6	1045	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACGTTTGA TGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTATTAGTTGGAAT AGTGGTACCATAGGT TATGTGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC	VL1-40	JL2	1046	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGCG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACATCG GGGCATCTTATGA TGTTCACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAC GGTAAGGGCAATC GGCCCTCAGGGG TCCCTGACCGATT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GCCAAGAACTCCCTG TATCTGCAAATGTAC AGTCTGAGAACTGAG GACACGGCCTTGTAT TACTGTGTTAAAGAC GTCTACATGGGCAAA ATTAACTTATACGGTC ATGAAGACTACGGTA TGGACGTCTGGGGC CAAGGGACCACGGT CACCGTCTCCTCAG				CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGAATTCAG GCTGAGGATGAG GCTGATTATTACT GCCAGTCCTTTGA CAGCAGCCTGAGT GGTGTGGTATTCG GCGGAGGGACCA AGCTGACCGTCCT AG
	B1017	Omicron BT	Clone	VH1-69	JH5	1047	CAGGTGCAGCTGGT GCAGTCTGGGTCTGA GGTGAAGAAGCCTG GGTCCTCGGTGAAAG TCTCCTGCAAGGCTT CTGGAGGCACCTTCA GCAGCTATAGTGTCA CCTGGGTGCGACAG GCCCCTGGACACGG GCTTGAGTGGATGGG AGGGATCCTCCCTAT CCTTAATCTACCAAAC TACGCAGAGAAGTTC CAGGGCAGACTCACC ATTACCGCGGACAGA TCCGCGAATATAGCC TACATGGAACTGAGC AGCCTGAGACCTGAC GACACGGCCGTGTAT TACTGTGCGAGAGAT CGGGTGAATAGCAGT GGTTCACCTTACTGG	VL1-40	JL2	1048	CAGTCTGTGCTGA CTCAGCCGTCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AACTCCAACATCG GGGCAGGTTATGA TGTACACTGGTAC CAACAGGTTCCAG GAATAGCCCCCAA ACTCCTCATCTAT GCTAACAACAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGACACCTCAG CCTCCCTGGCCAT CACTGGGCTCCA GGCTGAGGATGA GGCTGATTATTAC TGCCAGTCCTATG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TTCGACCCCTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG				ACAGCAGCCTGA GCGGTTCGGTTTT CGGCGGAGGGAC CAAACTGACCGTC CTAG
	B1018	Omicron BT	Clone	VH1-2	JH4	1049	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGGCC TCTGGATACACCTTC AACGGCCAGTATATG CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGTTGG GATGGATCGACCCTA ACAGTGGTGGCACAA ACTTTGCACAGAGGT TTCGGGGCAGGGTC ACCATGACCTGGGAC ACGTCCATCAGCACA GCCTACATGGACTTG AGCAGGCTGAGATCT GACGACACGGCCGT GTATTACTGTGCGAC TGATACGGGCACCAG CTGGTCTGAGGCTGA ATACCTTGACTACTG GGGCCAGGGAACCC TGGTCACCGTCTCCT CAG	VK1-39	JK5	1050	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA GCTATTTAAATTG GTATCAACAGAAA CCAGGGAAAGCC CCTAACCTCCTGA TCTATACTACATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTTT CACCATCAGCAGT CTGCGACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC CTCCGATCACCTT CGGCCCAGGGAC ACGACTGGAGATT AAAC
	B1019	Omicron BT	Clone	VH3-20	JH5	1051	GAGGTGCAGCTGGT GGAGTCGGGGGGAC GTGTGGTACGGCCTG	VL6-57	JL3	1052	AATTTTATGCTGA CTCAGCCCCACTC TGTGTCGGAGTCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTTACTTTTG GTGATTATGGCATGA GCTGGGTCCGCCAA GTTCCAGGGAAGGG GCTGGAATGGGTCTC TAATATTAATTGGAAT GGTGGTAGTATAACT TACGCAGACTCTGTG AAGGGCCGATTCACC GTCGCCAGAGACAAC ACCAAGAACTCCCTG CATCTGCAAATGACC AGTCTGAGAGTCGAG GACACGGCCTTCTAT TACTGTGCGAGAATG TCTTGTGGTGGTGAC TGCTATTCTTTAGTG GGCCCAACTGGAGA CACCTGGTTCGACCC CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				CCGGGGAAGACG GTAACCATCTCCT GCACCGGCAGCA GTGGCAGCATTGC CAGCAACTATGTG CACTGGTACCAGC AGCGCCCGGGCA GTGCCCCCATCAC TGTGATCTATGAG GATAAGCAAAGAC CCTCTGGGGTCC CTGATCGGTTCTC TGGCTCCGTCGAC GGCTCCTCCAACT CTGCCTCCCTCAC CATCTCTGGACTG AAGACTGAGGAC GAGGCTGACTATT ATTGTCAGTCTTA TGACAGCAGCAG CCATTGGGTGTTC GGCGGAGGGACC AAGCTGACCGTCC TA
	B1021	Omicron BT	Clone	VH5-51	JH2	1053	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTAAGGGTT CTGGATACAGCTTTA TCAGCAACTGGATCG GCTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG	VL1-44	JL3	1054	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCATCTCT TGTTCTGGAAGCA GCTCCAACATCGG AGGTACTCCTGTT AGCTGGTACCAGC AACTCCCAGGAAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GCATCATCTATCCTA GTGACTCTGATACCA TATATAGCCCGTCGT TCCAAGGCCAGGTCA CCATCTCAGCCGACA AGTCCATCAGCACCG CCTACCTGCACTGGA GCAGCCTGAAGGCCT CGGACACCGCCATAT ATTACTGTGCGAGAC GTGAAAGTGGGAGTT ACTCTGGCTACTTCG ATCTCTGGGGCCGTG GCACCCTGGTCACCG TCTCCTCAG				GGCCCCCAAACTT GTCATCTATAATA ATAATCAGCGGCC CTCAGGGGTCCCT GCCCGATTCTCTG GCTCCAAGTCTGG CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCAGTCTGA GGATGAGGCTGAT TATTACTGTGCAG CATGGGACGACA GCCTGAATGGGG TGTTCGGCGGAG GGACCAAGCTGA CCGTCCTA
	B1022	Omicron BT	Clone	VH3-30	JH6	1055	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAAC CTCTGGATTCATCTTC AGTAGTTATGGCATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGGTG GCAGATATATCGTAT CATGGAAGTAATAAA TATTATGCAGACTCC GTGAAGGGCCGATTC AACATCTCCAGAGAC AATTCGAACAAAACG CTGTATCTGCAAATG AACAGCCTGAGACCT	VL2-8	JL2	1056	CAGTCTGCCCTGA CTCAGCCTCCCTC CGCGTCCGGGTC TCCTGGGCAGTCA GTCACCATCTCCT GCACTGGAACCA GCAGTGACGTTG GTGGTTATAATTA TGTCTCCTGGTAC CAACAACACCCAG GCAAAGCCCCCAA ACTCTTGATTTAT GAGGTCACTAAGC GGCCCTCAGGGG TCCCTGATCGCTT CTCTGGCTCCAAG TCTGGCAACACGG CCTCCCTGACCAT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GAGGACACGGCTCT GTATTTCTGCGCGAA AGACTTGGGTCAGGG CATATTGCATTTTGTG CAATGGTCAATATCA CGCCACGGTCTGGA CGTCTGGGGCCAAG GGACCACGGTCACC GTCTCCTCA				CTCTGGACTCCAG GCTGAGGATGAG GCTGATTATTACT GCAGCTCATGTGC AGTCAGTGTCATA TTCGGCGGAGGG ACCAAGCTGACCG TCCTA
	B1023	Omicron BT	Clone	VH4-34	JH3	1057	CAGGTGCAGCTACAG CAGTGGGGCGCAGG ACTGTTGAAACCTTC GGAGACCCTGTCCCT CACCTGCGCTGTCTC TGGTGGGTCGTTCAG TGGTTATTACTGGAA CTGGATCCGCCAGCC CCCAGGAAAGGGGC TGGAGTGGATTGGG GAAATCAATCATAGT GGAAGCACCAATTAC AACCCGTCCCTTAAG AGTCGAGTCACCATA TCACTGGACACCTCC AAGAACCACTTCGCC CTGAAGCTGACCTCT GTGACCGCCGCGGA CACGGCTGTGTATTA CTGCGCGACCGCCG AGTATAACAGCAGCT GGTACGATGCTTTTG ATCTGTGGGGCCAAG GGACAATGGTCACCG TCTCTTCAG	VL1-44	JL3	1058	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCATCTCT TGTTCTGGAAGCA GCTCCAACATCGG AAGTAATCCTGTA AACTGGTACCAGC AGGTCCCAGGAA GGGCCCCCAAAC TCCTCATCTACAG TAGGAATCAACGG CCCTCAGGGGTC CCTGACCGATTCT CTGGGTCCTGGTC TGGCACCTCAGCC TCCCTGGCCATCA GTGGGCTCCAGT CTGAGGATGAGG CTGAATATTACTG TGCAGCATGGGG TGGCAATGTGAAT GGTTGGGTGTTCG GCGGAGGGACCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
											AGCTGACCGTCCTAG
	B1024	Omicron BT	Clone	VH1-69	JH4	1059	CAGGTGCAGCTGGTGCAGTCTGGGGCTGAGGTGAAGAAGTCTGGGTCCTCGGTGAAGGTCTCCTGCAAGGCTTCTGGAGGCATCTTCAGCAGGCTTGCTATCAGCTGGGTGCGACAGGCCCCTGGACAAGGGCTTGAGTGGATGGGAGGGATCATCCCTGTCTTTGCTACAACAAACTACGCGCAGAAGTTCCAGGGCAGAGTCACGATTACCGCGGACGAATCCGCGAGCACAGTTTACATGGAACTGAGCAGCCTGAGATCTGAGGACACGGCCGTCTACTTCTGTGCGAGAGCCCTTTATTACTATGATAGGAGTGGCCGTACCCGAATGGAGGACTACTTTGACTACTGGGGCCAGGGAACCCTGGTCACCGTCTCCTCAG	VL1-40	JL1	1060	CAGTCTGTGCTGACGCAGCCGCCCTCAGTGTCTGGGGCCCCAGGGCAGAGGGTCACCATCTCCTGCACTGGGAGCAGCTCCAACATCGGGGCACCTTCTGATGTACACTGGTACCAACAGCTTCCAGGAACAGCCCCCAAACTCCTCATCTATGGTAACAGCAATCGGCCCTCAGGGGTCCCTGACCGATTCTCTGGCTCCAAGTCTGGCACCTCAGCCTCCCTGGCCATCACTGGGCTCCAGGCTGAGGATGAGGCTGATTATTACTGCCAGTCCTATGACAGCAGCCTGAGTGCCCCTTATGTCTTCGGAACTGGGACCAAGGTCACCGTCCTAG
	B1025	Omicron BT	Singlet	VH4-61	JH6	1061	CAGGTGCAGCTGCAGGAGTCGGGCCCAGGACTGATGAAGCCTTCGGAGACCCTGTCCCTCACCTGCACTGTCT	VK1-5	JK2	1062	GACATCCAGATGACCCAGTCTCCTTCCACCCTGTCTGCATCTGTAGGAGACAGAGTCTCCATGAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CTGGTGGCTCCGTCA GAAGTGGTAATTTCC ACTGGAACTGGATCC GGCAGTCCCCAGGG AAGGGACTGGAGTG GATTGGGCATATGCA TTACACTGGGAGCCC CAGCTACAACCCCTC CCTCAAGAGTCGAGT CACCATATTACTAGA CACGTCCAAGAATCA GTTCTCCCTGAGGCT GAGCTCTGTGACCGC TGCGGACACGGCCG TATATTTCTGTGCGA GAGACACCCGTTACT ATGATAGAAGTGGTT ATGTGAGGTCCGACG GTATGGACGTCTGGG GCCAAGGGACCACG GTCACCGTCTCCTCA				TTGCCGGGCCAG TCAGACTATTGGT AGCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAACGC CCCTAAACTCCTG ATCTATGAGGCGT CTAGTTTACAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATTAGCAGC CTGCAGCCTGATG ATTTTGCAAGTTAT TACTGCCAACAGT ATAATAGTTATCC GGTGACTTTTGGC CAGGGGACCAAG CTGGAGATCAAGC
	B1026	Omicron BT	Singlet	VH1-58	JH3	1063	CAAATGCAGCTGGTG CAGTCTGGGCCTGAG ATAAAGAAGCCTGGG ACCTCAGTGAAGGTC TCCTGCAAGGCCTCT GGATTCACCTTTAGT AACTCTGCTGTGCAG TGGGTGCGACAGGC TCGTGGACAACGCCT TGAGTGGATAGGATG GATCGTCGTTGGCAG TGGTGACCCAAACTA CGCACAGAAGTTCCA	VK3-20	JK1	1064	GAAATTGTGTTGA CGCAGTCTCCAGT CTCCCTGTCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGACTGTTAGA AGCAGCTACTTTG TCTGGTACCAGCA GAAACTTGGCCAG GCTCCCAGGCTC CTCATCTATAGTG CATCCAGCAGGG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGAAAGAGTCACCCT TACCAGGGACATGTC CACAAGCACAGCCTA CATGGAGCTGAGCAG CCTGAGATCCGAGGA CACGGCCGTGTATTA CTGTGCGACAAATCA TTGTAGTAGAACCAT CTGCTCTGATGGTTT TGATATCTGGGGCCA AGGGACAGTGGTCAC CGTCTCTTCAG				CCGCTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TTTATTACTGTCA GCAGTATGGTAGC TCACCGTGGACGT TCGGCCAAGGGA CCAAGGTGGAAAT CAAAC
	B1027	Omicron BT	Singlet	VH3-74	JH4	1065	GAGGTGCAGCTGGT GGAGTCCGGGGGAG GCTTAGTTCAGCCGG GGGGGTCCCTGAGA CTCTCCTGTGTAGGC TCTGGATTCTCCTTCA GTAGGTACTGGTTGC ACTGGGTCCGCCAAG CTCCAGGGAAGGGG CTGGTGTGGGTCTCA CGTATTGATAGTGAT GGGAGTAGTCCAGTC TACGCGGACTTCGTG AAGGGCCGATTCACC ATGTCCAGAGACAAC GCCAAGAATACCCTG TATCTGCAAATGAAC AGTCTGAGAGCCGAG GACACGGCTGTTTAT TACTGTGCAAGAGCT AGTCCGGGATTCGG	VL3-21	JL3	1066	TCCTATGAGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGAATGAC GGCCAGGATTTCC TGTGGGGTAAATA ACATTGGAAGTGA AAGTGTGCACTGG TACCAGCAGAGG CCAGGCCAGGCC CCTGTGCTGGTCC TCTATTATGGTAG CGACCGGCCCTC AGGGATCCCTGA GCGATTCTCTGGC TCCAACTCTGGAA ACACGGCCACCCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTACTGTCAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGGGCTCCCTTTTGACTACTGGGGCCAGGGAGCCCTGGTCACCGTCGCCTC				TTGTGGGATAGTAGTAGTAGTGATCTTTGGGTGTTCGGCGGAGGGACCAAGCTGACCGTCCTAGG
	B1028	Omicron BT	Singlet	VH3-9	JH6	1067	GAAGTGCAGCTGGTGGAGTCTGGGGGAGGCTTGCTACAGCCTGGCAGGTCCCTCACACTCTCCTGTGCAGCCTCTGGATTCACTTTTGATGATTATGCCATGCACTGGGTCCGGCAAGCTCCAGGGAAGGGCCTGGAGTGGGTCTCAGGTATTAGTTGGAGTGGTGGTGTCATAGACTATGCGGACTCTGTGAGGGGCCGGTTCACCATCTCCAGAGACAACGCCAAAGAGTCCCTCTATCTGCACATGCGCAGTCTGAGACCTGAAGACACGGCCTTATACTACTGTGCAAGAGGGTCTCGTTCGGGGAGTTTTTCTCTTAGGGACCACGACTACGGAATGGACGTCTGGGGCCGAGGGACCACGGTCACCGTCTCCTCA	VK2-28	JK2	1068	GATATTGTGATGACTCAGTCTCCACTCTCCCTGCCCGTCACCCCTGGAGGGCCGGCCTCCATCTCCTGCAGGTCTAGTCAGAGCCTCCTGCACAGTAATGGATACAACTATTTGGATTGGTACCTGCAGAAGCCCGGGCAGTCTCCACAGCTCCTGATCTCTTTGGGTTCTAATCGGGCCTCCGGGGTCCCTGACAGGTTCAGTGGCAGTGGATCAGGCACAGATTTTACACTGAAAATCAGCAGAGTGGAGGCTGAGGATGTTGAGGTTTATTACTGCATGCAGGGTCTACAACCTCCTCCCACTTTTGGCCAGGGGACCAAGCTGGAGATCAAAC

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	B1029	Omicron BT	Singlet	VH5-51	JH4	1069	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTAAGGGTT CTGGATACAGTTTTAT CAGCTCCTGGATCGG CTGGGTGCGCCAGAT GCCCGGGAAAGGCC TGGAGTGGATGGGG ATCATCTATCCTGGT GACTCTGATACCAGA TACAGCCCGTCCTTC CAAGGCCAGGTCACC ATTTCAGTCGACAAG TCCATCAGCACCGCC TACCTGCAGTGGACC AGCCTGAAGGCCTCG GACACCGCCATGTAC TACTGTGCAAGATCC AGTGACTACGGTGGT ACTCCGGGGGCCTA CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG	VL1-44	JL3	1070	CAGTCTGTCNTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCATCTAT TGTTCTGGAAGAA GTTCCAACATCGG AAGTAATCCTGTA AACTGGTTCCAGC AGCTCCCAGGGA CGGCCCCCAAACT CGTCAACTATAAT AATAATCAGCGGC CCTCAGGGGTCC CTGACCGATTCTC TGGCTCTAAGTCT GGCACCTCAGCCT CCCTGGCCATCAG TGGGCTCCAGTCT GAGGATGAGGCT GATTATTACTGTG CAACATGGGATGA CAGCCTCAATGGG TGGGTGTTCGGC GGAGGGACCAAG CTGACCGTCCTAG
	B1030	Omicron BT	Singlet	VH1-46	JH1	1071	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAGG GTTTCCTGCAAGGCA TCTGGATACACCTTC ACCAGCTACTATATG CACTGGGTGCGACA	VL1-44	JL1	1072	CAGTCTGTGCTGA CGCAGCCACCCT CAGCGTCTGGGA CCCCCGGGCAGA GGGTCACCATCTC TTGTTCTGGAAGC AGCTCCAACATCG GAAGTAATCCTGT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGCCCCTGGACAAG GGCTTGAGTGGATGG GAATAATCAACCCTA GTGATGGTGGCGCAA GCTACGCACAGAAGT TCCAGGGCAGAGTCA CCATGACCAGTGACA CGTCCACGAGCACAG TCTACATGGAGTTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGG GCTCTGCGTCACCAT AGCAGTGGCTGGTAC TCGGCGTTGGACTTC CAGCACTGGGGCCA GGGCACCCTGGTCA CCGTCTCCTCAG				AAACTGGTATCAG CAGCTCCCAGGAA CGGCCCCCAGAC TCCTCATCTATAG TAATAATCAGCGG CCCTCAGGGGTC CCTGACCGATTCT CTGGCTCCAAGTC TGGCACCTCAGCC TCCCTGGCCATCA GTGGGCTCCAGT CTGAGGATGAGG CTGATTATTACTG TGCAGCATGGGAT GACAGCCTTTATG TCTTCGGAACTGG GACCAAGGTCACC GTCCTAGG
	B1032	Omicron BT	Singlet	VH3-9	JH6	1073	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGAAGCCTC TGGATTCACCTTTGA GGATTTTGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTGTTAGTTGGAAT AGCGGTACCATAGGA TATGGGGACTCTGTG AAGGGCCGATTCATC ATCATCAGAGACAAC GCCAAGAACTCCGTG	VL3-21	JL2	1074	TCCTATGAGCTGA CACAGACACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGGATTACC TGTGTGGGAAACA ACATTGGAAGTGA AAGTGTGCACTGG TACCAGCAGAAGT CAGGCCGGGCCC CAGTGCTGGTCGT CTATGATGATAGC GACCGGCCCTCA GGGATCCCTGAG CGATTCTCTGGCT CCACCTCTGGGAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TATCTGCAAATGAAC AGTCTGAGACCTGAG GACACGGCCTTCTAT TACTGTGTAAAAGAT ATGGCTACATATTAC AAGGATATTAGTGGG ACATATGGTATGGAC GTCTGGGGCCAAGG GACCACGGTCACTGT CTCCTCA				CACGGCCACCCT GATCATCAACAGG GTCGAGGCCGGG GATGAGGCCGGC TACTACTGTCAGG TGTGGGATGCTAG TAGTGATCATGTG GTTTTCGGCGGAG GGACCAAGCTGA CCGTCCTAG
	B1033	Omicron BT	Singlet	VH3-9	JH4	1075	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTATGCCTTGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCG GGTAGTAGTTGGAAT AGTGCTACCATAGGC TATGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAGAACTCCCTG TATCTGCACATGAGC AGTCTGAGAGTTGAG GACACGGCCTTGTAT TACTGTGCAAAAGAT TCTTCGGGTGGTGAC TGGCCGCTATGCTTT GACTACTGGGGCCA	VK3-15	JK2	1076	GAAATAGTGATGA CGCAGTCTCCAGC CACCCTGTCTGTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTGTTAGC AGCAACTTAGCCT GGTACCAGCAGAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTATGGTGCAT CCACCAGGGCCA CTGGTATCCCAGC CAGGTTCAGTGGC AGTGGGTCTGGG GCAGAGTTCACTC TCACCATCAGCAG CCTGCAGTCAGAA GATTTTGCAGTTT ATTACTGTCAGCA GTATAATAACTGG CGGTACACTTTTG GCCAGGGGACCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGGAATCCTGGTCAC CGTCTCCTCAG				AGCTGGAGATCAA AC
	B1034	Omicron BT	Singlet	VH1-46	JH4	1077	CAGGTGCAGCTGGT GCAGTCTGGGTCTGA GGTGAAGAAGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCA TCTGGAAACACTTTC ATCACTTACTACACG CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGTAATCAAGCCTA GTGATGGTTACACAA ACTACGCACAGAAAT TCCAGGGCAGAGTCA CCATGACCAGGGACA CGTCCGCGAGCACA GTCTACATGGAGCTG AGCAGCCTGACATCT GACGACACGGCCGT GTATTACTGTGCGAG AGATTCGAGTATTGC AGCTCGAGTAGTCGA CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG	VK1-33	JK2	1078	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTTACA ATTATTTGAATTG GTATCAACAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTTCGATGCAAT CAATTTGGAAACG GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACA GATTTTACTCTCA CCATCAGCAGCCT GCAGCCTGAAGAT ATTGCGACATATT ATTGTCAACAGCA TGATAATCTCCCG TACTCTTTTGGCC AGGGGACCAAGC TGGAGATCAAAC
	B1035	Omicron BT	Singlet	VH3-11	JH4	1079	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCAAGCCTG GAGGGTCCCTGAGA CTCTCCTGCGCAGCC TCTGGATTCATCTTCA GTAACTACTATATCA	VL3-21	JL3	1080	TCCTATGAGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGAATTACC TGTGGGGGAGAC GACATTGGAAGTA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTTGGATCCGCCAATCTCCAGGGAAGGGGCTGGAGTGGCTTTCATACATTAGTGGCAGTGGTTCTACAATATATTATGCAGACTCTGTGAAGGGCCGATTCACCATCTCCAGGGACAACGCCAAGAACTCACTGTATCTGGAAATGAACAGCCTGAGACCTGAAGACACGGCCGTGTATTACTGTGCGAGAGATGGGTCCCTTACGGGGTACATTGACTATTGGGGCCAGGGAACCCTGGTCACCGTCTCCTCAG				AAGGTGTGCACTGGTACCAGCAGAAGCCAGGCCAGGCCCCTGTGCTGGTCGTCTATGATGATAGCGACCGGCCCTCAGGGATCCCTGAGCGATTCTCTGGCTCCAACTCGGGGAACACGGCCACCCTGACCATCAGCAGGGTCGAAGTCGGGGATGAGGCCGACCTATTACTGTCAGGTGTGGGATAGTCATGCTAATCCCCATTGGGTGTTCGGCGGAGGGACCAAGGTGACCGTCCTAGG
	B1036	Omicron BT	Singlet	VH3-30	JH4	1081	CAGGTGCAGCTGGTGGAGACTGGGGGAGGCGTGGTCCAGCCTGGGAGGTCCCGGAGACTCTCCTGTGTAGCCTCTGGATTCACCTTCCGTCACTATGCCATGCACTGGGTCCGCCAGGCTCCAGGCAAGGGGCTGGAGTGGGTGGCAGTTATATCATATGATGGAAGTCATAAACACTATGGAGACTCCGTGAAGGGCCGAG	VL1-51	JL2	1082	CAGTCTGTCNTGACTCAGCCGCCCTCAGTGTCTGCGGCCCCAGGACGGACGGTCACCATCTCCTGCTCTGGAAGCAGCTCCAACATTGGGAGTAATTATGTATGTTGGTACCAGCAGTTCCCAGGAACAGCCCCCAAACTCCTCATTTATGACAATAATGAGAGACCCTCAGGGATTCCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCACCATCTCCAGAG ACGATTCCGGGAACA CGCTGTATCTGCAAA TGAACAACCTGAGAC CTGAGGACACGGCTA TGTATTACTGTGCGA AAGTTTCGGGACCCT ATTGTCGTGGTGGTA ACTGCTACTCAGGGG GGGAATTTGACTACT GGGGCCAGGGAACC CTGGTCACCGTCTCC TCAG				GCCCGATTCTCTG GCTCCAAGTCTGG CACGTCAGCCACC CTGGGCATCATCG GACTCCAGACTGG GGACGAGGCCGA TTATTACTGCGAA ACATGGGATAGCA GCCTGAATGCTGT GGTATTCGGCGG AGGGACCAAGGT GACCGTCCT
	B1037	Omicron BT	Singlet	VH1-69	JH4	1083	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGACACCTTC ATCAGTTATGCTATCA CCTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG AAGGATCATCCCTAT CCTTGGTGTAGCAGA CTACGCACCGAAGTT CCAGGGCAGAGTCA CGATTACCGCGGACA AGTCCACGAGCACAG CCTACATGGAACTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TTTTACTGTGCGAGT TGGCGGGGACGTGA	VK3-20	JK1	1084	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACTCTC TCCTGCAGGGCC AGTCAGAGTGTTA GCAGCAGCTACTT AGCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGCATCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TGTATTACTGTCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATATAATGGCTACGA TTGGACGGGACCAAC AAGGGGCTTTGACTC TTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				GCAGTATGATAGC TCACCGTGGACGT TCGGCCAAGGGA CCAAGGTGGAAAT CAAAC
	B1038	Vax3	Clone	VH1-46	JH6	1085	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAAG TTTCCTGCAAGGCAT CTGGATACACCTTTA CCAATTACTATATGCA CTGGGTGCGACAGG CCCCTGGACAAGGG CTTGAGTGGCTGGGA ATGATTAAAGCTAGT GGTGGTACCACACAC TACGCAGAGAAGTTT CAGGGCAGAGTCAC CATGACCAGGGACAC GTCCACGAACACAGT CTACGTGGAGTTGAG CAGCCTGAGATCCGA GGACACGGCCGTCTA TTACTGTGCAAGAGA CCGCCTAATGGGGTA TTACGAATTATGGAC TGCTTATGGCGGTAT GGACGTCTGGGGCC AAGGGACCACGGTCA CCGTCTCCTCA	VL3-21	JL3	1086	TCCTATGTGCTGA CTCAGCCACCCTC AGTGTCAGTGGCC CCAGGAAAGACG GCCAGCGTTACCT GTGGGGGAAACG ACATCGGAATTAA AACTGTGCGCTGG TACCAGCAGAAGC CAGGCCAGGCCC CTGTGCTGGTCAT CTATTCTGATAGT GACCGGCCCTCA GGGATCCCTGAAC GATTTTCTGGTTC CAACTCTGGGAAC ACGGCCTCCCTGA CCATCAACAGGGT CGAAGCCGGGGA TGAGGCCGACTAT TACTGTCAGGTGT GGGATAGTAGCA GTGCCTGGGTGTT CGGCGGAGGGAC CAAGCTGACCGTC CT
	B1039	Vax3	Clone	VH3-30	JH4	1087	CAGGTGCAGCTGGT GGAGTCTGGGGGAG	VK1-33	JK4	1088	GACATCCAGATGA CCCAGTCTCCATC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTACAGT CTCTGGATTCACCTT CAGGCATTATGGCAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGCAGTTATATTATAT GATGGAAGTGATAAA CAGTATGCAGACTCC GTGAAGGGCCGATTC ACCATCGCCAGAGAC AACTCCAAGAACACG CTGTATCTGCAAATG AACAGCCTGAGAGCT GAGGACACGGCTGT GTATTATTGTGTGAAA AGGAGGGGGTCATAT TGTGGTGGTGACTGC TATTCGGGGGAATTT GACTACTGGGGCCA GGGAACCCTGGTCAC CGTCTCCTCAG				CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAGTA CTTACTTAAATTG GTTTCAGCAGAAA CCAGGGAAAGCC CCTAACCTCCTGA TCTCCGATGCATC CAATTTGGAAACA GGGGTCCCATCAA GATTCAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATG TTGCAACATATTA CTGTCAACAGTAT CATAATCTCCCCA CTTTCGCCGGAG GGACCAAGGTGG AGCTCAAAC
	B1040	Vax3	Clone	VH3-9	JH6	1089	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACGTTTGA TGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA	VL1-40	JL2	1090	CAGTCTGTCCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAATGTCG GGGCATCTTATGA TGTACACTGGTAC CAGCAGCTTCCAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGTATTAGTTGGAAT AGTGGCACCATAGGC TATGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAGAACTCCCTG TATCTGCAAATGTAC AGTCTGAGAGCTGAG GACACGGCCTTGTAT TACTGTGCAAAAGAT GTCTACATGGGCAAA ATTAACTTATACGGTC ATGAAGACTACGGTA TGGACGTCTGGGGC CAAGGGACCACGGT CACCGTCTCCTC				GAACAGCCCCCAA ACTGCTCATCTAC GGTAAGGACAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGACTCCAG GCTGAGGATGAG GCTGATTACTACT GCCAGTCCTTTGA CAGCAGCCTGAGT GGTGTACTATTCG GCGGAGGGACCA AGCTGACCGTCCT AG
	B1041	Vax3	Clone	VH1-69	JH5	1091	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AAGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACTTTC AGCAGCTATACTGTC ACCTGGGTGCGGCA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCGCTG CCCTTGGTGCAGCAA ACTACGCACAGAAGT TCCAGGGCAGAGTCA CTTTTACCGCGGACG ATTCCAGGAGCACAG TCTACATGGAACTGA	VL1-40	JL2	1092	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCGGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AACTCCAACATCG GGGCAGGTTATGA TGTACACTGGTAC CAGCAACTTCCTG GAACAGCCCCCA GACTCCTCATCCA TGTTAACAGCAAT CGGCCCTCAGGG GTCCCTGAGCGAT TCTCTGGCTTTAA GTCTGGCACCTCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GCAGCCTGACATATG AGGACACGGCCGTAT ATTACTGTGCGACAT CACGTGGATATAGTG GCTACGGGGCGAAC AACTGGTTCGACCCC TGGGGCCAGGGAAG CCTGGTCACCGTCTC CTCAG				GCCTCCCTGGCC ATCACTGGGCTCC AGGCTGAGGATG AGGCTATTTATTA CTGCCAGTCCTAT GACAGCAGCCTG ACTGGATCGCTAT TCGGCGGAGGGA CCAAGCTGACCGT CCTAG
	B1042	Vax3	Clone	VH1-2	JH4	1093	CAGGTGCAGCTGGT GCAGTCTGGGGCCG AGGTGAGGAAGCCT GGGGCCTCAGTGAA GGTCTCCTGCAAGGC TTCTGGAAACACCTT CACCGGCTACTATAT ACACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GATGGATCAACCCTA ACAGTGGTGGCACAA ACTATGCACAGAGGT TTCGGGGCAGGGTC GCCCTGACCACGGA CACGCCCATCAATAT CGTCCACATGGAGTT GAGCGGGCTGAGAT CTGACGACACGGCC GTGTATTACTGTGCG AAAGATACGGGCAGC AGCTGGAGTGAGGCT GAATACTTTGACTCC TGGGGCCAGGGAAC	VK1-39	JK5	1094	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTGGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAACCTCCTGA TCTATGCTGCATC CAGTTTGCAAAGT GGGGTCCCGTCA AGGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGACG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC CTCCGATCACCTT CGGCCAAGGGAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CCTGGTCACCGTCTC CTCAG				ACGACTGGAGATT A
	B1043	Vax3	Clone	VH3-30	JH6	1095	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCATCTTC AGTAGTTATGGCATG CACTGGGTCCGCCA GGCACCAGGCAAGG GGCTGGAGTGGGTG GCGGATATATCGTAT CATGGAAGTAACAAA TATTATGCAGACTCC GTGAAGGGCCGATTC AACATCTCCAGAGAC AATTCGAAGAATACG CTATTTCTGCAAATGA ACAGCCTGAGACCTG AGGACACGGCTCTGT ATTTCTGTGCGAAAG ACTTGGGTCAGGGCA TATTACATTTTGTGCA ATGGTCATTATCCCG CCACGGTCTGGACGT CTGGGGCCAAGGGA CCACGGTCACCGTCT CCTCA	VL2-8	JL2	1096	CAGTCTGCCCTGA CTCAGCCTCCCTC CGCGTCCGGGTC TCCTGGACAGTCA GTCACCATCTCCT GCACTGGAACCA GCAGTGACGTTG GTGGTTATAATTA TGTCTCCTGGTAC CAAAAATACCCAG GCAAAGCCCCCAA ACTCATTATTTATG AGGTCGATAAGCG GCCCTCAGGGGT CCCCGATCGTTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACCGT CTCTGGACTCCAG GCTGAGGATGAG GCTGATTATTACT GCAGCTCATCTGC AGTCAGTGTGATA TTCGGCGGAGGG ACCAAGCTGACCG TCCTA
	B1044	Vax3	Clone	VH1-69	JH4	1097	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT	VL1-40	JL1	1098	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC

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							TCTGGAGGCACCTTC AGCAGCTATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCCCTA TCTTTGGTACAGCAA ACTACGCACAGAAGT TCCAGGGCAGAGTCA CGATTACCGCGGACG AATCCACGAGCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGA GCCCTTTATTACTATG ATAGTAGTGGCCGTA CCCGAATGGAGGAGT ACTTTGACTACTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				TGCACTGGGAGC AGCTCCAACATCG GGGCAGCTTATGA TGTACACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT GGTAACAGCAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGGCTCCA GGCTGAGGATGA GGCTGATTATTAC TGCCAGTCCTATG ACAGCAGCCTGA GTGCCCGTTATGT CTTCGGAACTGGG ACCAAGGTCACCG TCCTAG
	B1045	Vax3	Singlet	VH1-58	JH4	1099	CAAATGCAGCTGGTG CAGTCTGGGCCTGAG GNGAAGAAGCCTGG GACCTCAGTGAGGGT CTCCTGCAAGGCGTC TGGATTCACCTTTTAT AGTTCTGCTGTGCAG TGGGTGCGACAGGC TCGTGGACAACGCCT TGAGTGGATAGGATG GATCGTCGTTGCCAG CGGTAACACAAACTA	VK3-20	JK1	1100	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA CAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTC GCAGCGGCTACTT TGCCTGGTACCAG CAGCAACCTGGC CAGTCTCCCAGGC TCCTCATCTCCGG

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							CGCGCAGAAGTTCCA GGAAAGAGTCACCAT TACCAGGGACATGTC CACAAGCACAGCCTA CATGGAACTGAGCAG CCTGAGAGGCGAGG ACACGGCCGTGTATT ACTGTGCGGCACCAT ATTGTAATAGTACTAT CTGCGCGGGGGGTT TTGACTACTGGGGCC AGGGAACCCTGGTCA CCGTCTCCTCAG				TGCATCCAACAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TGTATCACTGTCA GCAGTATGATAAG TCACCGTGGACGT TCGGCCAAGGGA CCAAGGTGGAAAT GAAAC
	B1046	Vax3	Singlet	VH4-61	JH6	1101	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGCTGAAGCCTT CGGAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGGCTCCGTCA GCAGTGCTAATTTCC ACTGGAGCTGGATCC GGCAGCCCCCAGGG AAGGGACTGGAGTG GATTGGGAATTTCTT CTACAGTGGGAGCAC CAACTACAACCCCTC CCTCAAGAGTCGACT CACCATATCAGTAGA CACGTCCAAGAATCA GTTCTGTTTGAAGAA GTACTCTTTGACCGC TGCGGACACGGCCG TCTATTACTGTGCGA	VK2-28	JK3	1102	GATATTGTGATGA CTCAGTCTCCACT CTCCCTGCCCGTC ACCCCTGGAGAG CCGGCCTCCATCT CCTGCAGGTCTAG TCAGAGCCTCCTG CATAATAATGCAT ACAACTATTTGGA TTGGTACCTGCAG AAGCCAGGGCAG TCTCCACAGCTCC TGATCTATTTGGG TTCTAATCGGGCC TCCGGGGTCCCT GACAGGTTCAGTG GCAGTGGATCAG GCACAGATTTTAC ACTGAAAATCAGC AGAGTGGAGGCT

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							GAGACACCCGTTACT ATGATAGGAGTGGTT ATGTCAGGTCCGACG GTATGGACGTCTGGG GCCAGGGGACCACG GTCACCGTCTCCTCA				GAGGATGTTGGG GTTTATTACTGCA TGCAAGCTCTGCA AACTCCTCCGACT TTCGGCCCTGGG ACCAAAGTGGATA TCAAAC
	B1047	Vax3	Singlet	VH3-30	JH4	1103	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGTAGC CTCTGGATTCACCTT CAATAACCATGCTAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGACTGGGT GGCAGTTATATCATA TGATGGAAGCAATAA ATACTACGCAGACTC CGTGAAGGGCCGATT CACCATCTCCAGAGA CAATTCCAAGAACAC GCTGTATGTGCAAAT GAACAGCCTGAGAGC TGAAGACACGGCTGT GTATTACTGTGCGAG AGAGGATTACTATGA TAGTAGTGGTTCCTT TGACTACTGGGGCCA GGGGACCCTGGTCA CCGTCTCCTCAG	VL2-14	JL3	1104	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA TCACCATCTCCTG CACTGGAACCAGC AGTGACGTTGGTG GTTATAACTATGT CTCCTGGTACCAA CAACACCCAGGCA AAGCCCCCAAACT CCTGACTTATGAT GTCAGTAATCGGC CCTCAGGAGTTTC TAATCGCTTCTCT GGCTCCAAGTCTG GCAACACGGCCT CCCTGACCATCTC TGGGCTCCAGGC TGAGGACGAGGC TGATTATTACTGC AGCTCATACACAA ACAGCGCCACCT GGGTGTTCGGCG GAGGGACCAAGC TGACCGTCCTAG

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	B1048	Vax3	Singlet	VH1-69	JH6	1105	CAGGTGCAGCTACAG CAGTGGGGCGCAGG ACTGTTGAAGCCTTC GGAGACCCTGTCCCT CACCTGCGGTGTCTT TCGTGCGTCCCTCAT CGATTTCTACTGGAC CTGGATCCGTCAGTC CCCAGGAAAGGGGC CGGAGTGGATTGGG GGGATCTATCATAAT GGAAGCGCCGACTCT AGCCCGTCTATGAAG AGTCGAGTCACCATA TCAATCGACACGTCT AAGAATCAATTTTCCC TTCAGTTGACCTCTG TGACCGCCGCAGACA ATGGTGTCTATTATTG TGCGAGAGGACTAG GGAGTTGGCTGCAGA TGCCCGTCGCCTTTT GGGGCCAGGGAAAC CTGGTCACCGTCTCC TCAG	VK2-28	JK4	1106	GATATTGTGATGA CTCAGTCTCCACT CTCCCTGCCCGTC ACCCCTGGAGAG CCGGCCTCCATCT CCTGCAGGTCTAG TCAGAGCCTCCTG CATAGTAATGGAG ACACCTATTTGGA TTGGTACCTGCAG AAGCCAGGGCAG TCTCCACAGCTCC TGATCTATTTGGG TTCTAATCGGGCC TCCGGGGTCCCT GACAGGTTCAGTG GCAGTGGATCAG GCACAGATTTTAC ACTGAAAATCAGC AGAGTGGAGGCT GAGGATGTTGGG GTTTATTACTGCA TGCAAGCTCTACA AACTCCGGCTTTC GGCGGAGGGACC AAGGTGGAGATCA AAC
	B1049	Vax3	Singlet	VH4-31	JH4	1107	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CACAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGGCTCAATCA GCAGTGGTCCTTACT	VL1-44	JL2	1108	CAGTCTGTGCTGA CGCAGTCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCATCTCT TGTTCTGGAAGCA GCTCCAACATCGG

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							ACTGGAGTTGGATCC GCCAGCACCCAGGG AAGGGCCTGGAGTG GATTGGGTACATCTA TTACAGTGGGAGCAC CTACTACAACCCGTC CCTCAAGAGTCGAGT TACCATATCAGTGGA CACGTCTAAGAAGCA GTTCTCCCTGAACCT GAACTCTGTGACTGC CGCGGACACGGCCG TGTATTACTGTGCGA GAGTTTGGCAATACT ATGATAGTACTGGAT CCTTTGACTACTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				AAGTAATACTGTA AACTGGTACCAGC AAGTCCCAGGAAC GGCCCCCAAACTC CTCATCTATAGTG ATAATCAGCGGCC CTCAGGGGTCCCT GACCGATTCTCTG CCTCCAAGTCTGG CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCAGTCTGA GGATGAGGCTGAT TATTACTGTGCAG CATGGGATGACG GCCTGAATGGCGT GCTATTCGGCGGA GGGACCAAGCTG ACCGTCCTAGG
	B1050	Vax3	Singlet	VH4-34	JH4	1109	CAGGTGCAGCTACAG CAGTGGGGCGCAGG ACTGTTGAAGCCTTC GGAGACCCTGTCCCT CACCTGCGGTGTCTT TCGTGCGTCCCTCAT CGATTTCTACTGGAC CTGGATCCGTCAGTC CCCAGGAAAGGGGC CGGAGTGGATTGGG GGGATCTATCATAAT GGAAGCGCCGACTCT AGCCCGTCCATGAAG AGTCGAGTCACCATA TCAATCGACACGTCT	VL1-47	JL2	1110	CAGGTGCAGCTAC AGCAGTGGGGCG CAGGACTGTTGAA GCCTTCGGAGAC CCTGTCCCTCACC TGCGGTGTCTTTC GTGCGTCCCTCAT CGATTTCTACTGG ACCTGGATCCGTC AGTCCCCAGGAAA GGGGCCGGAGTG GATTGGGGGGAT CTATCATAATGGA AGCGCCGACTCTA GCCCGTCTATGAA

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							AAGAATCAATTTTCCC TTCAGTTGACCTCTG TGACCGCCGCAGACA ATGGTGTCTATTATTG TGCGAGAGGACTAG GGAGTTGGCTGCAGA TGCCCGTCGCCTTTT GGGGCCAGGGAAAC CTGGTCACCGTCTCC TCAG				GAGTCGAGTCACC ATATCAATCGACA CGTCTAAGAATCA ATTTTCCCTTCAG TTGACCTCTGTGA CCGCCGCAGACA ATGGTGTCTATTA TTGTGCGAGAGGA CTAGGGAGTTGG CTGCAGATGCCC GTCGCCTTTTGGG GCCAGGGAAACC TGGTCACCGTCTC CTCAG
	B1051	Vax3	Singlet	VH3-20	JH5	1111	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GAGTGGTCCGGCCG GGGGGGTCTCTGAG ACTCTCCTGTTCAGC CTCTGGATTCACGTT TGGAGAATATGGCAT GAGTTGGTTCCGCCA AGCTCCAGGGAAGG GGCCGGAGTGGGTC TCTGGTATTACTTGG AATGGTGGTAACCCA ACGTATGCAGACTCT GTGAAGGGCCGATTC ATGATCTCCAGAGAC AACGCCAAGAACTCC CTGTATCTGCAAATG AACAGTCTGAGAGCC GAGGACTCGGCCTC GTATCACTGTGCGAG	VL1-40	JL1	1112	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACATCG GGGCAGGTTATGA TGTTCACTGGTAC CAGCAGTTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT AATAACAACAATC GGCCCTCCGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGGCTCCA GGCTGAGGATGA

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							AGCCCTTTGTGGTGA TGACTGCTTAGCCTC TATGTACAACTGGTT CGACCCCTGGGGCC AGGGAACCCTGGTCA CCGTCTCCTCAG				GGCTGATTATTAC TGCCAGTCCTTTG ACAGCGGCCGGA GTGGTTCGGAAGT CTTCGGAACTGGG ACCAAGGTCACCG TCCTA
	B1052	Vax3	Singlet	VH1-2	JH4	1113	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGGCT TCTGGATACATTTTCA CCGGGTATTATATGC ACTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG GTGGATCAACCCTAA CAGTGGTGCCACAAA TTATGCACAGAAGTT TCAGGGCAGGGTCA CCATGACCAGGGACA CGTCCATCAGCACAG TCCACATGGACCTGA GCAGGCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGA GATCAGGCCTTTTCT ATGGTCTCGGGGAGT GTTGACTACTGGGGC CAGGGAACCCTGGTC ACCGTCTCCCCAG	VL2-23	JL1	1114	CAGTCTGTCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA TCACCATCTCCTG CACTGGGGCCAG CAGTGATGTTGGG ACTTATGACCTTG TCTCCTGGTACCA ACATCACCCAGGC AAAGCCCCCAAAC TCGTGATTTTTGA GGTCACTAAGCG GCCCTCAGGGGT TTCTAATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACAAT CTCTGGGCTCCAG GCTGAGGACGAG GCTGATTATTACT GCTGCTCATATGC AGGTAATAGCGCT TATGTCTTCGGAA CTGGGACCAAGG TCACCGCCCT

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	B1053	Vax3	Singlet	VH1-2	JH4	1115	CAGGTGCAGCTGGTGCAGTCTGGGGCTGAGGTGAAGCAGCCTGGGGCCTCAGTGAAGGTCTCCTGCAAGGCCTCTGGATACACCTTCACCCGCTACTATATGCACTGGGTGCGACAGGCCCCTGGACAAGGGCTTGAGTGGATGGGATGGATCAACCCTAACAGTGGTGGCACAAACTATGCACAGAAGTTTCAGGGCAGCGTCACCATGACCAGGGACACGCCCATCAGCACAGCCTACATGGAACTGAGCAGGCTGAAATCTGACGACACGGCCGTGTATTACTGTGCGAGAAGTCTGTTTTACTATGACAGGCGTGGGTACCCCACCCCGGAGGACCACTTTGACTACTGGGGCCAGGGAACCCTGGTCACCGTCTCCTCAG	VL1-40	JL3	1116	CAGTCTGTGCTGACTCAGCCGCCCTCAGTGTCTGGGGCCCCAGGGCAGAGGGTCACCATCTCCTGCACTGGGAGCAGCTCCAACATCGGGGCGAATTATGATGTACACTGGTACCAGCACCTTCCAGGAACAGCCCCCAAACTCCTCATCTATGGTAACACCAATCGGCCCTCAGGGGTCCCTGATCGATTCTCTGGCTCCAAGTCTGGCACCTCAGCCTCCCTGGCCATCACTGGGCTCCAGGCTGAGGATGAGGGTGATTATTACTGCCAGTCCTATGACAGCAGCCCGAGTGGCCCCAATTGGGTGTTCGGCGGAGGGACCAAGGTGACCGTCCTA
	B1054	Vax3	Singlet	VH3-23	JH4	1117	GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCGGGGGGGTCCCTGAGACTCTCCTGTGCAGCCTCTGGATTCAACTTTAGCAACCATGCCGTGAG	VK1-5	JK4	1118	GACATCCAGATGACCCAGTCTCCTTCCACCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTTGCCGGGCCAGTCAGAGTATTAGT

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							CTGGGTCCGCCAGG CTCCAGGGAAGGGG CTGGAGTGGGTCTCA GGTTTTAGTGGGAGT GGTGGTACCACTTTC TACGCGGACTCCGTG AAGGGCCGGTTCACC ATCTCCAGAGACAAT TCCAAGAACACGCTG TATCTGCAAATGAAC AGCCTGAGTGCCGA GGACACGGCCGTTTA TTACTGTGCGAAAAG GGGCGTATCTTATTA TGATAGAAGTGGTCA TTACTTCGAGAACAG CTTTGACTCCTGGGG CCAGGGAACCCTGGT CACCGTCTCCTCAG				AGTTGGTTGGCCT GGTATCAGCAGAA ACCAGGGGAAGC CCCTNANNNTCTG ATCTATAAGGGGT CTAATTTAGAAAG TGGGGTCCCATTA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CATCATCAGCAGC CTGCAGCCTGAAG ATTTTGCAACTTAT TACTGCCAACAGT ATGATAGTTACCC TTTCACTTTCGGC CGAGGGACCAAA GTGGAGATCAAAC
	B1056	Vax3	Singlet	VH1-8	JH5	1119	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGGCT TCTGGATACACCTTC ACCAGTTATGATATC GACTGGGTGCGACA GGCCACTGGACAAG GGCTTGAGTGGATGG GATGGATGAACCCTA ACAGTGGTAACACAG GCTATGCACAGAAGT TCCAGGGCAGAGTCA CCATGACCAGGAACA	VL1-47	JL2	1120	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCATCTCT TGTTCTGGAAGCA GCTCCAACATCGG CAGTAATTTTGTAT ACTGGTACCAACA ACTCCCAGGAACG GCCCCCAAACTCC TCATCTATAGTAAT AATCAGCGGCCCT CAGGGGTCCCTG ACCGATTCTCTGG

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							CCTCCATAAGCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGCCGTCT ATTACTGTGCGAGAG CAATATGGTTCGGGG AGCTACCCTCCGCCT GGGGCCAGGGAACC CTGGTCACCGTCTCC TCA				CTCCAAGTCTGGC ACCTCAGCCTCCC TGGCCATCAGTGG GCTCCGGTCCGA GGATGAGGCTGAT TATTACTGTGCAG CATGGGATGACAG CCTGAGTGGCCAT GTGGTCTTCGGC GGAGGGACCAAG CTGACCGTCCTAG
	B1057	Vax3	Singlet	VH3-9	JH5	1121	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTTTGCCATGCA CTGGGTCCGGCAAG CACCAGGGAAGGGC CTGGAGTGGGTCTCA GGTATTAGTTGGGAA AGTGGTAGCATAGGT TATGCGGACTCTGTG AAGGGCCGATTCACC ATCTCCAGAGACAAC GGCAAGAAGACCCTG CATCTGCAAATGACC AGTCTGAGAGTTGAG GACACGGCCCTGTAT TACTGTGCAAAAGCG AGCAACGGGTGGTTC GGGGAGTTATTACGG GGGTTCGACTCCTGG	VL3-21	JL2	1122	TCCTATGAGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGGATTACC TGTGGGGGAAAC AACATTGGGAGTA AAAGTGTGCACTG GTACCAGCAGAAG CCAGGCCAGGCC CCTGTGCTGGTCG TCTATGATGATAG CGACCGGCCCTC AGGGATCCCTGA GCGATTCTCTGGC TCCAACTCTGGGA ACACGGCCACCCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTACTGTCAG GTGTGGGATAGTA CTAGTGATCATGT

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							GGCCAGGGAACCCT GGTCACCGTCTCCTC				GGTATTCGGCGG AGGGACCAAGCT GACCGTCCTAG
B001	B601	Delta BT	Clone	VH1-2	JH6	1123	CAGGTGCAGCTGGT GCAGTCTGGGGCCG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGTAAGACT TCTGGATACACGCTC ATCGACTACTACGTT CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GACGGATCAACCCTA ACAGTGGGGGCACA AACTATGCACAGAAA TTTCAGGGCAGGGTC ACCATGACCGGGGG TACGTCCATCACCAC AGCCTACATGGAGTT GAGCGGCCTGAGAT CTGACGACACGGCC GTGTACTACTGTGCG ACCGAGCATTACGAT ATTGTGGCTGGTCAT TCTCCCGGGGGGAA ATACTTCGGTATGGA CGTCTGGGGCCAAG GGACCACGGTCACC GTCTCCTCA	VL2-14	JL2	1124	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA TCACCATCTCCTG CACTGGAAGCAG CAGTGACGTTGGT AGTTATAACTATG TCTCCTGGTACCA ACAGCACCCAGG CAGAGCCCCCAAA CTCATAATTTCTG AGGTCACTAATCG GCCCTCAGGGGT TTCTAATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACCAT CTCTGGGCTCCAG GCTGAGGACGAG GCTGATTATTACT GCAGCTCATATAC AAGCAGCAGTCCC CTTGTCCTATTCG GCGGAGGGACCA AGCTGACC
	B602	Delta BT	Clone	VH1-2	JH6	1125	CAGGTGCAGCTGGT GCAGTCTGGGGCCG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG	VL2-14	JL2	1126	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA

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							GTCTCCTGTAAGACT TCTGGATACACGCTC ATCGACTACTACGTT CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GACGGATCAACCCTA ACAGTGGGGGCACA AACTATGCACAGAAA TTTCAGGGCAGGGTC ACCATGACCGGGGG TACGTCCATCACCAC AGCCTACATGGAGTT GAGCGGCCTGAGAT CTGACGACACGGCC GTGTACTACTGTGCG ACCGAGCATTACGAT ATTGTGGCTGGTCAT TCTCCCGGGGGGAA ATACTTCGGTATGGA CGTCTGGGGCCAAG GGACCACGGTCACC GTCTCCTCA				TCACCATCTCCTG CACTGGAAGCAG CAGTGACGTTGGT AGTTATAACTATG TCTCCTGGTACCA ACAGCACCCAGG CAGAGCCCCCAAA CTCATAATTTCTG AGGTCACTAATCG GCCCTCAGGGGT TTCTAATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACCAT CTCTGGGCTCCAG GCTGAGGACGAG GCTGATTATTACT GCAGCTCATATAC AAGCAGCAGTCCC CTTGTCCTATTCG GCGGAGGGACCA AGCTGACCGTCCT AG
	B605	Delta BT	Clone	VH4-31	JH4	1127	CAGGTGCAGCTGCA GGAGTCGGGCCCAA GACTGGTGAAGCCCT CACAGACCCTGTCCC TCACCTGCAGTGTCT CTGGTGGCTCCTTCA GCAGTGGTGGTTACT ACTGGAGCTGGATCC GCCAGCACCCAGGG AAGGGCCTGGAATG GATTGGGTACATCTA	VL2-8	JL2	1128	CAGTCTGCCCTGA CTCAGCCTCCCTC CGCGTCCGGGTC TCCTGGACAGTCA GTCACCATCTCCT GCACTGGAACCA GCAGTGACGTTG GTGGTTATAACTA TGTCTCCTGGTAC CAACAGCACCCAG GCAAAGCCCCCAA

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							TTACACTGGGAGCAC CTACTACAACCCGTC CCTCAAGAGTCGAGT TTCCATATCAGTGGA CACGTCTAAGAACGA GCTCTCCCTGGGGCT GAGTTCTGTGACTGC CGCGGACACGGCCG TGTATTACTGTGCGA GAGGGCCATATACAA CTAGGGCCTTTGACT ACTGGGGCCAGGGA ACCCTGGTCACCGTC TCCTCAG				ACTCATTATTTATG AGGTCAGTAAGCG GCCCTCAGGGGT CCCTGATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACCGT CTCTGGGCTCCAG GCTGAGGATGAG GCTGATTATTACT GCAGCTCATATGG AGGCAGCAACAAT GAGGTATTCGGC GGAGGGACCAAG CTGACCGTCCTAG
	B606	Delta BT	Clone	VH4-31	JH4	1129	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CACAGACCCTGTCCC TCACCTGCTCTGTCT CTGGTGGCTCCGTCA GCAGTGGTGGTTACT ACTGGAGCTGGATCC GCCAGCACCCAGGG AAGGGCCTGGAGTG GGTTGGGTACATCTA TTACACTGGGAGCAC CTACTACAACCCGTC CCTCAAGAGTCGAGG TACCATATCAGTCGA CACGTCTAAGAACCA GTTCTCCCTGAAGCT GAGCTCTGTGACTGC CGCGGACACGGCCG	VL2-8	JL2	1130	CAGTCTGCCCTGA CTCAGCCTCCCTC CGCGTCCGGGTC TCCTGGACAGTCA GTCACCATCTCCT GCACTGGAACCA GCAGTGACGTTG GTGATTATAACTA TGTCTCCTGGTAC CAACAGCACCCAG GCAAAGCCCCCAA ACTCATGATTTAT GAGGTCAATAAGC GGCCCTCAGGGG TCCCTGATCGCTT CTCTGGCTCCAAG TCTGGCAACACGG CCTCCCTGACCGT CTCTGGGCTCCAG

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							TGTATTATTGTGCGA GAGGGCCATATACAA CTAGGGCCTTTGACT ACTGGGGCCAGGGA ACCCTGGTCACCGTC TCCTCAG				GCTGAAGATGAG GCTGATTATTACT GCAGCTCATATGC CGGCAGCAACACT GAGGTATTCGGC GGAGGGACCAAG CTGACCGTCCTAG
	B609	Delta BT	Clone	VH1-69	JH4	1131	CAGGTGCAGCTGGT GCAGTCTGGGGCTG CGGTGAGGAAGCCT GGGTCCTCGGTGAA GGTCTCCTGCAAGGC CTCTGGAGGCTTGTT CAGCTCTTTTGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTCAGTATATGG GAGGGATCATCCCAA TGTTTGGGATACCAA ACTACGCACAGAAGT TCCAGGGCAGAGTCA CTATTACCGCGGACG AATCAACGAGCACAG CCTACATGGAGCTGA GCAGCCTCACATCTG AGGACACGGCCGTG TATTACTGTGCGAGA GCCCCAGTAGCTACT CGTCCGCCTGACTAT TGGGGCCAGGGAAC CCTGGTCATCGTCTC CTCAG	VK3-15	JK4	1132	GAAATAGTGATGA CGCAGTCTCCAGC CACCCTGTCTGTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTGTTAGC AACAACTTAGCCT GGTATCAGCAGAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTATGGTGCAT CCACCAGGGCCA CTGGTATCCCAGC CAGGTTCAGTGGC AGTGGGTCTGGG ACAGAGTTCACTC TCACCATCAGCAG CCTGCAGTCTGAA GATTTTGCAGTTT ATTTCTGTCAGCA GTATAATGACTGG CCTCCCCTCACTT TCGGCGGAGGGA CCAAGGTGGAGAT CAAAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
	B610	Delta BT	Singlet	VH3-53	JH6	1133	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCGG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGCTTCCCCATC AGTAGCAACTACATG AACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC AATTATTTATAGCGGT GGTACTACATACTAC GTAGACTCCGTGAAG GGCCGATTCACCATC TCCAGAGACGATTCC AAGAACACGCTGTAT CTTCAAATGAACAGC CTGAGAGCCGAAGAC ACGGCCGTGTATTAC TGTGCGCGAGACCTC CAGAACTACGGTATG GACGTCTGGGGCCA AGGGACCACGGTCA CCGTCTCCTCA	VK1-9	JK3	1134	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC AATTATTTAGTCTG GTATCAGCAAAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CACTTTGCAAAGT GGGGTCCCATCAA GGTTCAGCGGCA GTGGATCTGGGA CAGAATTCACTCT CACAATCAGCAGC CTGCAGCCTGAAG ATTTTGCAACTTAT TACTGTCAACAGG TTAATAGTTACCC TCTTTTCGGCCCT GGGACCAAAGTG GATATCA
	B612	Delta BT	Singlet	VH3-53	JH6	1135	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGGGTCATCGTC AGTAGCAACTACATG ACCTGGGTCCGCCA GGCTCCAGGGAAGG	VK1-9	JK2	1136	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC AGTTCTTTAGCCT GGTATCAGCAGAA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGCTGGAGTGGGTC TCAGTTATTTATAGCG GTGGCAGCACATACT ACGCAGACTCCGTGA AGGGCCGATTCACCA TCTCCAGAGACAATT CCAAGAATACGTTGT ATCTTCAAATGAACA GCCTGAGAGCCGAG GACACGGCCGTCTAT TACTGTGCGAGAGAT CTTAACTACTACGGT ATGGACGTCTGGGG CCAAGGGACCACGG TCACCGTCTCCTCA				ACCCGGGAAAGC CCCTAAGCTCCTG ATCTATGCTGCAT CCACTTTGCAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACAATCAGCAGC CTGCAGCCTGAAG ATTTTGCAACTTAT TACTGTCAACAGT TTAATAGTTACCC CCATTTTGGCCAG GGGACCAAGCTG GAGATCAAAC
	B614	Delta BT	Singlet	VH3-53	JH3	1137	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCG TCTGGGATCATCGTC AGTAGCAACTACATG AACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGCTTTC AGTTTTTTATCCCGGT GGTACCACACAGTAC GCAGACTCCGTGAAG GGCCGATTCACCATC TCCAGAGACAATTCC AAGAACACGCTGTAT CTTCAAATGAACAGC CTGAGAGCCGAGGA	VK1-9	JK4	1138	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC AATTATTTAGCCT GGTATCAGCAAAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATGCTGCAT CCACTTTGCAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGCATCTGGGA CAGAATTCACTCT CACAATCAGCAGC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CACGGCCGTCTATTACTGTGCGAGAGATCGCTGGGAGGGGGCTTTTGATATCTGGGGCCAAGGGACAATGGTCACCGTCTCTTCAG				CTGCAGCCTGAAGATTTTGCAACTTATTACTGTCAACAGCTTAATAGTTACCCTCGGCTCACTTTCGGCGGAGGGACCAAGGTGGAGATCAAAC
	B615	Delta BT	Singlet	VH3-53	JH3	1139	GAGGTGCAGCTGGTGGAGACTGGAGGAGGCTTGATGCAGCCTGGGGGGTCCCTGAGACTCTCCTGCGCAGCCTCTGGGTTAACCGTCAGTGCCAACTACATGAGCTGGGTCCGCCAGGGTCCAGGGAAGGGGCTGGAGTGGGTCTCAGTTATTTATCCCGGTGGTAGCGCATTCTACGCAGACTCCGTGAAGGGCCGATTCACCATCTCCAGAGACAATTCCAAGAACACGCTTTATCTTCAAATGAACAGCCTGAGAGTCGAGGACACGGCCGTGTATTACTGTGCGAGAGATGCCCGAGAGGGTGTTTTAGATGTCTGGGGCCAAGGGACAGTGGTCACCGTCTCTTCAG	VK1-39	JK1	1140	GACATCCAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTTGCCGGGCAAGTCAGAGCATTAGCAGCTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAAGCTCCTGATCTATGCTGCATCCAGTTTGCAAAGTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCTGGGACAGATTTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGAGTTACAGTACCCCTCGGACGTTCGGCCAAGGGACCAAGGTGGAAATCAAAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
	B618	Delta BT	Singlet	VH3-74	JH5	1141	GAGGTGCAGCTGGT GGAGTCCGGGGGAG GCTTAGTTCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTC AGTAGCTACTGGATG CACTGGGTCCGCCAA GCTCCAGGGAAGGG GCTGGTGTGGGTCTC ACGTGTTAATGGTGA TGGGAGTATCACAGC CTACGCGGACTCCGT GAAGGGCCGATTCAC CATCTCCAGAGACAA CGCCAAGAAGACGCT GTATCTGCAAATGAA CAGTCTGAGAGCCGA AGACACGGCTGTGTA TTACTGTGCAAGAGA GCTCTTCCGTACGGT CGACCCCTGGGGCC AGGGAACCCTGGTCA CCGTCTCCTCAG	VL6-57	JL2	1142	AATTTTATGCTGA CTCAGCCCCACTC TGTGTCGGAGTCT CCGGGGAAGACG GTAACCATCTCCT GCACCGGCAGCA GGGGCAGCATTG CCAGCAACTATGT GCAGTGGTACCA GCAGCGCCCGGG CAGTGCCCCCAC CACTGTGATCTAT GAGGATAACCAAA GACCCTCTGGGG TCCCTGATCGGTT CTCTGGCTCCATC GACAGCTCCTCCA ACTCTGCCTCCCT CACCATCTCTGGA CTGAAGACTGAGG ACGAGGCTGACTA CTACTGTCAGTCT TATGATAGCAGCA ATGGGGATGTGAT ATTCGGCGGAGN NACCAAGCTGACC
	B621	Delta BT	Singlet	VH4-38-2	JH5	1143	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGCGAGGCCTT CGGAGACCCTGTCCC TAACCTGCGGTGTCA CTGGTTATTCCATCA GCGTTGGTTACTATT GGGGCTGGTTCCGG	VK3-20	JK1	1144	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTA GCAGGACCTACTT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CAGCCCCCGGGGAA GGGGCTGGAGTGGG TTGGGAGTATGTATC ACAGTGGGCCCGCC TATTACAACTCGTCC CTCAAGAGTCGAGTC AGCATCTCAATACAG GCGTCGAAGAATCGT TTCTCCCTGAGTCTG AGTTCTGTGACCGCC GCAGACTCGGCCGT GTATTTCTGTGCGGC CTCCGGTGTCGGAAG AGCTGGCGCACTCTC CTATGACGCCTGGGG CCAGGGAACGCTGG TCCTCGTCTCCTCAG				AGCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGTTTCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TGTATTACTGTCA GCAGTATCGTACG TTCGGCCAAGGG ACCAAGGTGGAAA TCAAAC
	B623	Delta BT	Singlet	VH3-30-3	JH5	1145	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCACCTT CAGTAGCCATGCTAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGCAGTTATATTAGA TGATGGAAGCAATAA ATATTACGCAGACTC CGTGAAGGGCCGATT CACCATCTCCAGAGA CAATTCCAGGAACAC GCTGTATCTGCAAAT	VK1-39	JK1	1146	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCAACATCCA TTGCCGGGCAAGT CAGAGCATTGGCA CCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGTTGTATC CAATTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GAACAGCCTGAGAGT TGAGGACACGGCTGT GTATTACTGTGCGAG AGATTATCATGTGGA TAGAGTTATGGTTAC CTGGTTCGACCCCTG GGGCCAGGGAACCC TGGTCACCGTCTCCT CAG				CACCATCAGCAGT CTGCAACCCGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC CTCCGTGGACGTT CGGCCAAGGGAC CAAGGTGGAGATC AAAC
	B624	Delta BT	Singlet	VH1-46	JH4	1147	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCA TCTGGATACACCTTC ACCAGCTACTATATG CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAATAATCAACCCTA GTGGTGGTAGCACAA GCTACGCACAGAAGT TCCAGGGCAGAGTCA CCATGACCAGGGACA CGTCCACGAGCACAG TCTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGT TCCCCCCTTTTCAACT GGGGCCAACTGTACT ACTTTGACTACTGGG GCCAGGGAACCCTG	VL1-40	JL3	1148	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACATCG GGGCAGGTTATGA TGTACACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT GGTAACAGCAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGGCTCCA GGCTGAGGATGA GGCTGATTATTAC TGCCAGTCCTATG ACAGCAGCCTGA GTGATAATTGGGT GTTCGGCGGAGG

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							GTCACCGTCTCCTCAG				GACCAAGCTGACCGTCCTAG
	B625	Delta BT	Singlet	VH4-39	JH6	1149	CAGCTGCAGCTGCAGGAGTCGGGCCCAGGACTGGTGAAGCCTTCGGAGACCCTGTCCCTCACCTGCACTGTCTCTGGCGGCTCCATCAGCAGTAGTAGTTTCTACTGGGGCTGGATCCGCCAGCCCCCAGGAAAGGGGCTGGAGTGGATTGGGAGTATCTATTATAGTGGGAGCACCTACTACAACCCGTCCCTCAAGAGTCGAGTCACCATATCCGTAGACACGTCCAAGAACCAGTTCTCCCTGAGGCTGAGCTCTGTGTCCGCCGCAGACACGGCTGTATATTACTGTGCGAGACATGGCCCCCGCCCGCATTACGATTTTTTGACTGGTGATTCTGACTACTACTACTATGGTTTGGACGTCTGGGGCCAAGGGACCACGGTCACCGTCTCCTCA	VK1-39	JK1	1150	GACATCCAGATGACCCAGTCTCCATCCTCCCTGTCTGCGTCTGTTGGAGACAGAGTCACCATCACTTGCCGGGCAAGTCACAATATCAGAAGCTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAACCTCCTGATCTATGTTGCAACCAGTTTGCAAAGTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCTGGGACAGATTTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGAGTTTCACTACCCCCCGCACGTTCGGCCAAGGGACCAGGGTGGAAATCAAAC
	B626	Delta BT	Singlet	VH3-7	JH4	1151	GAGGTGCAGCTGGTGGAGTCTGGGGGGGGACTTGGTCCAGCCGGGGGGGTCCCTGAGACTCTCCTGTGCAGCC	VL6-57	JL1	1152	AATTTTATGCTGACTCAGCCCCACTCTGTGTCGGAGTCTCCGGGGAAGACGGTAACCATCTCCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCTGGATTCACCTTTA ATAAGTATTACATGAA CTGGGTCCGCCAGG CTCCAGGGAAGGGG CTGGAGTGGGTGGC CAACATAAAGCAAGA TGGAAGCGAGAAATA CTATGTGGGCTCTGT GAAGGGCCGATTCAC CATCTCCAGAGACAA CGCCAAGAACTCACT GTATCTGCAAATGAG CAGCCTGAGAGCCG AGGACACGGCTGTGT ATTACTGTGCGAGCG GTGAGTGGCTACGAG GCCCCTTTGACTACT GGGGCCAGGGAACC CTGGTCACCGTCTCT TCAG				GCACCGGCAGCA GTGGCAGCATTGC CAGCAACTATGTG CAGTGGTACCAGC AGCGCCCGGGCA GTGCCCCCACCA CTGTGATCTATGA GGATAACCAAAGA CCCTCTGGGGTC CCTGATCGGTTCT CTGGCTCCATCGA CAGCTCCTCCAAC TCTGCCTCCCTCA CCATCTCTGGACT GAAGACTGAGGA CGAGGCTGACTAC TACTGTCAGTCTT ATGATAGCACCAT CTTTTATGTCTTC GGAACTGGGACC AAGGTCACCGTCC TAG
	B628	Delta BT	Singlet	VH3-9	JH3	1153	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTACGCCATGCA CTGGGTCCGCCAATA TCCAGGGAAGGGCC TGGAGTGGGTCTCAG GTGCCAGTTGGAATA GTGGTACCATAGGCT	VL3-21	JL1	1154	TCCTATGTGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGGATTACC TGTGGGGGAAATA ACATTGGAAGTAA AAGTGTGCACTGG TACCAGCAGAAGC CAGGCCAGGCCC CTGTGCTGGTCGT CTATGATGATAGC

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							ATGGGGACTCTGTTA AGGGCCGATTCATCA TCTCCAGAGACAACG CCAAGAACTCCGTGT ATCTGCAAATGAACA GTCTGAGACCTGAGG ACACGGCCTTGTATT ACTGTGCAAAATCCC TCCGTAGAGATGCAT ACAATTACGATGATT GTGCTTTTGATATCT GGGGCCAAGGGACA ATGGTCACCGTCTCT TCAG				GACCGGCCCTCA GGGATCCCTGAG CGATTCTCTGGCT CCAACTCTGCGAA CACGGCCACCCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTACTGTCAG GTGTGGCATAGTA GTAGTGAGCATCA AGTCTTCGGAACT GGGACCAAGGTC ACCGTCCTAG
	B630	Delta BT	Singlet	VH3-13	JH6	1155	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTACAGCCTG GGGGGTCCCTGAGA CTCTCCTGTACAGCC TCTGGATTCACCTTC AGTAGGTACGACATG CACTGGGTCCGCCAA CCTACAGGAAAAGGT CTGGAGTGGGTCTCA GCTATAGGGACCTCT GGTGACAGATACTAT CCAGACTCCGTGAAG GGCCGATTCACCATC TCCAGAGAAGACGCC AAGAACTCCTTGTAT CTTCAAATGAACAAC CTGAGAGCCGGGGA CACGGCTGTGTATTA TTGTGCAAGAGGGGA	VL1-40	JL3	1156	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACATCG GGGCAGGTTATGA TGTACACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT GGTAACAGCAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGGCTCCA GGCTGAGGATGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TAGCACCACTTCTCT ACTAAGGCATTACTA CTACATGGACGTCTG GGGCAGAGGGACCA CGGTCACCGTCTCCT CA				GGCTGATTATTAC TGCCAGTCCTATG ACAGCAGCCTGA GTGATAATTGGGT GTTCGGCGGAGG GACCAAGCTGACC GTCCTAG
	B631	Delta BT	Singlet	VH3-9	JH3	1157	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTATTAGTTGGAAT AGTGGTAGAACAGCC TATGCGGACTCTGTG AAGGGCCGATTCACC ATCTCCAGAGACAAC GCCAAGAACTCCCTG TATCTGCAAATGAAC AGTCTGAGAGCTGAG GACACGGCCTTATAT TACTGTGCAAAAGCT TCTTGTGGTGGTGAT TGCTATTCGCTTCTTT TATCCCCCGATGGTT TTGATATCTGGGGCC AAGGGACAATGGTCA CCGTCTCTTCAG	VL1-40	JL2	1158	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACATCG GGGCAGGTTATGA TGTACACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT GATAACAACAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGGCTCCA GGCTGAGGATGA GGCTGATTATTAC TGCCAGTCCTATG ACAGCAGCCTGG GTGGTCTTGTGCT ATTCGGCGGAGG GACCAAGCTGACC GTC

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	B632	Delta BT	Singlet	VH1-3	JH4	1159	CAGGTCCAGCTTGTG CAGTCTGGGGCTGA GGTGAAGAAGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCT TCTGGATACACCTTC ACTAGATATGTTATG CATTGGGTGCGCCAG GCCCCCGGACAAAG GCTTGAGTGGATGGG ATGGATCAACGGTGG CAATGGTGACACAAA ATATTCACAGAAGTT CCAGGGCAGAGTCA CCATTACCAGGGACA CATCCGCGAGCACAG CCCACATGGAGCTGA GGAGCCTGAGATCTG AAGACACGGCTGTGT ATTACTGTGCGAGAG ATCTGTATTATTATAA TAGAAGTGGTCATTA CGACGTGGATTACAA CCTTGACTACTGGGG CCAGGGAACCCTGGT CACCGTCT	VL1-40	JL2	1160	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACACCG GGGCAGGTTATGA TGTACACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT GGTAATACCAATC GGCCCTCGGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGGCTCCA GGCTGAGGATGA GGCTGATTATTAC TGCCAGTCCTATG ACAGCAGCCTGA GTGGATATGTGAT TTTCGGCGGAGG GACCAAGCTGACC GTCCTA
	B633	Delta BT	Singlet	VH3-53	JH4	1161	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGGTTCATCGTC AGTAGTAATTACATG	VL1-40	JL1	1162	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACATCG

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							AGCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCAGTGATTTATAGC GGTGGTAGCACATTC TACGCAGACTCCGTG AAGGGCCGATTCACC ATCTCCAGAGACAAT TCCAAGAACACGCTG TATCTTCAAATGAACA GCCTGAGAGCCGAG GACACGGCCGTGTAT TACTGTGCGAGAACC CTGCCGGGAACTACC GACCTCTTTGACTAC TGGGGCCAGGGAAC CCTGGTCACCGTCTC CTCAG				GGGCAGGTTATGA TGTACACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT GGTGACAGCAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT TACTGGGCTCCAG GCTGAGGATGAG GCTGATTATTACT GCCAGTCCTTCGA CAGCAGCCTGAGT GGTCTAGGGGTCT TCGGAACTGGGA CCAAGGTCACCGT CCTA
	B634	Delta BT	Singlet	VH3-21	JH6	1163	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCCTGGTCAAGCCTG GGGGGTCCCTGAGA CTCTCCTGTTCAGCC TCTGGATTCATCTTTA CTAACTATAACATGC ACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC ATCCATTAGTAGTGG GAGTGATTACATATA CTACTCAGACTCACT GAAGGGCCGATTCAC	VK3-20	JK5	1164	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTTA GTAGCAGTTACTT AGCCTGGTACCAG CACAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGCATCCAGCAGG GCCCCTGGCATC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CATCTCCAGACACAA CGCCAAGAACTCACT CTATCTGCATATGAA CAGCCTGAGAGCCG AGGACACGGCTGTCT ATTACTGTGCGAGAG AGGGTTATCACTCCG GTCTGGACGTCTGGG GCCTAGGGACCACG GTCAGCGTCTCCTCA				CCAGACAGGTTCA GTGGCAGTGGGT CTGGGACAGACTT CACTCTCACCATC AGCAGACTGGAG CCTGAAGATTTTG CAGTGTATTACTG TCAGCAGTATGGT AATTCACCCCTGA TCACCTTCGGCCA AGGGACACGACT GGAGATTAAAC
	B635	Delta BT	Singlet	VH3-53	JH4	1165	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGGTTCATCGTC AGCAGTAATTACATG AGCTGGATCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC AATTCTTTATCCCGGT GGCAGCGCATTCTAC GCAGACTCCGTGAAG GGCCGATTCACCATC TCCAGAGACAATTCC AAGAGCACACTGTAT CTTCAAATGAACAGC CTGAGAGCCGAGGA CACGGCCGTATATTA CTGTGCGAGGTACG GGCTATGGTTGGACT GGGGCCAGGGAACC	VK3-11	JK1	1166	GAAATTGTGTTGA CACAGTCTCCAGC CACCCTGTCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TGAGAATATTGTC AGCTACTTAGCTT GGTACCAACAGAA GCCTGGCCAGGC TCCCAGGCTCCTC ATCTATGATGCGT CCAACAGGGCCA CTGCCATCCCAGC CAGGTTCAGTGGC AGTGGGTCTGGG ACAGACTTCACTC TCACCATCAGCAG CCTAGAGCCTGAA GATTTTGCGATTT ATTACTGTCAGCA GCGTAGCGACTG

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							CTGGTCACCGTCTCC TCAG				GCCCCCACTAACG TTCGGCCAAGGG ACCAAGGTGGAAA TCAAAC
B007	B1076	Delta BT	Clone	VH3-53	JH4	1167	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCGAGCCGG GGGGGTCCCTGAGA CTCTCCTGTACAGCC TCTGAGCTCATCGTC AGTCGCAACTACATG ACCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCAGTTATTTATGCC GGCGGTACCACATAC TACGCAGACTCCGTG AAGGGCCGATTCACC ATCTCCAGAGACAAT TCCAAGAACACACTG TATCTTCAAATGAACA GGCTGAGAGCCGAG GACACGGCCGTGTAT TACTGTGCGAGAGAT TTAGTTAATAGTGGC CTTGACTGCTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG	VK1-9	JK2	1168	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC AGTTATTTAGCCT GGTATCAGCAAAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATGCTGCAT CCACTTTGCAGAC TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACAATCAGCAGC CTGCAGCCTGAAG ATTTTGCAACTTAT TACTGTCAACAAC TTGATAGTTACCC TCCGTACACTTTT GGCCAGGGGACC AAGCTGGAGATCA AA
	B1077	Delta BT	Singlet	VH4-59	JH4	1169	CAGGTGCAGCTGCA GGAGTCGGGCCCAA AACTGGTGAAGCCTT CGGAGACCCTGTCCC	VK1-9	JK5	1170	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCA TCTGTAGGAGATA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TCACCTGCACTGTCT CTGGTGCCTCCATCA GTAGTTACTACTGGA GTTGGATCCGGCAGC CCCCAGGGAAGGGA CTGGAGTGGATTGGG TATATCTTTTACAATG GGAGAACCAGCTACA ACCCCTCCCTCAAGA GTCGAGTCACCTTAT CAGTAGACACATCCA AGGACCAGTTCTCCC TGAAACTGAACTCTG TGACTGCTGCGGACA CGGCCGTGTATTTCT GTGCGACGGATTATT ATGATACTAGTGGCT GGCACTACGGTCTGG ACTACTGGGGCCAG GGAGCCCTGGTCAC CGTCTCCTCAG				GAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC AGTCATTTAGGCT GGTATCAGCAAAA ACCAGGGAAAGC CCCCAAGCTCCTG ATCTATGGTGCAT CCACTTTGCAAAG TGGCGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACAATCAGCAGT CTGCAGCCTGAAG ATTTTGCAACTTAT TACTGTCAACAGC TTAATAGTTACCG CCTCTTCGGCCAA GGGACACGACTG GACATTAAAC
	B1078	Delta BT	Singlet	VH1-8	JH4	1171	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGGCT TCTGGATACACCTTC ACCAGTTATGATATC AACTGGGTGCGACAG GCCACTGGACAAGG GCTTGAGTGGATGGG ATGGATGAACCCTCA CAGTGGTAACACAGG CTATGCACGGACGTT	VL3-21	JL1	1172	TCCTATGTGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGGATAAC CTGTGGGGGAGA CTACATTGGAAGT AAAAATGTGCACT GGTACCAGCTGA GGCCAGGCCAGG CCCCTGTGCTGGT CGTCTATGATGAT AGCGACCGGCCC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CCAGGGCAGGGTCA CCGTGACCAGGAACA CCTCCATAAGCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGATA ACTTATGAGGCCCAC GATATTTTGACCGGT TGTCTTGACTCCTGG GGCCAGGGAACCCT GGTCACCGTCTCCTC AG				TCAGGGATCCCTG AGCGATTCTCTGG CTCCAACTCTGGG AACACGGCCACC CTGACCATCAGCA GGGTCGAAGCCG GGGATGAGGCCG ACTATTACTGTCA GGTGTGGGATAGT AGTAGTGATCAAC TTTATGTCTTCGG AGCTGGGACCAA GGTCACCGTCCTA G
	B1079	Delta BT	Singlet	VH3-9	JH4	1173	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTATTAGTTGGAAT AGTGGTAGCACAGGC TATGCGGACTCTGTG AAGGGCCGATTCACC ATCTCCAGAGACAAC GCCAAGAACTCCCTA TATCTGCAAATGAGC AGTCTGAGAGCTGAG GACACGGCCTTCTAT TACTGTGCAAAAGGG	VL2-11	JL3	1174	CAGTCTGTGCTGA CTCAGCCTCGCTC AGTGTCCGGGTCT CCTGGACAGTCAG TCACCATCTCCTG CACTGGAACCAGC AGTGATGTTGGTG GTTATGACTATGT CTCCTGGTACCAA CAGCACCCAGGC AAAGCCCCCAAAC TCATGATTTATGAT GTCAGTGAGCGG CCCTCAGGGGTC CCTGATCGCTTCT CTGGCTCCAAGTC TGGCAACGCGGC CTCCCTGACCATC TCTGGGCTCCAG GCTGAGGATGAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ACCATAGGAGTGCCC CTACGGGAGTGTTAC TTTGATTATTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG				GCTGATTATTACT GCTGCTCATATGC AGGCAGCTACCTT TTGGTGTTCGGCG GAGGGACCAAGC TGACCGTCCTAG
	B1080	Delta BT	Singlet	VH3-9	JH4	1175	GAAGTGCAGCTGGTG GAGTCTGGGAGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTATGCCATGCA CTGGGTCCGACAAGC TCCAGGAAAGGGCCT GGAGTGGGTCTCAG GTATTAGTTGGAATA GTGGTAGCATAGGCT ATGTGGACTCTGTGA AGGGCCGATTCACCA TCTCCAGAGACAACG CCAAGAACACCCTCT ATCTGCAAATGAACA GTCTGAGAGCTGAGG ACACGGCCTTATATT ACTGTGCAAAAGGGA CCATAGCAGTGCCCC TACGGGAGTGTTCCC TTGACTACTGGGGCC AGGGAACCCTAGTCA CCGTCTCCTCAG	VK1-39	JK2	1176	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTACA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTTACG GCTTTTTAAATTG GTATCAGCAGAGA CCAGGGAAAGCC CCTAAGCTCCTGA TTTATGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGC CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACATTACCC CGTACACTTTTGG CCAGGGGACCAA GCTGGAGATCAAA C
	B1081	Delta BT	Singlet	VH3-9	JH4	1177	GAAGTGCAGCTGGTG GAGTCTGGGAGAGG	VL2-14	JL1	1178	CAGTCTGTGCTGA CTCAGCCTGCCTC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTATGCCATGCA CTGGGTCCGACAAGC TCCAGGAAAGGGCCT GGAGTGGGTCTCAG GTATTAGTTGGAATA GTGGTAGCATAGGCT ATGTGGACTCTGTGA AGGGCCGATTCACCA TCTCCAGAGACAACG CCAAGAACACCCTCT ATCTGCAAATGAACA GTCTGAGAGCTGAGG ACACGGCCTTATATT ACTGTGCAAAAGGGA CCATAGCAGTGCCCC TACGGGAGTGTTCCC TTGACTACTGGGGCC AGGGAACCCTAGTCA CCGTCTCCTCAG				CGTGTCTGGGTCT CCTGGACAGTCGA TCACCATCTCCTG CACTGGAACCAGC AGTGACGTTGGTG GCTATGACTATGT CTCCTGGTACCAA CAGCACCCAGGC AAAGCCCCCAAAC TCATGATTTATGA GGTCAGTAATCGG CCCTCAGGGGTTT CTAATCGCTTCTC TGGCTCCAAGTCT GGCAACACGGCC TCCCTGACCATCT CTGGGCTCCAGG CTGAGGACGACG CTGATTATTACTG CAGCTCATATACA AGCAGCATCACTC GCTATGTCTTCGG AACTGGGACCAAG GTCACCGTCCTAG
	B1082	Delta BT	Singlet	VH3-30	JH4	1179	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGT CTCTGGATTCACCTT CAGTAGATATGGCAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT	VK1-5	JK2	1180	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATAAGT AGGTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC

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							GGGAGTTATACTATA TGATGGAAGTAATGA ATACTATGCAGACTC CGTGAAGGGCCGATT CACCATCTCCAGAGA CAATTCCAAGAACAC GCTGTATCTGCAAAT AAACAGCCTGAGAGT TGAGGACACGGCTGT CTATTACTGTGCGAA AGCGTCGGGGCCCT ATTGTGGTGGTGGTG ACTGCTATAGCGCCT TCTTTGACTACTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				CCCTAAGGTTCTC ATCTATGAGGCGT CTAGTTTAGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAGT ATAATAGTTATTCC AGTTTTGGCCAGG GGACCAAGCTGG AGATCAAAC
	B1083	Delta BT	Singlet	VH3-30	JH4	1181	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGT CTCTGGATTCACCTT CAGTAGATATGGCAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGGAGTTATACTATA TGATGGAAGTAATGA ATACTATGCAGACTC CGTGAAGGGCCGATT CACCATCTCCAGAGA CAATTCCAAGAACAC GCTGTATCTGCAAAT	VK1-33	JK4	1182	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TATGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT CAGGACATTAGCA ACTATTTACATTG GTATCAGCAGAAA TCGGGGAAAGCC CCTACGCTCCTGA TCTACGATGCATC CAATTTGCAAACA GGGGTCCCATCAA GGTTCCGTGGAA GTGGATCTGGGA CAGATTTTACTCT

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							AAACAGCCTGAGAGT TGAGGACACGGCTGT CTATTACTGTGCGAA AGCGTCGGGGCCCT ATTGTGGTGGTGGTG ACTGCTATAGCGCCT TCTTTGACTACTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				CACCATCAGCAGC CTGCAGCCTGAAG ATTTTGCAACATAT TACTGTCAACAGT ATGATAATCTCCC CCCCACTTTCGGC GGAGGGACCAAG GTGGAGATCAAAC
	B1084	Delta BT	Singlet	VH3-30	JH4	1183	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCACCTT CAGTAGTTATGGCAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGCAGTTATATCATA TGATGGAAGTAATAA ATACTATGCAGACTC CGTGAAGGGCCGATT CACCATCTCCAGAGA CAATTCCAAGAACAC GCTGTATCTGCAAAT GAACAGCCTGAGAAC TGAGGACACGGCTGT GTATTACTGTGCGAA ACAGGCTGGCTTATA TTGTAGTGGTGGTAA CTGCTACTCCGGATA CTTTGACTACTGGGG	VK1-13	JK4	1184	GCCATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGGGCATTAGCA GTGCTTTAGCCTG GTATCAGCAGAAA CCAGGAAAAGCC CCTAAGTTCCTGA TCTCTGATGCCTC CAGTTTGGGAAGT GGGGTCCCATCAA GGTTCAGCGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGC CTGCAGCCCGAA GATTTTGCAACTT ATTACTGTCAACA GTTTAACAGTCAT ACACCGCTCACTT TCGGCGGAGGGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CCAGGGAACCCTGGT CATCNTCTCCTCAG				CCAAGGTGGAGAT CAAAC
	B1085	Delta BT	Singlet	VH3-13	JH3	1185	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTACAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGGAGCC TCTGGATTCACCTTC AGTACCTACGACATG CACTGGGTCCGCCAA ACTACAGAAACAGGT CTGGAGTGGGTCTCA GCTATTGGTACTGCC GGTGACACATACTAT CGAGACTCCGTGAAG GGCCGATTCACCATC TCCAGAGAAAATGCC AAGAACTCCTTGTAT CTTCAAATGAACAGC CTGAGAGCCGGGGA CACGGCTGTGTATTA CTGTGCAAGAGGACT TAATAGTGACAACTA CGCGGTCTGGGCTTT TGATATCTGGGGCCA AGGGACAATGGTCAC CGTCTCTTCAG	VK1-39	JK3	1186	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCACG TCAGAGCATAGGC ACCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCCATGCTGCATC CAATTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTCGCAACTTA TTACTGTCAACAG AGTTACAGTAACC CTCCAACCACTTT CGGCCCTGGGAC CAAAGTGGATATC AAAC
	B1086	Delta BT	Singlet	VH1-18	JH3	1187	CAGGTTCAGCTGGTG CAGTCTGGAGCTGAG GTGAAGAAGCCTGG GGCCTCAGTGAAGGT CTCCTGCAAGGCCTC TGGTTACACCTTTAC	VK1-33	JK4	1188	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT

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							CAGTAATGGTATCAG CTGGGTGCGACAGG CCCCTGGACAAGGG CTTGAGTGGATGGGA TGGATCAGCGTTTAC AATGGTAACACAAAC TATGCACAGAAGCTC CAGGGCAGACTCACC ATGACCACAGACACA TCCACGAGCACAGCC TACATGGAGCTGAGG AGCCTGAGATCTGAC GACACGGCCGTGTAT TACTGTGCGAGAGCG GTTTGGAGCAGTGGC GACTACGGGGGGGA TCTTTTTTGACATCTGG GGCCAAGGGACAAT GATCACCGTCTCTTC AG				CAGGACATTAGTA ACTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTACGATGCATC CAATTTGGAATCA GGGGTCTCATCAA GGTTCAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGATA TTGCAACATATTA CTGTCAACAGTAT CAGAATCTCCCTC TCACTTTCGGCGG AGGGACCAAGGT GGAGATCAAAC
	B1087	Delta BT	Singlet	VH30-3	JH6	1189	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTTGTCCAGCCTG GGAGGTCCCTGAGA CTGTCCTGTGCAGCC TCTGGATTCACCTTC AGTAATCATGCTATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGGTG GCAAGTATAACATAT GATGGAAGCAATAAA TACTACGCAGGTTCC GTGAAGGGCCGATTC	VK2-24	JK5	1190	GATATTGTGATGA CCCAGACTCCACT CTCCTCACCTGTC ACCCTTGGACAGC CGGCCTCCATCTC CTGCAGGTCTAGT CAAAGCCTCGTAC ACCGTGATGGAAA CACCTACTTGAGT TGGCTTCAGCAGA GGCCAGGCCAGC CTCCAAGACTCCT AATTTATAAGATTT CTAACCGATTCTC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ACCATCGCCAGAGAC AATTCCAAGAATACG TTGCATCTGCAAATG AACAGCCTGAGAGCT GAGGACACGGCTGT GTATTACTGTGCGAG AGATGGCGGCAGTG GCTATGACTACTCTTT CGACGGTTTGGACGT CTGGGGCCAAGGGA CCACGGTCACCGTCT CCTCA				TGGGGTCCCAGA CAGATTCAGTGGC AGTGGGACAGCG ACAGATTTCACAT TGAAAATCAGCAG GGTGCAAGCTGA GGATGTCGGGGT TTATTTCTGCATG CAAGCTACACACC CAGGGATCACCTT CGGCCAAGGGAC ACGACTGGAGATT AAAC
	B1088	Delta BT	Singlet	VH5-51	JH4	1191	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTAAGGGTT CTGGATACAGCTTTA CCAACTACTGGATCG CCTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG GGATCATCTATCCTG GTGACTCTGATACCA GATACAGCCCGTCCT TCCAAGGCCAGATCA CCTTCTCAGCCGACA AGTCCATCAGCACCG CCTACCTGCAGTGGA GCAGCCTGAAGGCCT CGGACACCGCCATGT ATTACTGTGCGCGAC TATATCCCCAATCGT	VL3-25	JL3	1192	TCCTATGTGCTGA CTCAGCCACCCTC GGTGTCAGTGTCC CCAGGACAGACG GCCAGGATCACCT GCTCTGGAGATGC ATTGCCAAAGCCA TATGCTTATTGGT ACCAGCAGAAGC CAGGCCAGGCCC CTGTGTTGGTGAT ATATAAAGACAGT GAGAGGCCCTCA GGGATCCCTGAG CGATTCTCTGGCT CCAGCTCAGGGA CAACAGTCACGTT GACCATCAGTGGC GTCCAGGCAGAA GACGAGGCTGAC TATTACTGTCAAT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATTACTATGATAGTAG TGGTTATTACTATTTT GACTACTGGGGCCA GGGAACCCTGGTCAC CGTCTCCTCAG				CAGCAGACATCAC TGGTACTTATGTG GTGTTCGGCGGA GGGACCAAGCTG ACCGTCCTAG
	B1089	Delta BT	Singlet	VH3-9	JH1	1193	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTATGCCATGCA CTGGGTCCGACAAGC TCCAGGGAAGGGCC TGGAGTGGGTCTCAG GTATTAGTTGGAATA GTGGGACCGTAGACT ATGCGGACTCTGTGA AGGGCCGATTCACCA TCTCCAGAGACAACG CCAAGAACTCCCTGT ATCTGCAAATGAACA GTCTGAGAGCAGAG GACACGGCCTTGTAT TACTGTACAAAAGATT CACGAGCCCATTACG ATATTTTGACTGGTTA TTATTCTCCCTACACT TACTGGGGCCAGGG CACCCTGGTCACCGT CTCCTCAG	VK2-28	JK2	1194	GATATTGTGATGA CTCAGTCTCCANT CTCCCTGCCCGTC ACCCCTGGAGAG CCGGCCTCCATCT CCTGCAGGTCTAG TCAGAGCCTCCTG CATAGTAATGGAT ACAACTATTTGGA TTGGTACCTGCAG AAGCCAGGGCAG TCTCCACAGCTCC TGATCTATATGGG TTCTAATCGGGCC TCCGGGGTCCCT GACAGGTTCAGTG GCAGTGGATCGG GCACAGATTTTAC ACTGAAAATCAGC AGAGTGGAGGCT GAGGATGTTGGG GTTTATTACTGCA TGCAAGCTCTACA AACTCCTCCGTAC ACTTTTGGCCAGG GGACCAAGCTGG AGATCAAAC
	B1090	Delta BT	Singlet	VH3-48	JH6	1195	GAGGTGCAGCTGGT GGAGTCTGGGGGAG	VL2-11	JL2	1196	CAGTCTGTGCTGA CTCAGCCTCGCTC

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							GCTTGGTACAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTC AGTACCTATAGCATG AACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGCTTTC ATACATTAGTAGTGG TAGTAGCACCATAAA ATACGCAGACTCTGT GAAGGGCCGACTCA CCATCTCCAGAGACA ATGCCAAGAACTCAC TGTTTCTGCAAATGA ACAGCCTGAGAGACG AGGACACGGCTGTGT ATTACTGTGCGAGAG TTCAGATTAGGAGTG GTTATTACTACTACTA CGGTATGGACGTCTG GGGCCAAGGGACCA CGGTCACCGTCTCCT CA				AGTGTCCGGGTCT CCTGGACAGTCAG TCACCATCTCCTG CACTGGAACCAGC AGTGATATTGGTA GTTATGACTATGT CTCCTGGTACCAA CAGCACCCAGGC ACAGCCCCCAAAC TCATGATTTATGAT GTCAGTAAGCGG CCCTCAGGGGTC CCTGATCGCTTCT CTGGCTCCAAGTC TGGCAACACGGC CTCCCTGACCATC TCTGGGCTCCAGA CTGAGGATGAGTC TGATTATTATTGCT GCTCATATGCAGG CATCTGGCTATTC GGCGGAGGGACC AAACTGACCGTCC TAG
	B1091	Delta BT	Singlet	VH1-69	JH4	1197	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AAGTGAAAAAGCCTG GGTCCTCGCTGAAGG TCTCCTGCAAGGCTT CTGGAGGCAGCTTCA GGAACTTTGGTATCA CCTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG	VL1-40	JL1	1198	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAACA GCTCCAACATCGG GGCAGGTTATGAT GTACACTGGTACC AGCAGCTTCCACG

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							AGTGATCAGCCCTTT CTATGGAACAGCAGA CTACGCACAGAAGTT CCAGGACAGAGTCAC GATTACCGCGGACAA ATCCACGAGCACAGC CTACTTGGAGCTGAG CAGCCTGAGATCTGA GGACACGGCCGTGT ATTTCTGTGCGAGGG CCCGGTATTACTATG ATAGAAGTGGTTCTT TGAAGGCCGACTACG ACTTTGACTACTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				AACAGCCCCCAAA CTCCTCATCTATG GTAACACCAACCG GCCCTCAGGGGT CCCTGACCGATTC TCTGCTTCCAAGT CTGGCACCTCAGC CTCCCTGGCCATC ACTGGACTCCTGG CTGACGATGAGG CTGATTATTACTG CCAGTCCTTTGAC AGCGGCCTGAGT GGTTCCGTCTTCG GAACTGGGACCAA GNTCACCGTCCTA G
	B1092	Delta BT	Singlet	VH3-9	JH5	1199	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTCAT GATTATGCCATACAC TGGGTCCGGCAAGTT CCAGGGAAGGGCCT GGAGTGGGTCTCAG GTATTAGTTGGAATA GTGATGACCTAGGCT ATGCGGACTCTGTGA GGGGCCGATTCACCA TCTCCAGAGACAACG CCAAGAACTCCGTGT ATTTGCAAATGAACA	VK1-39	JK1	1200	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACC GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTCGCA ATTATTTAAATTGG TATCAGCAGAAAC CAGGGAAAGCCC CTAAGCTCCTGAT CTATGGTGCATCC ACTTTGCAAAGTG GGGTCCCAGCTA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTCTGAGAGCTGAGG ACACGGCCATTTATT ACTGTGCAAAAGATC ATATACTAGGAGCTG GTACGGGTTGGGAAA AACGGGAGAACAACT TCGACCCCTGGGGC CAGGGAACCCTGGTC ATCGTCTCCTCAG				CACCATCAGCAGT CTGCAGCCTGAAG ATCTTGCAACGTA TTACTGTCAACAG ACTTACGAAATTC CTCCGTGGACGTT CGGCCAAGGGAC CAAGGTGGAAATC AAAC
	B1093	Delta BT	Singlet	VH3-9	JH5	1201	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTCAT GATTATGCCATACAC TGGGTCCGGCAAGTT CCAGGGAAGGGCCT GGAGTGGGTCTCAG GTATTAGTTGGAATA GTGATGACCTAGGCT ATGCGGACTCTGTGA GGGGCCGATTCACCA TCTCCAGAGACAACG CCAAGAACTCCGTGT ATTTGCAAATGAACA GTCTGAGAGCTGAGG ACACGGCCATTTATT ACTGTGCAAAAGATC ATATACTAGGAGCTG GTACGGGTTGGGAAA AACGGGAGAACAACT TCGACCCCTGGGGC	VK1-5	JK1	1202	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTGTTAGT AGCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATAAGGCGT CTAATTTACAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAGT ATAATACTTATCC CTGGATGTTCGGC CAAGGGACCAAG GTGGAAATCAAAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CAGGGAACCCTGGTC ATCGTCTCCTCAG				
	B1094	Delta BT	Singlet	VH3-53	JH6	1203	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTAAGA CTCTCCTGTACACCC TCTGGATTCACCGTC AGTGGCATCTACTGG GGCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCAGTTCTTTATGAC GGTGGTGCGATATAC TACGCAGACGCCGTG AAGGGCCGTTTCACC ATCTCCAGAGACAAT TCCAAGAACACGGTG CATCTTCAAATGAAC AGCCTGAGAGTCGAG GACACGGCCGTGTAT TACTGTGCGAGGAGG TCCCTGTATGTCGGG GATTTCGGAGACTTA TTATATCCTATTATCT GGGGCCAAGGGACC ACGGTCACCGTCTCC TCA	VK2-28	JK3	1204	GATATTGTGATGA CTCAGTCTCCACT CTCCCTGCCCGTC ACCCCTGGAGAG CCGGCCTCCATGT CCTGCAGGTCTAG TCAGAGCCTCCTG CATGGTAATGGAT ACAACTACTTGGA TTGGTACCTGCAG AAGCCAGGGCAG TCTCCACAGCTCC TGATCTATTTCGG TTCTTATCGGGCC TCCGGGGTCCCT GACAGGTTCAGTG GCAGTGGATCAG GCACAGATTTTAC ACTGAAAATCAGC AGAGTGGAGGCT GAGGATGTTGGG GTTTATTTCTGCAT GCAAGCTCTACGA ACCCCATTCACTT TCGGCCCTGGGA CCGAAGTGGATAT CAAAC
	B1095	Delta BT	Singlet	VH1-69	JH4	1205	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAGGAAGCCT GGGTCCTCGGTGAA GGTCGCCTGCAAGG	VK4-1	JK2	1206	GACATCGTGATGA CCCAGTCTCCAGA CTCCCTGGCTGTG TCTCTGGGCGAGA GGGCCACCATCAA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CGTCTGGAGGCAATT TCAACAACTCTGGTA TCAGCTGGGTGCGAC AGGCCCCTGGACAA GGGCTTGAGTGGATG GGCGGGATCATCCCT CTCTTTGAGAGTGAA AAATACGCACAGAAG TTCCAGGGCAGAGTC ACGATTACCGCGGAC GAATCCACGAGCACA GCCTACATGGAGCTG AGCAGCCTGAGATCT GAGGACACGGCCGT GTATTACTGTGCGAG AGGGCGGGTGGCTA CGAGGAGAACTACG GTGACTACCCTCTTT GACGACTGGGGCCA GGGAACCCTGGTCAC CGTCTCCTCAG				CTGCAAGTCCAGC CAGAGTGTTTTAT ACAGCTCCAACAA TAAGAACTACTTA GCTTGGTACCAGC AGAAACCAGGACA GCCTCCTAAACTG CTCTTTTACTGGG CATCTACCCGGGA ATCCGGGGTCCCT GACCGATTCAGTG GCAGCGGGTCTG GGGCAGATTTCAC TCTCACCATCAGC AGCCTGCAGGCT GAAGATGTGGCA GTTTATTACTGTCT TCAATATTATAGTT CTCCGTACACTTT TGGCCAGGGGAC CAAGCTGGAGATC AAAC
	B1096	Delta BT	Singlet	VH3-13	JH4	1207	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTACAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTCT ATACCTACGACATGC ACTGGGTCCGCCAAA CTCCAGGAAAAGGTC TGGAGTGGGTCTCAG GCATTGGTACTGCTG GTGACACATATTATTC	VL1-51	JL2	1208	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGCGGC CCCAGGACAGAA GGTCACCATCTCC TGCTCTGGAAGCA GCTCCAACATTGG GAATAATTATGTAT CCTGGTTCCAGCA GCTCCCAGGAACA GCCCCCAAACTCC TCATTTATGACAAT

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							AGGCTCCGTGAAGG GCCGATTCACCGTCT CCAGAGTTGATGCCA AGAACTCCTTGTATC TTCAAATGGACAGCC TGAGAGCCGGGGAC ACGGCTGTGTACTAC TGTGCAAGAGGACTG TGCGATTTTTGGAGT GATTATGTTTCTTGTT ACTTTGACTACTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				AATAAGCGACCCT CAGGGATTCCTGA CCGATTCTCTGGC TCCAAGTCTGGCA CGTCAGCCACCCT GGGCATCACCGG ACTCCAGACTGGG GACGAGGCCGAT TATTACTGCGGAA CATGGGATAGCAG TGTGAATGCTGGC GTGGTATTCGGCG GAGGGACCAAGC TGACCGTCCTAG
	B1097	Delta BT	Singlet	VH4-39	JH3	1209	CAGCTGCAGCTGCAG GAGTCGGGCCCAGG ACTGGTGAAGCCTTC GGAGACCCTGTCCCT CTCCTGCACTGTCTC TGGTGTCTCCATCAG TAGTAGAAATTTCTAC TGGGGCTGGATCCG CCAGCCCCCAGGGA AGGGGCTGGAGTGG ATTGGGAGCATCTAT TATAGTGGGAGCACC TTCTCAAACCCGTCC CTCAAGACTCGAGTC ACCATATCCGTAGAC ACGTCTAAGAAGCAG TTCTCTCTGAAGCTG AGCTCTGTGACCGCC GCAGACACGGCTGT GTATTACTGTGCGAG	VK3-11	JK4	1210	GAAATTGTGTTGA CACAGTCTCCAGC CACCCTGTCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTGTTGGC AACTACTTAGCCT GGTACCAACAGAA ACCTGGCCAGACT CCCAGGCTCCTCA TCTCTGATGCATC CGACAGGGCCAC TGGCATCCCAGCC AGGTTCAGTGGCA GTGGGTCTGGGA CAGACTTCACTCT CACCATCAGCAGC CTAGAGCCTGAAG ATTTTGCAGTTTAT

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							AGCATTACGACATTTT GACTGGTCAAGGCCA AATGACTATCATGAT GCTTTTGACATCTGG GGCCAAGGGACAAT GGTCACCGTCTCTTC AG				TACTGTCAGCAGT GTAGCAACTGGCC GCTCACTTTCGGC GGAGGGACCAAG GTGGAGATCAAAC
	B1098	Delta BT	Singlet	VH4-39	JH3	1211	CAGCTGCAGCTGCAG GAGTCGGGCCCAGG ACTGGTGAAGCCTTC GGAGACCCTGTCCCT CTCCTGCACTGTCTC TGGTGTCTCCATCAG TAGTAGAAATTTCTAC TGGGGCTGGATCCG CCAGCCCCCAGGGA AGGGGCTGGAGTGG ATTGGGAGCATCTAT TATAGTGGGAGCACC TTCTCAAACCCGTCC CTCAAGACTCGAGTC ACCATATCCGTAGAC ACGTCTAAGAAGCAG TTCTCTCTGAAGCTG AGCTCTGTGACCGCC GCAGACACGGCTGT GTATTACTGTGCGAG AGCATTACGACATTTT GACTGGTCAAGGCCA AATGACTATCATGAT GCTTTTGACATCTGG GGCCAAGGGACAAT GGTCACCGTCTCTTC AG	VL1-40	JL6	1212	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACATCG GGGCAAATTATGA TGTACACTGGTAC CAGCACCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT GGTAACAACAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG CCTCCCTGGCCAT CACTGGGCTCCG GGCTGAGGATGA GGCTGATTATTAC TGCCAGTCCTATG ACAGCAGCCTGA GTGGTATTGTGTT CGGCAGTGGCAC CAAGGTGACCGTC CTCG

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	B1099	Delta BT	Singlet	VH3-9	JH1	1213	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CGGGTCCCTGAGACT CTCCTGTACAGCCTC TGGATTCACCTTTGA TGATTATGCCCTGCA GTGGGTCCGGCAGG CTCCAGGGAAGGGC CTGGAGTGGATCTCA GGTATTAATTGGAAC AGTGGTAGCAGAGG CTATGCGAACTCTGT GAAGGGCCGATTCAC CATCTCCAGAGACAA CGCCAAGAACTCCCT GTATCTGCAAATGAA CAGTCTGAGAGCCGA TGACACGGCCTTCTA TTACTGTGCAAAAGA CCGAAATCGCCGTGG CTTGACCCACGATTT TGAATACTTCCAACA CTGGGGCCAGGGCG CCCTGGTCACCGTCT CCTCAG	VK3-15	JK1	1214	GAAATAGTGATGA CGCAGTCTCCAGC CACCCTGTCTGTG TCTCCAGGGGAG CGAGCCACCCTCT CCTGCAGGGCCA GTCAGACTGTTAG CAGCAACTTAGCC TGGTACCAGCAGA AACCTGGCCAGG GTCCCAGGCTCCT CATCCATGGTGCA ACCACCAGGGCC ACTGGTATCCCAG CCAGGTTCAGTGG CAGTGGGTCTGG GACAGAGTTCACT CTCACCATCAGCA GCCTGCAGTCTGA AGATTTTGCAATTT ATTACTGTCAACA GTATAAAGCCTGG CCTCGAACGTTCG GCCAAGGGACCA AGGTGGAAATCAA AC
	B1100	Delta BT	Singlet	VH3-9	JH6	1215	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA TGATTATGCCATGCA CTGGGTCCGGCAAG	VL3-21	JL6	1216	TCCTATGTGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGGATGAC CTGTGGGGGAAA CAACATTGGAAGT AAAAGTGTGCACT

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							CTCCAGGGAAGGCC CTGGAGTGGGTCTCA GGTATTACTTGGAAT AGCGGAACCATAGGC TATGCGGACTCTGTG AAGGGCCGATTCACC ATCTCCAGAGACAAC GCCAAGAACTCCCTG TATCTGCAAATGATC CGTCTGAGACCTGAG GACACGGCCTTGTAT TACTGTGCAAAAGAT ATAACTTACGGTGAC AAACACCCCGAGAAC TACGGTATGGACGTC TGGGGCCAAGGGAC CACGGTCACCGTCTC CTCA				GGTACCAACAGAA GCCAGGCCAGGC CCCTGTGTTGGTC GTCTATGATGATA GCGACCGGCCCT CAGGGATCCCTGA GCGATTCTCTGGC TCCAACTCTGGGA ACACGGCCACCCT GACCATCAGTAGG GTCGAAGCCGGG GATGAGGCCGAC TATTACTGTCAGG TGTGGGATAGTAG TAGTGATCTTAAT GTATTCGGCAGTG GCACCAAGGTGA CCGTCCTCG
	B1101	Delta BT	Singlet	VH1-69	JH2	1217	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGATGAAGAAGCCTG GGTCGTCGGTGAAG GTCTCCTGCAAGGCC TCTGGAGGCACCTTC AGCAGCTACTCTATC AGTTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG AGAAATCATGCCTAT CTTAGGTATTCCAAA CTACGCACAGAAGTT CCAGGGCCGAGTCA CGCTTACCGCGGACC AATCCACGAGCACAG	VL1-40	JL2	1218	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AACTCCAACATCG GGGCAGCTTATGA TGTACACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATGTAT GGTAACAACAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG

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							CCTACATGGACCTGA CTAGCCTGAGATCTG AGGACACGGCCGTCT ATTACTGTGCGAGAG TCAGGGGGTACAGCT CCTCCTCCTCGAGCT GGTACTTCGATCTCT GGGGCCGTGGCACC CTGGTCTCTGTCTCC GCAG				TCTGACACTTCAG CCTCCCTGGCCAT CACTGGGCTCCA GGCTGAGGATGA GGCTGATTATTAC TGCCAGTCCTATG ACAGCAGCCTGA GTGGTTCTGTATT CGGCGGAGGGAC CAAGCTGACCGTC CTAG
	B1102	Delta BT	Singlet	VH1-69	JH5	1219	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAAG TCTCCTGCAAGGCTT CTGGAGGCGCCTTCA GCATCTATGCTATCA CCTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG AGGGATCATCCCTAT CTCTGGTACAGCAAA CTACGCACAGAAGTT CCAGGGCAGAGTCA CGATAACCGCGGAC GAATCCACGAGCACA GCCTACATGGAGCTG AGCAGCCTGAGATCC GAGGACACGGCCGT GTATTATTGTGCGAC AGACTTCCGATATTG TAATAATACCAGCTG TTTATACTGGTTCGA	VK1-39	JK1	1220	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA GCTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC CTCGAACGTTCGG

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							CCCCTGGGGCCAGG GAACCCTGGTCACCG TCTCCTCAG				CCAAGGGACCAA GGTGGAAATCAAA C
	B1103	Delta BT	Singlet	VH1-46	JH3	1221	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCA TCTGGATACACTTTC ATCAGCCACTATATG CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAATAATCAACCCTG ATGGTGGTAGCACAA CCTACGCACAGAAGT TCCAGGGCAGAGTCA CTATGACCGGGGACT CGTCCACGAGCACAC TCTACATGGAGTTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGA GATGGCGGATTTATC CCGGCTGCCGAAGTT TTTGATATCTGGGGC CAAGGGACAGTGGTC ACCGTCTCCTCAG	VK1-27	JK4	1222	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCGAG TCAGGGCATTAGC AATTATTTAGCCT GGTATCAGCAGAA ACCAGGGAAAGTT CCTAAGCTCCTGA TCTATGCTGCATC CACTTTGCAATCA GGGGTCCCATCTC GGTTCAGCGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGC CTGCAGCCTGAAG ATGTTGCAACTTA TTACTGTCAAAAG TATAACAGTGCCC CGCTCACTTTCGG CGGAGGGACCAA GGTGGAGATCAAA C
	B1104	Delta BT	Singlet	VH1-46	JH4	1223	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGACGCCTG GGGCCTCAGTGAAG CTTTCCTGCAAGGCA	VL3-21	JL2	1224	TCCTATGTGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGACAGAC GGCCAGGATTACC

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							TCTGGATACACCTTC AGCAACTACTATATA CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAATAATCAACCCTA GTGGTGGTGGCACAA GCTACGCACAGAAGT TCCAGGGCAGAGTC GCCATGACCAGGGA CACGTCCACGAGCAC AGTCTACATGAAACT GAGCAGCCTGACATC TGAGGACACGGCCG TTTATTACTGTGCGTA CACCTCCACTACGGT GACTACGTCGGGCTT TGACTACTGGGGCCA GGGAACCCTGGTCAC CGTCTCCTCAG				TGTGGGGAAAAC GACATTGGAAGTA AAAGTGTGCACTG GTACCAGCAGAG GCCAGGCCAGGC CCCTGTGCTGGTC GTCTATGATGATA GCGACCGGCCCT CAGGGATCCCTGA GCGATTCTCTGGC TCCAACTCTGGGA ACCCGGCCACCC TGACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTACTGTCAG GTGTGGGATAGTA GTAGTGATCATGG GCATGTGGTATTC GGCGGAGGGACC AAGCTGACCGTCC TAG
	B1105	Delta BT	Singlet	VH1-69	JH6	1225	CAGGTCCAGCTGGTG CAGTCTGGGGCTGA GGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCTTC AGCAGCTATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGGGATCATCCCTA TCTCTGGTACAGCTT	VL1-47	JL2	1226	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGACAGAG GGTCACCATCTCT TGTTCTGGAAGCA GCTCCAACATCGG AAGTAATTATGTAT ACTGGTACCAGCA GCTCCCAGGAAC GGCCCCCAAACTC CTCATCTATAGGA

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							ACTACGCACAGAGGT TCCAGGGCAGAGTCA CGATTACCGCGGACA AATCCACGAGCACAG CCTACATGGACCTGA GCAGCCTGAGATCTG AGGACACGGCCATAT ATTACTGTGCGACTC TACAAATAGTAGTAC CAGCTGCTGTGCCAC CAGACGGGGGCTATT ACTTCTACTACTACG GTATGGACGTCTGGG GCCAAGGGACCACG GTCACCGTCTCCTCA				ATAATCAGCGGCC CTCAGGGGTCCCT GACCGATTCTCTG GCTCCAAGTCTGG CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCGGTCCG AGGATGAGGCTG ATTATTACTGTGC AGCATGGGATGAC AGCCTGAGTGGT GTGGTATTCGGCG GAGGGACCAAGC TGACCGTCCTAG
	B1106	Delta BT	Singlet	VH3-15	JH3	1227	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTAAAGCCTG GGGGGTCCCTTAGAC TCTCCTGTGCAGCCT CTGGATTCAGTTTCA GTGACGCCTGGATGA GCTGGGTCCGCCAG ACTCCCGGGAAGGG GCTGGAATGGGTTGG CCGTATTAAAAGCAA AATTGATGGTGGGCC AGCAGACTACGCTGC ACCCGTGAAAGGCAG ATTCACCATCTCAAG AGATGATTCAAAAAA CACTCTGTATCTGCA AATGAACAGCCTGAA AGCCGAGGACACAG	VL1-44	JL1	1228	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCTTCTCT TGTTCTGGACGCA GCTNCAACATCGG AAGTAATACTGTA AACTGGTACCAGC AGCTCCCAGGAAC GGCCCCCAAACTC CTCATCTATAGTA ATAATCAGCGGCC CTCAGGGGTCCCT GACCGATTCTCTG GCTCCAAGTCTGG CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCAGTCTGA

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							CCGTGTATTACTGTA CAACAGAGGCTACGG TGACCACGTGGGATG CTTTTGATATCTGGG GCCAAGGGACAATG GTCACCGTCTCTTCA G				GGATGAGGCTGAT TATTACTGTGCAT CATGGGATGACAG CCTGAATGGTTTT GTCTTCGGAACTG GGACCAAGGTCA CCGTCCTAG
B008	B651	Delta BT	Clone	VH3-23	JH4	1229	GAGGTGCAGCTGTTG GAGTCTGGGGGAGA CTTGGTACGGCCTGG GGGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCATGTTTAG GAGATATGCCATGAA CTGGGTCCGCCAGG CTCCAGGGAAGGGG CTGGAGTGGGTCTCA GGTATTAGTGGAAGT GGTGATAAGACATGC TACGCAGAGTCCGTG AAGGGCCGGTTCACC ATCTCCAGAGACAAC TCCAAGAATACGCTG TATCTGCAAATGAGC GGCCTGAAAGCCGA GGACACGGCCATATA TTACTGTGCGAAAGG TCCCCGCAGCTCGTT CGATTACTTTGAGTC CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG	VK1-5	JK1	1230	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT AACTGGTTGGCCT GGTATCAGCAGAA ACCTGGGAAAGC CCCTAAACTCCTG ATCTATGATGCCT CCAGTTTGGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACACT ATAATAGTTGTCC GTGGACGTTCGG CCAAGGGACCAA GGTGGAAATCAAA C

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	B652	Delta BT	Clone	VH3-23	JH4	1231	GAGGTGCAGCTGTTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG GGGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGGTTCACCTTTAC TAGGTATGCCATGAA CTGGGTCCGCCAGG CTCCAGGGAAGGGG CTGGAGTGGGTCTCA GGTATTGGTGGTTAT GGAGGTAGCACCAAC TACGCAGACGCCGTG AAGGGCCGGTTCACC ATCTCCAGAGACGAC TCCAAGAACACCGTG TATCTGCAAATGAAC AGCCTGAGAGGCGA GGACACGGCCGTATA TCACTGTGCGAAGGG TCCCCGCAGCTCGTT CGATTACTTTGATTCT TGGGGCCAGGGTAC CCTGGTCACCGTCTC CTCAG	VK1-5	JK1	1232	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGACTATTAGT ACCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAGAGC CCCTAAGCTCCTG ATCTATGATGCCT CCAGTTTGGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAAT ATAATAGTTATCC GTGGACGTTCGG CCAAGGGACCAA GGTGGACATCAA
	B653	Delta BT	Clone	VH1-2	JH2	1233	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCACGGCT TCTGGATACACCTCC ATCGACTACTTTATG CACTGGGTGCGGCA GGCCCCTGGACAAG	VK2-40	JK3	1234	GATATTGTGATGA CCCAGACTCCACT CTCCCTGCCCGTC ACCCCTGGAGAG CCGGCCTCCATCT CCTGCAGGTCTAG TCAGAGCCTCTTG GGTAGTGATGATG GAAACACCTATTT

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							GGCTTGAGTGGATGG GACGGATCAACCCTA ACAGTGGAGGCACAA ACTATGCACCGAAGT TTCAGGGCAGGGTCA CCATGACCAGGGACA CGTCTATCAACATTG CCTACATGGAGCTGA GCAGACTGAGATCTG ACGACACGGCCGTTT ATTACTGTGCGAATA CTGGTAGCTGGCGAC AAGAAAACTGGTACT TCGAACTCTGGGGCC GTGGCACCCTGGTCA TAGTCTCCTCAG				GGACTGGTACTTG CAGAGGCCAGGG CAGTCTCCACAGC TCCTGATCTATTC GCTTTCCTATCGG GCCTCTGGAGTCC CAGACAGGTTCAG TGGCAGTGGGTC AGGCACTGATTTC ACACTGAAAATCA GCAGGGTGGAGG CTGAGGATGTTGG AGTTTATTACTGC ATGCATCGTATAG AGTTTCCTTTCAC TTTCGGCCCTGGG ACCAAAGTGGATA TCAA
	B654	Delta BT	Clone	VH1-2	JH2	1235	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCACGTCT TCTGGATACACCTCC ATCGACTACTTTGTG CACTGGGTGCGGCA GGCCCCTGGACAAG GGCTTGAGTGGATGG GACGGGTCAACCCTA ACAGTGGAGGCACAA ACTATGCACCGAAGT TTCAGGGCAGGGTCA CCATGACCAGGGACA CGTCTATCAACATAG	VK2-40	JK3	1236	GATATTGTGATGA CCCAGACTCCACT CTCCCTGGCCCGTC ACCCCTGGAGAG CCGGCCTCCATCT CCTGCAGGTCTAG TCAGAGCCTCTTG CGTAGTGATGATG GAAACACCTATTT GGACTGGTACTTG CAGAGGCCAGGG CAGTCTCCACAGC TCCTGATCTATTC GCTTTCCTATCGG GCCTCTGGAGTCC CAGACAGGTTCAG

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							TCTACATGGAGCTGA GCAGACTGAGATCTG ACGACACGGCCGTTT ATTACTGTGCGAATA CTGGTAGCTGGCGAC AAGAAAACTGGTATC TCCAACTCTGGGGCC GTGGCACCCTGGTCA TAGTCTCCTCAG				TGGCAGTGGGTC AGGCACTGATTTC ACACTGAAAATCA GCAGGGTGGAGG CTGAGGATGTTGG AATTTATTACTGCA TGCATCGTGTAGA GTTTCCTTTCATTT TCGGCCCTGGGA CCAAAGTGGATAT CAA
	B655	Delta BT	Singlet	VH3-53	JH3	1237	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGTAGCC TCTGAAATTATCGTCA GCAGTAATTACATGA GCTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC AGTTATTTATCCCGG TGGTAGTACATTCTA CGCAGACTCCGTGAA GGGCCGATTTACCAT CTCCAGAGACAGCTC CAAGAACACGCTGTC TCTTCAAATGAACAG CCTGAGAGACGAGG ACACGGCCATGTATT ACTGTGCGAGAGAG GGGCTGGTGGGAGG TATGCTGGCGTTTGA TATCTGGGGCCAAGG	VK1-9	JK5	1238	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC AGTTATTTAGCCT GGTATCAGCAAAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATGCTGCAT CCACTTTGCAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACAATCAGCAGC CTGCAGCCTGAAG ACTTTGCAATTTAT TACTGTCAACGCC TTAATAGTTCCCC TGCGGAAATCACC

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											TTCGGCCAAGGG ACACGACTGGAGA TTAAAC
	B656	Delta BT	Singlet	VH1-8	JH4	1239	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGGCC TCTGGATACACTTTC ACCAGTTATGAAATC ATCTGGGTGCGACAG GCCACTGGACAAGG GCTTGAGTGGATGGC ATGGATGAACCCTAA CAATCCTAACACAGC CTATAAACAGAAGTT CCGGGGCAGAATCA CCCTGACCAGGGACA CCTCCAGAAGCACAG CCTACATGGAACTGA CCAGCCTGACATCTG AGGACACGGCCGTG TATTTCTGTGCGAGA GTAGGCGGTTTGACT GGAGCTTCGGACTAC TGGGGCCAGGGAAC CCTGGTCACCGTCTC CTCAG	VL3-21	JL1	1240	TCCTATGTGCTGA CTCAGCCACCCTC GGTGTCAGTGGC CCCAGGCAAGAC GGCCAGGATTCC CTGTGGGGGAAA CAACCTTGGAAGT AAAAATGTGCACT GGTACCAGCAGAA GCCAGGCCAGGC CCCTGTGCTGGTC GTCTATGATGATA GCGACCGGCCCT CAGGGATCCCTGA GCGATTCTCTGGC TCCAACTCTGGGA ACACGGCCACCCT GACCATCAGCAG GGTCGAAGCCGG GGATGAGGCCGA CTATTACTGTCAG GTGTGGGATGGC ACTACTGATGTCT TTTATGTCTTCGG AAGTGGGACCAA GGTCACCGTCCTA G
	B657	Delta BT	Singlet	VH1-46	JH4	1241	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCTGTGAAAG	VK1-39	JK4	1242	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA

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							TATCCTGCAAGGCAT CTGGATACAGCTTCA CCAGCTACTTGATGC ACTGGGTGCGACAG GCCCCTGGACAGGG GCTTGAGTGGATGGG AATAATCAACCCTAG TGGTGGTGGCAGAAC CTACGCACAGAAATT CCAGGGCAGAGTCA CCATGACCAGAGACA CGTCCACGGGCATAG TCTACATGGAATTGA GCAGCCTGAGATCTG AGGACACGGCCCTGT ATTACTGTGCGAGAG AACACGGTGGTAACT CGTTGTTTGATTACT GGGGCCAGGGAACC CGGGTCACCGTCTCC TCAG				GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA GGTATTTAAATTG GTATCAGCAAAAG CCAGGGAAAGCC CCTAACGTCCTGA TCTATGCTGCTTC CACTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCGGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAATTCCC TCGGGGTCACTTT CGGCGGAGGGAC CAAGGTGGAAATC AAAC
	B658	Delta BT	Singlet	VH1-18	JH6	1243	CAGGTTCAGCTGGTG CAGTCTGGAGCTGAG GTGAAGAAGCCTGG GGCCTCAGTGAAGGT CTCCTGTGAGGCCTC TGGTTACAACTTTATG AGCTATGGTATCAGC TGGGTGCGACAGGC CCCTGGACAAGGGCT TGAGTGGATGGGATG GATCAGCGTTTACAA TGATTATACACACTAT	VK3-11	JK4	1244	GAAATTGTGTTGA CACAGTCTCCAGC CACCCTGTCTTTG TCTCCAGGGGAAA GAGTCACCCTCTC CTGCAGGGCCAG TCAGAGTGTTAGC AGCTACTTAGCCT GGTACCAACAGAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTATGATGCAT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GCACAAAAACTCCAG GGCAGAGTCACCATG ACCACAGACACATCC ACGAGCACAGCCTAC ATGGAGCTGAGGAG CCTGAGATCTGACGA CACGGCCGTTTATTA CTGTGCGAGAGAGG GATTTTGTAGTGGCT CCAACTGTTATCGTG GTACCTACAACTACT ACGGTATGGACGTCT GGGGCCAAGGGACC ACGGTCACCGTCTCC TCA				CCAACAGGGCCA CTGGCATCCCAGC CAGGTTCAGTGGC AGTGGCTCTGGG ACAGACTTCACTC TCACCATCAGCAG CCTAGAGCCTGAA GATTTTGCAGTTT ATTACTGTCAGCA GCGTCGCGACGC GGGATCTTTCGGC GGAGGGACCAAG GTGGAGATCCAAC
	B659	Delta BT	Singlet	VH3-9	JH4	1245	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTTCAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCTACTTTGAT GATTATGCCATGCAC TGGGTCCGGCAAGCT CCAGGGAAGGGCCT GGAGTGGGTCTCTG GTATTAGTTGGAATA GTGGTACCGTCGTCT ATGCGGACTCTGTAA AGGGCCGATTCACCA TCTCTAGAGACAACG CCCAGAAGTCCCTGT ATCTGCAGGTGAACA GTCTGACAGTTGAGG ACACGGCCCTCTACT	VK2-28	JK4	1246	GATATTGTGATGA CTCAGTCTCCACT CTCCCTGCCCGTC ACCCCTGGAGAG CCGGCCTCCATCT CCTGCAGGTCTAG TCAGAGCCTCCTG CATAGTAATGGAC ACACCTATTTGGA TTGGTACCTGCAG AAGCCAGGACAGT CTCCACAGCTCCT GATCTATATGGGT TCTAATCGGGCCT CCGGGGTCCCTG ACAGGTTCAGTGG CAGTGGATCAGG CACAGATTTTACA CTGAAAATCAGCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATTGTGCAAAAGATA CGCGGTCTCATAACG ATATCTTGGCTGGTT ATCATGGAATAGACT ACTGGGGCCAGGGA ATCCTGGTCATCGTC TCCTCAG				GAGTGGAGGCTG AGGATGTTGGGGT TTATTACTGCATG CAAGCTCTCCAAA CTCCTCCCACTTT CGGCGGAGGGAC CAAGGTGGAGATC AAAC
	B660	Delta BT	Singlet	VH5-51	JH3	1247	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA AGTGAAAAAGCCCGG GGAGTCTCTGAAGAT CTCCTGTAAGACTTC TGGATACAACTTTAA CATCTACTGGATCGG CTGGGTGCGCCAGAT GCCCGGGAAAGGCC TGAAGTGGATGGGGA TCATCTTTCCTGGTG ACTCTGATACCAGAT ACGGCCCGTCCTTCC AAGGCCAGGTCACCA TCTCAACTGACAAGT CCATCAGTACCGCCT ACCTGCAGTGGAGCA GCCTGAAGGCCTCG GACACCGGCATGTAT TACTGTGCGAGAGTA GCGTCCCCAGAGGG GTTCACCACTGGCTG GAACGGCCGCGGCC CCGATGAAGCCTTTG ATATTTGGGGCCAAG	VL1-47	JL2	1248	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGAG GGTCACCATCTCT TGTTCTGGAGGCA GCTCCAACATCGG AAGTAATTATGTAT ACTGGTACCAGCA TCTCCCAGGTACG GCCCCCAAACTCC TCATCTATAGGAA TGATCAGCGGCC CTCAGGGGTCCCT GACCGATTCTCTG GCTCCAAGTCTGG CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCGGTCCG AGGATGAGACTGA TTATTACTGTGCA ACATGGGATGACA GCCTGAGTGCCG GGGTATTCGGCG GAGGGACCAAGC TGACCGTCCTAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGACACCGGTCACA GTCTCTT				
	B661	Delta BT	Singlet	VH3-53	JH6	1249	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCGG GGGGGTCCCTGAGA CTCTCTTGTGCAGCC TCTGGGCTCACCGTC AGTAGCAACTACATG AACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC AATTATTTATAGCGGT GGCACCACATACTAC GCAGAGTCCGTGAAG GGCCGATTCACCATC TCCAGAGACAATTCC AAGAACACGTTATAT CTTCAAATGAACAGC CTGAGAGCCGAGGA CACGGCCGTATATTA TTGTGCGAGAGAGGC TTATGGTATGGATGT CTGGGGCCAAGGGA CCACGGTCACCGTCT CC	VK1-9	JK5	1250	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCCACA TCTGTTGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC CGTTCTTTAGCCT GGTATCAGCAAAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATGAGACAT CCACTTTGCAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGGTCTGGG ACAGATTTCACTC TCACCATCAGCAG CCTCCAGCCTGAA GATTTTGCAACTT ATTACTGTGAACA CCTTAATAGTTAC CCCACCTTCGGCC AAGGGACACGACT GGAGATTAAAC
	B662	Delta BT	Singlet	VH1-2	JH6	1251	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGCCT TCTGGATACAGCTTC ACCGACTACTATATA	VL7-46	JL2	1252	CAGGCTGTGGTG ACTCAGGAGCCCT CACTGACTGTGTC CCCAGGAGGGAC AGTCACTCTCACC TGTGGCTCCAGCA CTGGAGCTGTCAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CACTGGGTGCGACA GGCCCCTGGACAAG GACTTGAGTGGATGG GATGGATCAACCCTA ACAGTGGTGGCACAA ACTATGCACAGAAGT TTCAGGGCTGGGTCA CCATGACCAGGGACA TGTCCAGCAGCACAG CCTACATGGAGATGA GCAGGCTGAAATCTG ACGACACGGCCGTGT ATTACTGTGCGAGAG GTACGGCGACTACAA ATCGTTACTACCACT ACGGTATGGACGTCT GGGGCCAAGGGACC ACGGTCATCGTCTCC TCA				CAGTGGTCATTAT CCCTACTGGTTCC AGCAGAAGCCTG GCCAAGCCCCCC GGACACTGATTTT TGATACAAGCAAC AAACACTCCTGGA CACCTGCCCGGTT TTCAGGCTCCCTC CTTGGGGACAAAG CTGCCCTGACCCT TTCGGGTGCGCA GCCTGACGATGA GGCTGAGTATTAC TGCTTGCTCTCCT ATAGTGGTGCTCA GGTATTCGGCGG AGGGACCAAGCT GACCGTCCTAG
	B663	Delta BT	Singlet	VH4-30-4	JH6	1253	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTCGTGAAGCCTT CACAGACCCTGTCCC TCACCTGCGCTGTCT CTGGTGGCTCCATCA GCAGTGGTTATTACT CCTGGAGTTGGATCC GGCAGCCGGCAGGG AAGGGACTGGAGTG GATTGGGTTTATCGA TGACAGTGGGAGCAC CCACTACAACCCGTC CCTCAAGCGCCGAGT TACCATTTCAATGGA	VL3-25	JL2	1254	TCCTATGAGCTGA CTCAGCCACCCTC GGTGTCAGTGTCC CCAGGACAGACG GCCAGGATCACCT GCTCTGGAGATGC ATTGCCAAAGCAA TATGCTTATTGGT ACCAGCAGAAGC CAGGCCAGGCCC CTCTTCTGGTGAT ATATAAAGACACT GAGAGGCCCTCA GGGATTCCTGAGC GATTCTCTGGCTC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CACGTCCAAGAACCA GTTCTCCCTGAAACT GAGCTCTGTGACCGC CGCGGACACGGCCG TGTATTACTGTGCCC GAGATAACTGGAACG ACCAACGGCCAGACT ACTACGGTATGGACG TCTGGGGCCAAGGG ACCACGGTCACCGTC TCCTCA				CAGCTCAGGGAC AACAGTCACGTTG ACCATCAGTGGAG TCCAGGCAGAAGA CGAGGCTGACTAT TACTGTCAATCAG CAGACAGCAGTTT AGTGGTATTCGGC GGAGGGACCAAG CTGACCGTCCTA
	B664	Delta BT	Singlet	VH3-30-3	JH5	1255	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCACCTC CAGTCTCTATACTAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GGCAGTTTTATTATAT GATGGAAACAATAAA TACTACGCAGACTCC GTGAAGGGCCGATTC ACCATCTCCAGAGAC AATCCCAAGAACACT CTGTATCTGCAAATG AACAGCCTGAGAGCT GAGGACACGGCTATT TACTTCTGTGCGAGA GCGGCTACAGTAGGA GCAGGTAGTGATGAT CACTGGTTCGCCCCC	VL1-40	JL3	1256	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCGCTGGGGGC AGTTCCAACATCG GGGCATTTTATGA TGTACACTGGTAC CAGCTACTTCCAC GGACAGCCCCCA AACTCCTCATCTT TGCTAACACCAAT CGGCCCTCAGGG GTCCCTGACCGAT TCTCTGGCTCCAA GTCTGGCACCTCA GCCTCCCTGGCC ATCACTGGGCTCC AGGCTGAGGATG AGGCTACTTATTA CTGCCAGTCCTAT GACAGCAGCCTG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TGGGGCCAGGGAAC CCTGGTCACCGTCTC CTCAG				AGTGGTTGGGTGT TCGGCGGAGGGA CCAAGCTGACCGT CCTAG
	B666	Delta BT	Singlet	VH5-51	JH4	1257	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTAAGGGCT CTGGATATCAGTTTA CCAGGAATTGGATCG CCTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG GGACTATCGATCCTG GTGACTCTGAGACCA GATACAGCCCGTCCT TCCAAGGCCAGGTCA CCATCTCAGTCGACA AGTCCATCAGCACCG CCTACCTGCAGTGGA GCAGCCTCAAGGCCT CGGACACCGCCAAAT ATTTCTGTGCGAGAC TCTTTTGTGGTGGTG ACTGCCCCCTTGACT CCTGGGGCCAGGGA ACCCTGGTCACCGTC TCCTCAG	VK1-5	JK1	1258	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGC ACCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAGAGC CCCTAAGCTCCTG ATCTATGATGCCT CCAATTTGGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAGT ATAATAGTTATTG GACGTTCGGCCAA GGGACCAAGGTG GAAGTCAAAC
	B667	Delta BT	Singlet	VH5-51	JH4	1259	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GATTAAAAGGCCCGG GGAGTCTCTGAGGAT CTCCTGTCAAGGTTC	VK1-33	JK4	1260	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTGGGAGACA GAGTCACCATCAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TGGATACAGCTTAAC CAACTCCTGGATCGC CTGGGTGCGCCAGAT GCCCGGGAAAGGCC TGGAGTGGATGGGG GTCATCTATGCTGCT GACTCTGACACCAGA TACAGCCCGTCCTTC CAAGGCCACGTCACC ATCTCAGCCGACAAG TCCATCAGCACCGCC TACCTGCAGTGGAGC AGCCTGAAGGCCTCG GACACCGCCATGTAT TACTGTGTGAGACTC AGCAGCAACTGGTAT TGGGGGAGTGCCTA CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				TTGCCAGGCCAGT CAGGACATTAGCA ACTATTTAAATTG GTATCAACAGAAA CCAGGGAAGGCC CCTAAGCTCCTGA TCTACGATGCATC CAATTTGGAAACA GGGGTCCCATCAA GGTTCAGTGGAAG TGGATCTGGGACA GATTTTAGTTTCA CCATCAGCAGTCT GCAGCCTGAAGAT ATTGCAACATATT ACTGTCAACAGTA TAATAATCTCCCT CCCACTTTCGGCG GAGGGACCAAGG TGGAGATCAAAC
	B668	Delta BT	Singlet	VH5-51	JH4	1261	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTAAGGGTT CTGGATACATCTTTAA CAGGAATTGGATCGC CTGGGTGCGCCAGAT GCCCGGGAAAGGCC TGGAGTGGATGGGG GTCATCGATCCTGGT GACTCTGAAACCAGA TACAGCCCGTCCTTC CAAGGCCAGGTAACC	VK1-5	JK2	1262	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCGGTAGGAGAC CGAGTCACCATCA CTTGCCGGGCCA GTCAAAGTATTAG TAGCTGGTTGGCC TGGTATCAGCAGA AACCAGGGAAAG CCCCTAAGCTCCT GATCTATGATGCC TCCAATTTGGAAA CTGGGGTCCCATT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATCTCAGTCGACAAG TCCATCAGCACCGCC TACCTGCAGTGGAGC AGCCTGAAGGCCTCG GACACCGCCATGTAT TACTGTGCGAGACAG CTTGTTGGGGGTGAT AGCAGTTTTGACTTC TGGGGCCAGGGAAC CCTGGTCACCGTCTC CTCAG				AAGGTTCAGCGG CAGTGGATCTGG GACAGAATTCACT CTCACCATCAGCA GCCTGCAGCCTG ATGATTTTGCAAC TTATTACTGCCAA CAATATAATAGTTA TCCGAGGACTTTT GGCCAGGGGACC ACGCTGGAGATCA AAC
	B669	Delta BT	Singlet	VH3-23	JH4	1263	GAGGTGCAGCTGTTG GAGTCTGGGGGAAG CGTGGTACAGCCGG GCGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCACCTTTA GCAGATATGTCATGA GCTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGCGTCTC AGTTATTAGTGGTGA TGGTGATGGCGCAAA CTACGCAGACTCCGT AAAGGGCCGGTTCAC CATCTCCAGAGACAA TTCCAAGAACACTCT GTTCCTGCAAATGAA CAGCCTGAGAGCCG AGGACACGGCCGTG TATTACTGTGCGAAA GGCCCTCGGTATAAT TGGGACTACTTCGAC	VK1-5	JK2	1264	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTCGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT ACCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAACTCCTG ATCTATGATGCCT CCAGTTTGGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAGT ATAATAGTTATTCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							AACTGGGGCCAGGG AACCCTGGTCACCGT CTCCTCAG				TCAGAAGCTTTTG GCCAGGGGACCA AGCTGGAGATCAA AC
	B671	Delta BT	Singlet	VH3-23	JH4	1265	GAGGTGCAGCTGTTG GAGTCTGGCGGAGG CTTGGTACAGCCTGG GGGGTCCCTGACACT CTCCTGTGCAGTCTC TGGATTCACCTTTAC CAATTATGCCGTGGC CTGGGTCCGCCAGG CCCCAGGGAAGGGG CCGGAATGGGTCTCA ACTATTAAAGGTGGG GGTGATGTCACATGG TACGTCGCCTCCGTC AGGGGCCGGTTCAC CATATCCAGAGACAA TTCCATGAATACGGC ATTTCTCCAAATGGA CAGCCTGAGAGCCG AAGACACGGCCATAT ATTACTGTGCGAGAG ACGGTGACTACCCTA CAGACCGCTTTGACT TCTGGGGCCAGGGA ACGCTGGTCGTCGTC TCCTCA	VL1-40	JL1	1266	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACATCG GGGCAGGTTATG CTGTACACTGGTA CCAGCAGCTTCCA GGAACAGCCCCC AAACTCCTCATCT ATAGTAACAACAA TCGGCCCTCAGG GGTCCCTGACCG ATTCTCTGGCTCC AAGTCTGGCACCT CAGCCTCCCTGG CCATCACTGGGCT CCTGGCTGAGGAT GAGGCTGATTATT TCTGCCAGTCCTA TGACAGCAGCCTG AGCGGTTCGGTCT TCGGAACTGGGA CCAAGGTCACCGT CCTAG
	B672	Delta BT	Singlet	VH4-30-4	JH4	1267	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT	VK3-11	JK4	1268	GAAATTGTGTTGA CACAGTCTCCAGC CACCCTGTCTTTG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CACAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGGCTCCATCA GCAGTAGTGATTACT ACTGGAGTTGGATCC GCCAGTCCCCAGGG AAGGGCCTGGAGTG GATTGGGTACATCTT TTACAGTGGGAACAC CTACTACAACCCGTC CCTCAAGAGTCGACT TGTCATATCAGTAGA CACGTCCAAAAACCA GTTCTCCCTGAGGCT GAGCTCTGTGACTGC CGCAGACACGGCCG TGTATTACTGTGCCA GAGACGGTGCTATGG TTCAGGGAGTCTTTG ACTTCTGGGGCCAGG GAATCCTGGTCACCG TCTCCTCAG				TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAAGGCCAGT CAGAGTGTTCGTA ACTACTTAGCCTG GTACCAACAAAGA CCTGGCCAGGCT CCCAGGCTCCTCA TCTATGATGCATC CCTCAGGGCCACT GGCATCCCAGCC CGGTTCAGTGGTA GTGGGTCTGGGA CAGACTTCACTCT CACCATCAGCAGC CTAGAGCCTGAAG ATTTTGCAGTTTAT TACTGTCAGCAGC GTTACAACTGGCC TCCGCTCACTTTC GGCGGAGGGACC AAGGTGGAGATCA AAC
	B673	Delta BT	Singlet	VH1-46	JH4	1269	CAGGTGCAGCTGGT GCAGTCTGGGCCTGA GGTGAAGAAGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCA TCTGGATACACCTTC TCCAACTATTTTATCC ACTGGGTGCGACAG GCCCCTGGACAAGG ACTTGAGTGGGTGGG AATGATCAGCCCTGG	VK1-39	JK5	1270	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTCGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA GCGATTTAAATTG GTATCAACAGAAA CCAGGGAAAGCC CCTCAGCTCCTCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TGGTGCTGGCACAAG CTACGCACAGAAGTT CCAGGGCAGAGTCA CCATGACCAGGGACA CGTCCACGAACACAG TCTACATGGAGCTGA CCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTCCTAGA GCCGATAGTGGGAG CTACCACTTCTTTGAT TACTGGGGCCAGGG AACCCTGGTCACCGT CTCCTCAG				TCTATGCTGCATC CATTTTGCAAAGT GGGGCCCCATCA AGGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCGCT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTCTTT TTCCGATAACCTT CGGCCAAGGGAC ACGACTGGAGATT AAAC
	B674	Delta BT	Singlet	VH1-46	JH4	1271	CAGGTGCAGCTGGT GCAGTCTGGGGCGG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTTTCCTGCAAGGCA TCTGGAAACACCTTC AACAACCACTATATG CACTGGGTGCGACA GGCCCCTGGACAAG GCCTTGAGTGGATGG GGATAATCAGTCCTA GTGGTGGTTCCACAA GCTACACACAGAACT ACCAGGGCAGAGTCA CCGTGACCAGGGAC ACGTCCACGAGCACA GTCTACATGGAGCTG ATCAGCCTCAGATAT GAGGACACGGCCGT	VK1-39	JK5	1272	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGTATTAGCA GCTCTTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAACTCCTGA TCTATGCTGCATC CATTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGAGTATACTCT CACCATCGACAGT CTGCAACCTGAAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTATTATTGTGCTAG AGCCGATAGTGGGA GCTACCACTTCCTTG ACTATTGGGGCCAGG GAACCCTGGTCACCG TCTCCTCAG				ATTTTGCAACTTA CTTCTGTCAACAG AGTCACAGTATCC CTCCGATCACCTT TGGCCAAGGGAC ACGACTGGAGATT AAAC
	B675	Delta BT	Singlet	VH5-51	JH4	1273	GAGGTGCAGCTGGT GCAGTCTGGAACAGA GGTGAAAAAGCCCG GGGAGTCTCTGAAGA TCTCCTGTCAGGGCT CTGGATACAGGTTTA CCAGCTACTGGATCG CCTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG GGATCATCTATCCTG GTGACTCTGAGACCA GATACAGCCCGTCCT TCCAAGGCCAGGTCA CCATCTCAGTCGACA AGTCCATCAGCACCG CCTACCTGCACTGGA GCAGCATGAAGGCCT CGGACACCGCCATGT ATTACTGTGCGAGGT CAATGACCACGAACT ACTTTGACTTGTGTG GCCAGGGA	VL2-14	JL2	1274	CAGTCTGTGCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA TCACCATCTTCTG CACTGGAACCAGC AGTGACGTTGGTG GTTATAACTATGT CTCCTGGTACCAA CAGCACCCAGGC AAAGCCCCCAAAC TCATGATTTATGAT GTCAGTAATCGGC CCTCAGGGGTTTC TAATCGCTTCTCT GGCTCCAAGTCTG GCAACACGGCCT CCCTGACCATCTC TGGGCTCCAGGC TGAGGACGAGGC TGATTATTACTGC AGCTCATATACAA GCAGCAGCACTCT CGTGGTATTCGGC GGAGGACCAAG CTGACCGTCCTAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
	B676	Delta BT	Singlet	VH5-51	JH5	1275	GAGGTGCAGCTGGTGCAGTCTGGAGCAGAGGTGAAAAAGCCCGGGGAGTCTCTGAGGATCTCCTGTAAGGGTTCTGGATACAGGTTTACCAGCTACTGGATCGGCTGGGTGCGCCGGGTGCCCGGGAAAGGCCTGGAGTGGATGGGGATCATCTATGCTGGTGACTCTGAGACCAGATACAGCCCGTCCTTCCAAGGCCAGGTCACCATGTCAGTCGACAAGTCCATCAGTACCGCCTACCTGCAGTGGAGCAGCCTGAAGGCCTCGGACACCGCCATGTATTACTGTGCGAGGACCCAGACAACGGGGTGGTTCGACCTCTGGGGCCAGGGAACCCTGGTCACCGTCTCCTCAG	VK1-5	JK2	1276	GACATCCAGATGACCCAGTCTCCTTCCACCCTGTCTGCATCTGTAGGAGACAGANTCATCATCACTTGCCGGGCCAGTCAGAGTGTTAGTAGTTGGTTGGCCTGGTATCAGCAGAAGCCAGGGAGAGCCCCTAAACTCCTGATCTATGATGCCTCCATTTTGGAAACTGGGGTCCCATCAAGGTTCAGCGGCAGTGGATCTGGGACAGAATTCACTCTCACCATCAGTAGCCTGCAGCCTGATGATTTTGCAACTTATTACTGCCAACAGTATAGTGGTTATTCTCTGTACACTTTTGGCCAGGGGACCAAGCTGGAGATCAAAC
	B677	Delta BT	Singlet	VH5-10-1	JH4	1277	GAAGTGCAGCTGGTGCAGTCCGGAGCAGAGGTGAAAAAGCCCGGGGAGTCTCTCAGGATCTCCTGTAAGGGTTCTGGATACAGCTTTACCAGCCACTGGATCAGCTGGGTGCGCCAG	VK3-11	JK2	1278	GAAATTGTGTTGACACAGTCTCCAGCCACCCTGTCTTTGTCTCCAGGGGAAAGAGCCACCCTCTCCTGCAGGGCCAGTCAGAGTGTTAGCAGCTTCTTAGCCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATGCCCCGGGAAAGG CCTGGAGTGGATGG GGAGGATTGATCCTA GTGACTCTTATACCA ACTACAGCCCGTCCT TCCAAGGCCACGTCA CCATCTCAGGTGACA AGTCCATCAGCACTG TCTACCTGCAGTGGA GCAGCCTGAAGGCCT CGGACTCCGCCATGT ATTACTGTGTCTGCA CTCTAGTGGTGGTAG ATCACACTATTGACTA CTGGGGCCAGGGAA CCCTGGTCACCGTCT CCTCAG				GGTACCAACAGAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTATGATGCAT CCAACAGGGCCA CTGGCATCCCAGC CAGGTTCAGTGGC AGTGGGTCTGGG ACAGACTTCACTC TCTCCATCAGCAG CCTAGAGCCTGAA GATTTTGCTGTTT ATTACTGTCAGCA TCGTAGCAACTGG CCTCCGTACACTT TTGGCCAGGGGA CCAAGCTGGAGAT CAAAC
	B678	Delta BT	Singlet	VH3-53	JH4	1279	GAGGTGCAGCTGGT GGAGTCTGGAGGAG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGTC TCTGGCCTCGGCGTC AATACCAACTACATG AGCTGGGTCCGCCA GGCTCCAGGGAAGG GCCTGGAGTGGGTCT CACTTATTTATGGCG GTGGCAGTACATACT ACGCAGACTCCGTGA AGGGCCGATTCATCA TCTCCAGAGACAATT CCGAGAACACGCTGT	VK3-20	JK2	1280	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTATTG ACAGTAGGGTCTT AGCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGCATCCAGCAGG GCCACCGGCATC CCAGACAGATTCA GCGGCAGTGGGT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATCTTCAAATGAACAA CCTGACAACCGAGGA CACGGCCGTGTATTA CTGTGCGACCAGCAG TGGCTGGTACGTCCT AAGGAGGGGGGGAT TTGACTACTGGGGCC AGGGAACCCTGGTCA CCGTCTCCTCAG				CTGGGACAGACTT CACTCTCACCATC AGCAGACTGGAG CCTGAAGATTTTG TTGTATATTTCTGT CAGCAGTATGGCA CCTCACCGGGCA CTTTTGGCCAGGG GACCAAGTTGGAG ATCAAAC
	B679	Delta BT	Singlet	VH3-9	JH4	1281	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACCTTTGA AGATTATGCCATGCA CTGGGTCCGGCAAG CTCCAGGAAAGGGC CTGGAGTGGGTCTCA GGTATTAGTTGGAAT GGTGGTGTCATAGAC TATGCGGACTCTGTG AAGGGCCGATTCATC ATCTCCAGAGACAAC GCCAAGAACTCCCTG TATCTGCAAATGCGA AGGCTGACAGCTGAG GACACGGCCTTATAT TACTGTGCGAAAGAT ATTGACCGGGGAAAT GGCTACGATTTCCCC CTTGACTACTGGGGC	VL1-44	JL2	1282	CAGTCTGTGCTGA CTCAGCCACCCTC AGCGTCTGGGAC CCCCGGGCAGGC GGTCACCATCTCT TGTTCTGGAAGCA GCTCCAACATCGG AAGTAATACTGTA AACTGGTACCAGC AACTCCCAGGAAC GGCCCCCAAACTC CTCATCTATAATAA TCATCAGCGGCCC TCAGGGGTCCCT GACCGATTCTCTG GCTCCAAGTCTGG CACCTCAGCCTCC CTGGCCATCAGTG GGCTCCAGTCTGA GGATGAGGCTAAT TTTTACTGTGCAG CATGGGATGACAG ATTGAATGGTGTG GTATTCGGCGGA

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							CAGGGAACCCTGGTC ACCGTCTCCTCAG				GGGACCAAGCTG ACCGTCCTAG
	B680	Delta BT	Singlet	VH3-13	JH5	1283	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTACAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGTAGCC TCTGGATTCACCTTC AGTAGCTACGACATG CACTGGGTCCGCCAA ACTACAGGAAAAGGT CTGGAGTGGGTCTCA CTTATCGGTACTGCT GGTGACACATACTAT CCAGACTCCGTGAAG GGCCGATTCACCATC TCCAGAGAAAATGCC AAGAACTCCTTGTAT CTTCAAATGAACAGC CTGAGAGCCGAGGA CACGGCCGTGTATTA CTGTGCAAGAGGAG GATACAGTTTTGGTT ACGGCGGGGGGTTT TTCGACCCCTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG	VK1-39	JK2	1284	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCTTCAC TTGCCGGGCAAGT CAGAGCATTAGCA GGTATTTAAATTG GTATCAACAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCCATGGTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGAATTCACTCT CACCATCAACAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC CGGGGTACACTTT TGGCCAGGGGAC CAAGCTGGAGATC AAAC
	B681	Delta BT	Singlet	VH3-23	JH1	1285	GAGGTGCAGCTGTTG GAGTCTGGGGGAGC CCTGGTACAGCCGG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGATTCGCGTTC	VK1-5	JK3	1286	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCAGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG

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							AGCAACTATGCCATG AGTTGGGTCCGCCAG GCTCCAGGAAAGGG GCTGGAGTGGGTCTC AGCTATAAGTGGTCG TGGTGATAGGACATA CTACGCAGACTCCGT GAAGGGCCGGTTCA CCGTCTCCAGAGACA ATTCCAACAACACGT TGTATCTGCAAATGA AGAGCCTGAGAGCC GAGGACACGGCCGT ATATTACTGTGCGAA AGATGTGGATACAGC TATGGTTCAGGCTGA ATACTTCCAACACTG GGGGCAGGGCACCC TGGTCACCGCCTCCT CAG				TCAGAGTGTTGGT AGGTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAACTCCTG ATCTCTGATGCCT CCAGTTTGGAGGC TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACCTA TTACTGCCAACAG TGTAATGGTCACA TCACTTTCGGCCC TGGGACCAAAGTG GATATCAAAC
	B682	Delta BT	Singlet	VH3-30	JH4	1287	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGC CTCTGGATTCAACTT CAATACCTATGGCAT GCACTGGGTCCGCC AGGCTGCAGGCAAG GGGCTGGAGTGGGT GGCTCTTATTTCATAT GATGGAAGTAATGAA TACTATGCAGACTCC GTGAAGGGCCGATTC	VK1-13	JK4	1288	GCCATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTTGGGGACA GAGTCACCATCAC TTGCCGGACTAGT CAGGGCATTAGCA ATGCTTTAGTCTG GTATCAGCAGAAA CCAGGGAAAGCT CCTAAGCTCCTGA TCTATGATGCCTC CAGTTTGGAAAGT GGGGTCCCATCAA

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							ACCATTTCCAGAGAC ATTTCCAAGAACACG GTGTATCTGCAAATG AACAGCCTGAGAGCT GAGGACACGGCTGT GTATTACTGTGCGAA ATCTATATTCAGCTAT GCCTACCCGAATCAA TACTTTGACTACTGG GGCCAGGGAACCCT GGTCACCGTCTCCTC AG				GGTTCAGCGGCA GTGGATCTGGGA CAGACTTCACTCT CACCATCAGCAGC CTGCAGCCTGAAG ATTTTGCAACTTAT TATTGTCAACAGT TTAATAGTTACCC GCTCACTTTCGGC GGAGGGACCAAG GTGGAGATCAAAC
	B684	Delta BT	Singlet	VH1-58	JH3	1289	CAAATGCAGCTGGTG CAGTCTGGGCCTGAG GTGAAGAAGCCTGG GACCTCAGTGAAGGT CTCCTGCAAGGCTTC TGGATTCACCTTTACT ACCTCTGCTGTGCAG TGGGTGCGACAGGC TCGTGGACAGCGCCT TGAGTGGATAGGATG GATCGCCGTTGGCAG TGGAAACACAGACTA CGCTCAGAAGTTCCA GGAGAGAGTCACCAT TACCAGGGACTTGTC CACAAGCACAGCCTA CATGGAGTTGAGGAG CCTGAGGTCCGAAGA CACGGCCGTGTATTA CTGTGCGGCCCCATA TTGTAGTGGTGGTAC CTGCTCCGATGGTTT	VK3-20	JK1	1290	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTTT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTGTGA GGACCGGCTACTT AGCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCTTCATCAATGG TGCGTCCAACAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGGCTGGAACCT GAAGATTTTGCAG TGTATTACTGTCA GCAGTATGGTACC

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							TGACATCTGGGGCCA AGGGACAATGGTCAC CATCTCTTCAG				TCACCGTGGACGT TCGGCCAAGGGA CCAAGGTGGAAAT CAAAC
	B685	Delta BT	Singlet	VH1-2	JH3	1291	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGGCT TCTGGATACACCTTC AGCGGCCACTATATC TATTGGGTGCGACAG GCCCCTGGACAAGG GCTTGAGTGGATGGG ACGGATCAATCCTAA CACTGGTGACACAGA CTCTGCACAGAAGTT TCAGGGCAGGGTCA CCATGACCAGGGACA CGTCCATCAGCACAG CCTACATGGAGCTGA GTAGGTTGGGATCTG ACGACACGGCCGTGT ACTACTGTGCGAGAG TTTTCTCCAGAATTCG AGCTTTGGTTCAGGG AGGAGTTGCTACTTT TGATATCTGGGGCCA AGGGACAATGGTCAC CGTCTCTTCAG	VK1-39	JK1	1292	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGACCGTTAGCA GCAATTTAAATTG GTATCAGCACAAA CCAGGAAAAGCC CCTAAGCTCCTGA TCTATACTGCATC CAATTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCG GTGGATCTGGGA CAGATTTCACTCT CACCATCGCCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACTCTATTC CTCCCACGTTCGG CCAAGGGACCAA GGTGGAAATCAAA C
	B686	Delta BT	Singlet	VH3-30	JH3	1293	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG	VK1-13	JK4	1294	GCCATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA

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							ACTCTCCTGTGCAGC CTCTGGAATCTCCTT CAGTACCTCTGTCAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT GACAGTTATATCATAT GATGGAGTAAATAAC TACTATGCAGACTCC GTGAAGGGCCGATTC ACCATCTCCAGAGAC AATTCCAAGAACACG CTGTATCTGCAAATG AACAGCCTGAGAGAT GAGGATACGGCTGTG TATTACTGTGCGAAA AGCCACCCAATAGCA GCTGGTACCCTTTTT TGGAATGCTTTTGAT ATCTGGGGCCAAGGA ACAATGGTCACCGTC TCTTCAG				GAGTCACCATCAC TTGCCGGGCAAGT CAGGGCATTAGCA GTGCTTTAGCCTG GTATCAGCAGAAA CCAGGGAAAGCT CCTAAGCTCCTGA TCTATGATGCCTC CAGTTTGGAAAGT GGGGTCCCATCAA GGTTCAGCGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGC CTGCAGCCTGAAG ATTCTGCAACTTA TTACTGTCAACAG TTTAATACTTACCT CACTTTCGGCGGA GGGACCAAGGTT GAGATCAAAC
B014	B2067	Delta BT	Clone	VH4-31	JH4	1295	CAGGTGCAGCTGCA GGAGTCGGGCCCGG GACTGGTGAAGCCTT CACAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGGCTCCATCA GCAGTGGTGGTTACT ACTGGCACTGGATCC GCCAGCACCCAGGG AAGGGCCTGGAGTG GATTGGATCCATCTA TTACAGTGGGAGCAC	VK1-33	JK4	1296	CATCCGGATGACC CAGTCTCCATCCT CCCTGTCTGCATC TGTAGGAGACAGA GTCACCATCACTT GCCAGGCGAGTC AGGACATTAATAA GCATTTAAGCTGG TATCAGCAAAAAC CAGGGAAAGCCC CTAAGCTCCTGAT CTACGATGCATCC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							CTACTACAACCCGTC CCTCAAGAGTCGAGT TACCATATCAGTAGA CACGTCTAAGAACCA GTTCTCCCTGAAGCT GAGCTCTGTGACTGC CGCGGACACGGCCG TGTATTACTGTGCGA GAGATTTCGGTGGTA ACGCTAACTACTTTC ACTTCTGGGGCCAGG GAACGCTGGTCACCG TCTCCTCAG				GATTTGGAAGCAG GGGTCCCATCGA GGTTCAGTGGAAG TGGATCTGGGACA GATTTTACTTTCAC CATCCGCACCCTG CAGCCTGAAGACA TTGCAACATATTA CTGTCAACAGAAT GAAAATCTCCCGC TCACTTTCGGCGG AGGGACCAAGGT GGAGATCAAAC
	B2068	Delta BT	Singlet	VH3-30	JH2	1297	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGGGGTCCCTGAG ACTCTCCTGTGCAGC GTCTGGATTCACCTT CGATCACTTTCACAT GCACTGGGTCCGCC AAGCTCCAGGCAAGG GGCTGGAGTGGGTG GCATTTATCCGGTAT CATGGAGTTGGTGAA TACTATGCAGACTCC GTGAAGGGCCGATTC ACCATTTCCAGAGAC AATTCCAAGAACACG CTGTATGTGCAAATG AACAGCCTGAGAGTT GAGGACACGGCTGT CTATTACTGTGCGAA AGGAGGTTTCGGGG	VK1-5	JK2	1298	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT AGCTGGTTGGCCT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATAAGGCGT CTAGTTTAGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ATTTTGCAACTTAT TACTGCCAACAGT

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							CTAGTATAGCTAGTC GTCCCGACTACTACT TCGATCTCTGGGGCC GTGGCACCCTGGTCA CTGTCTCCTCAG				ATAATAGTTTCCC GTACACTTTTGGC CAGGGGACCAAG CTGGAGATCAAAC
	B2070	Delta BT	Singlet	VH1-69	JH6	1299	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCTTC AGCAGTAATGTTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAGCGATCATCCCCA TCTTTGGTCCAGCAA ACTACGCACAGAAGT TCCAGGACAGAGTCA CGATTACCGCGGACG AATCCACGAGCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGTGCGAGA CGGTCTCAGAGCAGC TCGTTTGGTCCCCGA TATTACGGTATGGAC GTCTGGGGCCAAGG GACCACGGTCACCGT CTCCTCAG	VK1-33	JK2	1300	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCAGGCGAGT GAGGACATTAACA AATATTTAAATTGG TATCAGCAGAAAC CAGGGAAAGCCC CTAAGCTCCTGAT CTACGATGCATCC AATTTGGAAACAG GGGTCCCATCAAG GTTCAGTGGAAGT GGATCCGGGACA GATTTTACTTTCAC CATCAGCAGCCTG CAGCCTGAAGACA TTGCAACATATTA CTGTCAACAGTAT GATAATCTGCCTC GGACTTTTGGCCA GGGGACCAAGCT GGAGATCAAAC
	B2071	Delta BT	Singlet	VH5-51	JH1	1301	GAGGTGCAGCTGGT GCAGTCTGGAGCAGA GGTGAAAAAGCCCG	VL1-40	JL3	1302	CAGTCTGTGCTGA CGCAGCCGCCCT CAGTGTCTGGGG

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							GGGAGTCTCTGAAGA TCTCCTGTAAGGGTT CTGGGTACAGCTTTA CCAGATACTGGATCG GCTGGGTGCGCCAG ATGCCCGGGAAAGG CCTGGAGTGGATGG GGATCATCTATCCTG GTGACTCTGATACCA GATACAACCCGTCCT TCCAAGGCCAGGTCA CCGTCTCAGCCGACA AGTCCATCGGCACCG CCTACCTGCAGTGGC GCAGCCTGAAGGCCT CGGACACCGCCATGT ATTACTGTGCGAGAA TCCCCCATTACTATG ATAGATTTGGTAAGG CCCGGGCTGAGGAG TACTTCCAGTATTGG GGCCAGGGCACCCT GGTCACCGTCTCCTC AG				CCCCAGGACAGA GGGTCACCATCTC CTGCACTGGGAAC ACCTCCAACATCG GGGCAGGCTTTG ATGTACACTGGTA CCAGCAACTTCCA GGAACGGCCCCC AAACTCCTCATCT ATGGTAACACCAA TCGGCCCTCAGG GGTCCCTGACCG ATTCTCTGCCTCC AAGTCTGGCACCT CAGCCTCCCTGG CCATCACTGGGCT CCAGCCTGAGGAT GAGGCTGATTATT ACTGCCAGTCCTG TGACAGCAGCCTG AGTACTAATTGGG TGTTCGGCGGAG GGACCAAGCTGA CCGTCCTAG
	B2072	Delta BT	Singlet	VH1-69	JH5	1303	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGGCACCCTC AGCACCTATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG	VK2-30	JK2	1304	GATGTTGTGATGA CTCAGTCTCCACT CTCCCTGCCCGTC ACCCTTGGACAGC CGGCCTCCATCTC CTGCAGGTCTAGT CAAAGCCTCGTAT ACAGTGATGGAAG TACATACTTGAATT GGTTTCAACAGAG

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							GAGGGATCATCCCTA TCTTCGGCACAGAAA ACCACGCACAGAAGT TCCAGGGCAGAGTCA CAATTAACGCGGACG AGTCCACGAGCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGGCGTG TATTACTGTGCGAGA ATGCCAGGGGCGAC TTATTACTTTGATAGT ACCGGTTATCCCACC TGGTTCGGCCCCTGG GGCCAGGGAACCCT GGTCACCGTCTCCTC AG				GCCAGGCCAATCT CCAAGGCGCCTAA TTTATAAGGTTTCT AACCGGGACTCTG GGGTCCCAGACA GATTCAGCGGCA GTGGGTCAGGCA CTGATTTCACACT GAAAATCAGCAGG GTGGAGGCTGAG GATGTTGGGGTCT ATTACTGCATGCA AGGTACAAACTGG CCTCCGACTTTTG GCCAGGGGACCA AGCTGGAGATCAA AC
	B2073	Delta BT	Singlet	VH4-4	JH4	1305	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGGGACCCTGTCC CTCACCTGCGCTGTC TCTGGTGGCTCCATC AGCAGTAGTAACTGG TGGAGTTGGGTCCGC CAGCCCCCAGGGAA GGGGCTGGAGTGGA TTGGGGAAATCTATC ATAGTGGCAGCTCCA ACTACAACCCGTCCC TCGAGAGTCGAGTCA CCATGTCAGTAGACA AGTCCAAGAACCACT TCTCCCTGAAGTTGA	VL1-40	JL3	1306	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGGGGC CCCAGGGCAGAG GGTCACCATCTCC TGCACTGGGAGC AGCTCCAACATCG GGGCAGGTTATGA TGTAAACTGGTAC CAGCAGCTTCCAG GAACAGCCCCCAA ACTCCTCATCTAT GATAACAGCAATC GGCCCTCAGGGG TCCCTGACCGATT CTCTGGCTCCAAG TCTGGCACCTCAG

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							GCTCTGTGACCGCCG CGGACACGGCCGTG TATTACTGTGCGAGA GCCTCCTATTACTAT GGTTTGGGGAGTTAT TCTCAACATCCTTACT ACTTTGACTACTGGG GCCAGGGAACCCTG GTCACCGTCTCCTCA G				CCTCCCTGGCCAT TACTGGGCTCCAG GCTGAGGATGAG GCTGATTATTACT GCCAGTCCTATGA CAACAGCCTGGGT GGTTTTTGGGTGT TCGGCGGAGGGA CCAAGCTGACCGT CCTAG
	B2074	Delta BT	Singlet	VH3-23	JH1	1307	GAGGTGCAGCTGTTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG GGGGTCCCTGCGAC TCTCCTGTGCAGCCT CTGGATTCACCTTTA GTAACTATGCCATGA ACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC AGCTATCGATGGTAG TGTTGGTAGCACATA TTACGCAGACTCCGT GAAGGGCCGGTTCA CCATCTCCAGAGACA ATTCCAAGAACACTC TGTATCTGCAAATGA ACAGCCTGAGAGCC GACGACACGGCCGT ATATTACTGTGCGAA ACGGCGGGGTTACTA TGATAGTATTCATTAT CGCCCCGGGCCTGA ATACTTCCAGAACTG	VK1-39	JK5	1308	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTGGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGTATTAGCA GGTATTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CAGTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAAATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC CTCCGATCACCTT CGGCCAAGGGAC

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							GGGCCAGGGCACCC TGGTCACCGTCTCCT CAG				ACGACTGGAGATT AAAC
	B2075	Delta BT	Singlet	VH3-23	JH1	1309	GAGGTGCAGCTGTTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG GGGGTCCCTGCGAC TCTCCTGTGCAGCCT CTGGATTCACCTTTA GTAACTATGCCATGA ACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTCTC AGCTATCGATGGTAG TGTTGGTAGCACATA TTACGCAGACTCCGT GAAGGGCCGGTTCA CCATCTCCAGAGACA ATTCCAAGAACACTC TGTATCTGCAAATGA ACAGCCTGAGAGCC GACGACACGGCCGT ATATTACTGTGCGAA ACGGCGGGGTTACTA TGATAGTATTCATTAT CGCCCCGGGCCTGA ATACTTCCAGAACTG GGGCCAGGGCACCC TGGTCACCGTCTCCT CAG	VK1-39	JK1	1310	GACATCCAGTTGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCG AATATTTAAATTGG TATCAGCAGAGAC CAGGGAGAGCCC CTGAGCTCCTGAT CTATGCTGCTTCC ACTTTGGAGAGTG GGGTCCCATCAAG GTTCAGTGGCAGT GGATATGGGACA GATTTCACTCTCA CCATCAGCAGTCT GCAGCCTGAAGAT TTCGCCACTTACT ACTGTCAACAGAG TTACAATACCCCC GAGTCGTTCGGC CAAGGGACCAAG GTGGAGATCAAAC
	B2076	Delta BT	Singlet	VH3-49	JH2	1311	GAGGTGCAGCTGGT GGAGTCTGGGGGAC GCTTGGTTCAGCCAG GGCGGTCGCTGAGA	VK2-28	JK4	1312	GATATTGTGATGA CTCAGTCTCCACT CTCCCTGCCCGTC ACCCCTGGAGAG

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							CTCTCCTGTACAGCT TCTGGATTCACGTTT CGTGACTATGCTATG AGCTGGTTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTAG GTTTCATGAGAAGCA TAGCTTTTGGTGCGA CAATAGAGTACGCCG CGTCTGTGAAAGGCA GATTCACCATCTCAA GAGATGATTCCCAAG GCATCGCCTATCTGC AAATGAACAGCCTGA AAAGCGAGGACACAG CCGTGTATTACTGTA GTTGTTCTGGAAGTG GTGGGACTGTCTTTG GTAACTTCGATCTCT GGGGCCGTGGCACC CTGGTCACCGTCTCC TCAG				CCGGCCTCCATCT CCTGCAGGTCTAG TCAGAGCCTCCTG CATAGTAATGGAT ACAACTATTTGGA TTGGTACCTGCAG AAGCCAGGGCAG TCTCCGCAGCTCC TGATCTATTTGGG TTCTAATCGGGCC TCCGGGGTCCCT GACAGGTTCAGTG GCAGTGAATCAGG CACAGATTTTACA CTGAAAATCAGCA GAGTGGAGGCTG AGGATGTTGGGGT TTATTACTGCATG CAAGCTCTACAAA CTCCGCTCACTTT CGGCGGAGGGAC CAAGGTGGAGATC AAAC
	B2077	Delta BT	Singlet	VH4-59	JH4	1313	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CGGAGACCCTGTCCC TCACCTGCACTGTCT CTGTTGGCTCCATCA GTAGTTACTACTGGA GCTGGATCCGGCAG CCCCCAGGGAAGGG ACTGGAATGGATTGG GTATATCTATTACAGT	VL1-40	JL2	1314	CAGTCTGTGCTGA CGCAGCCGCCCT CAGTGTCTGGGG CCCCAGGGCAGA GGGTCACCATCTC CTGCACTGGGAG CAGCTCCAACATC GGGGCAGGTTGT GATGTACACTGGT ATCAGCACCTTCC AGGAACAGCCCC

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							GGGAGCACCAACTAC AACCCCTCCCTCAAG AGTCGAGTCACCATA TCAGTAGACACGTCC AAGAACCAGTTCTCC CTGAAGCTGAGCTCT GTGACCGCCGCAGA CACGGCCGTGTATTA TTGTGCGAGACATGT ACTAGTCCCACCTGC TGCGTTGGGTCTGAC ACCCCACACATACTT TGACACCTGGGGCCA GGGAACCCTGGTCAC CGTCTCCTCAG				CAAACTCCTCATC TATGGTAACACCA ATCGGCCCCCAG GGGTCCCTGACC GATTCTCTGGCTC CAAGTCTGGCACC TCAGCCTCCCTGG CCATCACTGGGCT CCAGGCTGAGGA TGAGGCTGATTAT TACTGCCAGTCCT ATGACACCAGCCT GAGTGGTGAGGT GGTATTCGGCGG AGGGACCAAGCT GACCGTCCTAG
	B2078	Delta BT	Singlet	VH3-7	JH2	1315	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTAGAGTC TCTGGATTCACCTTTA GTAACTATTGGATGA GTTGGGTCCGCCAG GCTCCAGGGAAAGG GCTGGAGTGGGTGG CCAACATAGGGCAAG ATGGAAATGAGAAAT ACTATGTGGACTCTG TGAAGGGCCGATTCA CCATCTCCAGAGACA ACGCCAAGAACTCAC TGTATCTGCAAATGA ACAGCCTGAGAGCC	VK3-11	JK3	1316	GAAATTGTGTTGA CACAGTCTCCAGC CACCCTGTCTTTG TCTCCAGGGGAAA GAGCCACCCTCTC CTGCAGGGCCAG TCAGAGTATTTAT AGCTACTTAGCCT GGTACCAACAGAA ACCTGGCCAGGC TCCCAGGCTCCTC ATCTATGATGCAT CCAACAGGGCCA CTGGCATCCCAGC CAGGTTCAGTGGC AGTGGGTCTGGG ACAGACTTCACTC TCACCATCAGCAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GAGGACACGGCTGT GTATTTCTGTGTGAG GGGAATGGACGATCC CTATTGTAGTGGTGG TAGCTGCTACAACTG GTACTTCGATCTCTG GGGCCGTGGCACCC TGGTCACTGTCTCCT CAG				CCTAGAGCCTGAA GATTTTGCAGTTT ATTACTGTCAGCA GCGTAACAACTGG CCTCCGCGATTCA CTTTCGGCCCTGG GACCAAAGTGGAT ATCAAAC
	B2079	Delta BT	Singlet	VH1-69	JH6	1317	CAGGTCCAGCTGGTG CAGTCTGGGGCTGA GGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGACACCTTA AGAAGTTATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAAGGATCATCCCCA CTCTGGGTGTAACAA CCTACGCACAGAGGT TCCAGGGCAGAGTCA CGTTTACCGCGGACA AATCCACGAGCACAG CCTACATGGAGCTGA GCAGCCTCAGATCTG ACGACACGGCCGTGT ACTATTGTGCCGCCC CCCCTCCGTATGACT GGAGAGCCGGGTCC GGCTTCCACTACTAC GGTATGGACGTCTGG GGCCAAGGGACCAC	VK2-28	JK4	1318	GATATTGTGATGA CTCAGTCTCCACT CTCCCTGCCCGTC ACCCCTGGAGAG CCGGCCTCCATCT CCTGCAAGTCTAG TCAGAGCCTCCTG CATGGTAATGGAT ACAACTATTTGGA TTGGTACCTGCAG AAGCCAGGGCAG TCTCCACAGCTCC TGATCTATTTGGG TTCTAATCGGGCC TCCGGGGTCCCT GACAGGTTCAGTG GCAGTGGATCAG GCACAGATTTTAC ACTGAAAATCAGC AGAGTGGAGGCT GAGGATGTTGGG GTTTATTACTGCA TGCAAGCTCTAGA AACTCCTCTCACT TTTGGCGGAGGG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGTCACCGTCTCTTCAG				ACCAAGGTGGAAATCAAAC
	B2080	Delta BT	Singlet	VH1-2	JH1	1319	CAGGTGCAGCTGGTGCAGTCTGGGGCTGAGGTGAAGAAGCCTGGGGCCTCAGTGAAGGTCTCCTGCAAGGCTTCTGGATACACCTTCAGCGGCTACTATATGAACTGGGTGCGACAGGCCCCGGGACAAGGGCTTGAGTGGATGGGATGGATCAACCCTAACAGTGGTGGCACAAACTATGCACAGAAGTTTCAGGGCAGGGTCACCATGACCAGGGACACGTCCATCAGCACAGCCTATATGGAGCTGAGCAGGCTGACATCTGACGACACGGCCGTGTATTACTGTGCGAGGCCGACCGGGGACTCCCAGAGAGAGATGGGTACAATTATAGGGGAATACTTCCAGCACTGGGGCCAGGGCACCCTGGTCACCGTCTCCTCAG	VL3-25	JL2	1320	TCCTATGAGCTGACACAGCCACCCTCGGTGTCAGTGTCCCCAGGACAGACGGCCAGGATCACCTGCTCTGGAGATGTGTTGCCAAAGCAACATGCTTATTGGTACCAGCAGAAGCCAGGCCAGGCCCCTGTGTTGGTGATATATAAAGACAGTGAGAGGTCCTCAGGGATCCCTGAGCGATTCTCTGGCTCCAGCTCAGGGACAACAGTCACGTTGACCATCAGTGGAGTCCAGGCAGAAGACGAGGCTGACTATTACTGTCAATCAGCAGACAGCAGGTATGTGGTATTCGGCGGAGGGACCAAGCTGACCGTCCTAG
	B2081	Delta BT	Singlet	VH4-39	JH3	1321	CAGCTGCAGCTGCAGGAGTCGGGCCCAGGACTGGTGAAGCCTTCGGAGACCCTGTCCCTCACTTGCACTGTCTC	VL2-23	JL2	1322	CAGTCTGCCCTGACTCAGCCTGCCTCCGTGTCTGGGTCTCCTGGACAGTCGATCACCATCTCCTG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TGGTGGCTCCATCAC CAGTAGTAGTTACTA CTGGGCCTGGATCC GCCTGCCCCCAGGG AAGGGACTGGAGTG GATTGGGAGTGTCTT TTATAGTGGAATCAC CTACTACAGCCCGTC CCTCAAGAGTCGGGT CACCATATCCGTAGA CACGTCCAAGAATCA GTTCTCCCTGAATCT GAGCTCTGTGACCGC CGCAGACACGGCTGT CTATTACTGTGCGAG ATGGCCCAGGGATTT TTCTGATAGTAGTGG TTATTACCACCATGCT TTTGATATCTGGGGC CACGGGACAATGGTC ACCGTCTCTTCAG				CACTGGAACCAGC AGTGATGTTGGGA GTTATGACCTTGT CTCCTGGTACCAA CGGCACCCAGGC CAAGCCCCCAAAC TCATGATTTATGA GGTCACTAAGCG GCCCTCAGGGGT TTCTAATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACAAT CTCTGGGCTCCAG GCTGAGGACGAG GCTGATTATTATT GCTGCTCATATGC AGGTCGTTGGTTT TTCGGCGGAGGG ACCAAGCTGAGC GTCCTAG
	B2082	Delta BT	Singlet	VH3-66	JH3	1323	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCG GGGGGGTCTCTGAG ACTCTCCTGTGCAGC CTCTGGAATCACCGT CAGTAGCAACTACAT GAGCTGGGTCCGCC AGGCTCCAGGGAAG GGGCTGGAGCGGGT CTCAGTTATTTATAGC GGTGGTAGTACATTC TACGCAGACTCCGTG	VK1-9	JK4	1324	GACATCCAGTTGA CCCAGTCTCCATC CTTCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGGGCATTAGC AGTTATTTAGCCT GGTATCAGCAAAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATGCTGCAT CCACTTTGCAAAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							AAGGGCAGATTCACC ATTTCCAGAGACAAT TCCAAGAACACGTTA TATCTTCAAATGAAGA GCCTGAGAGCCGAG GACACGGCTGTTTAT TACTGTGCGAGAGAT GTGTCTGATGCTTTT GATATCTGGGGCCAA GGGACAATGGTCACC GTCTCTTCAG				TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA CAGAATTCACTCT CACAATCAGCAGT CTGCAGCCTGAAG ATCTTGCAACTTA TTACTGTCAACAG CTTAATAGTCTCC CTCCGAAGCTCAC TTTCGGCGGAGG GACCAAGGTGGA GATCAAAC
	B2083	Delta BT	Singlet	VH1-2	JH6	1325	CAGGTGCAGCTGGT GCAGTCTGGGGCTG AGATGAAGAAGCCTG GGGCCTCAGTGAAG GTCTCCTGCAAGGCT TCCAGATACACCTTC ACCGGCTACTATATA CACTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GATGGATCAACCCTG ACAGTGGTGGCGTAA ACTATGCACAGAAGT TTCAGGGCAGGGTCA CCATGACCAGGGACA CGTCCATCAACACAG CCTACATGGAGCTGA GCAGTCTGAGATCTG ACGACACGGCCGTGT ATTACTGTGCGACCC ACGTACTTCGATCTT	VL2-23	JL3	1326	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA TCACCATCTCCTG CACTGGAACCAAC AGTGATGTTGGGG CTTATGACCTTGT CTCCTGGTACCAA CAGCACCCAGACA AAGCCCCCAAACT CATCATTTATGAA GTCACTAAGCGTC CCTCAGGGGTTTC TAATCGCTTCTCT GGCTCCAAGTCTG GCAACACGGCCT CCCTGACAATCTC TGGGCTCCAGGC TGACGACGAGGC TGATTATTTCTGCT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTAGTGGTGGTACCT GTTACGAGTATTATTA CTACGGTATGGACGT CTGGGGCCAAGGGA CCACGGTCACCGTCT CCTCAG				GCTCATTTACAGG TCGTAGCGCCTCC TTTTGGGTGTTCG GCGGAGGGACCA AGCTGACCGTCCT AG
	B2084	Delta BT	Singlet	VH3-7	JH4	1327	GAGGTGCAGCTGGT GGAGTCTGGGGGAG CCTTGGTCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGTAACC TCTGGATTCACCCTC AGCGACTATTGGATG AACTGGGTCCGCCAG GCTCCAGGGAAGGG GCTGGAGTGGGTGG CCCTAATAAAGAAAG ATGGAAGTGAGACAA AGTATGTGGACTCTC TAAGGGGCCGATTCA CCATCTCCAGAGACA ACGCCAAGAATTCAC TATATCTCCAGATGG ATAGCCTGAGAGTCG ACGACACGGCCGTGT ATTATTGTGTGGCAG GGGCAGGATGGCTA CCTGACTACTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG	VL1-51	JL3	1328	CAGTCTGTGCTGA CTCAGCCGCCCTC AGTGTCTGCGGC CCCAGGACAGAA GGTCACCATCTCC TGCTCTGGAAGCA GCTCCAACATTGG GAATAATTATGTAT CCTGGTACCAGCA GCTCCCAGGAACA GCCCCCAAACTCC TCATCTATGAAAA CAATAAGCGAGCC TCAGGGATTCCTG ACCGATTCTCTGG CTCCAAATCTGGC ACGTCAGCCACCC TGGGCATCACCAG ACTCCAGAGTGG GGACGAGGCCGA TTATTACTGCGGA ACTTGGGATAGCA ACCTGAGTGCCTC TTGGGTGTTCGGC GGAGGGACCAAG CTGACCGTCCTAG
	B2085	Delta BT	Singlet	VH1-69	JH6	1329	CAGGTCCAGCTGGTG CAGTCTGGGGCTGA	VK1-39	JK2	1330	GACATCCAGTTGA CCCAGTCTCCATC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGTGAAGAAGCCTG GGTCCTCGGTGAAG GTCTCCTGCAAGGCT TCTGGAGACACCTTC AACAGATATGCTATC AGCTGGGTGCGACA GGCCCCTGGACAAG GGCTTGAGTGGATGG GAAGGATCATCCCTA TCTCGGGTATAGCAA ACTACGCACAGAAGT TCCAGGGCAGAGTCA CGATTACCGCGGACA AATCCACGAGCACAG CCTACATGGAGCTGA GCAGCCTGAGATCTG AGGACACGGCCGTG TATTACTGCGCGAGA TATCCGGTGACTACG GGTTTCTACTACTAC GCTATGGACGTCTGG GGCCAAGGGACCAC GGTCACCGTCTCCTC AG				CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAG CCAGAGTATCAGC AGCTATTTAAATT GGTATCAGCAGAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATGCTGCAT CCAGTTTGCAAAG TGGGGTCCCATCA AGGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTGCCC CAACTTTTGGCCA GGGGACCAAGCT GGAGATCAAAC
	B2086	Delta BT	Singlet	VH3-33	JH4	1331	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGGAGGTCCCTGAG ACTCTCCTGTGCAGT GTCTGGATTCACCTT CAGTAAATATGGCAT GCACTGGGTCCGCC AGGCTCCAGGCAAG GGGCTGGAGTGGGT	VK1-33	JK4	1332	CATCCGGATGACC CAGTCTCCATCCT CCCTGTCTGCATC TGTTGGAGACAGA ATCACCATTACTT GCCAGGCGAGTC AGGACATTAGGAA GTATTTAAATTGG TATCAGCAGAAAC CAGGGAAAGCCC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GGCAGTCATATGGTA TGATGGAAGTAATAA ATATTATGTAGACTCC GTGAAGGGCCGATTC ACCACCTCCAGAGAC AATTCCAAGAACACG TTGTATCTGCAAATG AGCAGCCTGAGAGC CGACGACACGGCTGT GTATTACTGTGTAAA GGCGGGATACAGCTA TGCCTACACCCCCTA CTACTTTGACTACTG GGGCCAGGGAACCC TGGTCACCGTCTCCT CAG				CTAAGCTCCTGAT CTACGATGCATCC GATTTGGAAACAG GGGTCCCATCAAG GTTCAGTGGAAGT GGATCTGGGACA GATTTTACTTTAAC CATCAGCAACCTG CAGCCTGAAGATT TTGCAAGATATTA CTGTCAACAGAAT GATAATCTCCCGC TCACTTTCGGCGG AGGGACCAAGGT GGAGATCAAAC
	B2087	Delta BT	Singlet	VH3-9	JH4	1333	GAAGTGCAGCTGGTG GAGTCTGGGGGAGG CTTGGTACAGCCTGG CAGGTCCCTGAGACT CTCCTGTGCAGCCTC TGGATTCACGTTTGA TAATCATGCCATGCA CTGGGTCCGGCAAG CTCCAGGGAAGGGC CTGGAGTGGGTCTCA GGTGTGAGTTGGAAT AGTGGAACCATAGGC TATGCGGACTCTGTG AAGGGCCGATTCATC ATCATCAGAGACAAC GCCAAGAACTCCCTG TATCTGCAAATGAAC CGTCTGAGACCTGAG	VL1-51	JL2	1334	CAGTCTGTGTTGA CTCAGCCGCCCTC AGTGTCTGCGGC CCCAGGACAGAA GGTCACCATCTCC TGCTCTGGAACCA GCTCCAACATTGG AAATAATTATGTAT CCTGGTACCAGCA GCTCCCAGGAATA GCCCCCAAACTCC TCATTTATGACAAT AATAAGCGACCCT CAGGGATTCCTGA CCGATTCTCTGGC TCCAAGTCTGGCA CGTCAGCCACCCT GGGCATCACCGG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GACACGGCCTTATAT TACTGTGCAAAAGAT GGGTCGTTTCTTGAT ACCGACCATTTCTAC TTTGACTACTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG				ACTCCAGACTGGG GACGAGGCCGAT TATTACTGCGGAA CATGGGATAGCG GCCTGAGTGCTGT GGTATTCGGCGG AGGGACCAAGCT GACCGTCCTAG
	B2088	Delta BT	Singlet	VH4-31	JH4	1335	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGCCTT CACAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGGCTCCATCA GCAGTAGTGATTACT ACTGGAGCTGGGTCC GCCAGCGCCCAGGG AAGGGCCTGGAGTG GATTGGGTACGCCTA TTACACTGGGATCAC GTACTACAACCCGTC CCTCAAGAGTCGGCT TACCATCTCAGTAGA CACGTCTAAGAACCA GTTCTCCCCTGAGGCT GAGCTCTGTGACTGC CGCGGACACGGCCG TCTATTACTGTGCGA GGATAGGCCGCCCG TTTGGAGTGGTCCCC GGCTTTGACAACTGG GGCCAGGGAACCCT GGTCACCGTCTCCTC AG	V:2-23	JL2	1336	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA CCACCATCTCCTG CACTGGAACCAGC GGTGATGTTGGGA GTTATGACCTCGT CTCCTGGTATCAA CACCACCCAGGC AAAGCCCCCAAAC TCATGATTTATGA GGTCACTAAGCG GCCCTCAGGGGT TTCTAATCGCTTC TCTGGCTCCAAGT CTGGCAACACGG CCTCCCTGACAAT CTCTGGGCTCCAG GCTGAGGACGAG GCTGATTATTACT GCTGCTCATATGC AGGTAGTAGCGCT GTAATATTCGGCG GAGGGACCAAGC TGACCGTCCTAG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
	B2089	Delta BT	Singlet	VH3-30	JH4	1337	CAGGTGCAGCTGGTGGAGTCTGGGGGAGGCGTGGTCCAGCCTGGGAGGTCCTTGAGACTCTCCTGTGAAGCCTCTGGATTCAGCTTCAGCACTCATGGCATGCACTGGGTCCGCCAGGCTCCAGGCAAGGGGCTGGAGTGGGTGGCACTTATATATTTTGATGGAAAAAAGACAAAGTATTCTGACTCCGTGAAGGGCCGATTCACCGTCTCCAGAGACAATTCCAGGAACACACTCTTTCTACAAATGACCCGCCTGAGAACTGAAGACACGGCTGTCTATTATTGTGCGAGAGAGGGGGGAAGTTACTCTGATAGTCGGGAACTACTTTGACTATTGGGGCCAGGGAACCTTGGTCACCGTCTCCTCAG	VK1-39	JK2	1338	GACATCCAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTGGGAGACAGAGTCACCATCACTTGCCGGGCAAGTCAGTACATTAGCAACTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAAGCTCCTGATCTATGCTGCATCCAGTTTGCAAAGTGGGGTCCCATCACGGTTCAGTGGCAGTGGATCTGGGACAGATTTCACTCTCACCATCAGCAGTCTACAACCTGAAGATTTTGCAACTTATTACTGTCAACAGAGTTACACTAATCCTCTGTACACTTTTGGCCAGGGGACCAAGCTGGAGATCAAAC
	B2090	Delta BT	Singlet	VH3-13	JH2	1339	GAGGTGCAGCTGGTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTGCAGCCTCTGGATTCACCTTCAGTAGCTACGACATGCACTGGGTCCGCCAA	VK1-39	JK5	1340	GACATCCAGTTGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTGGGAGACAGAGTCACCATCACTTGCCGGGCAAGTCAGTTCATTAGCAGCTATTTAAATTG

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GAAACAGGAAAAGGT CTGGAGTGGGTCTCA GCTATTGGTACCGCT GGTGACACATACTAT CTAGGCTCCGTGAAG GGCCGATTCACCATC TCCAGAGAAAATGCC AAGAACTCCTTGTAT CTTCAAATGAACAGC CTGAGAGCCGGGGA CACGGCTGTGTATTA CTGTGCAAGGGCGG GGAATGGCTACAATT TGGGGAGCTGGTACT TCGATCTCTGGGGCC GTGGCACCCTGGTCA CTGTCTCCTCAG				GTATCAGCAGAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CACTTTGCAAAGT GGGGTCCCATCAA GGTTCAGTGGCG GTGGATCTGGGA CAGATTTTACTCT CACCATCAGCAGT CTGCAACGTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTATGC CTCCAATCTCCTT CGGCCAAGGGAC ACGACTGGAGATT AAAC
	B2091	Delta BT	Singlet	VH3-66	JH6	1341	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGAATCACCGTC AGTAGCAACTACATG AGCTGGGTCCGCCA GGCTCCAGGGAAGG GACTGGAGTGGGTCT CAGTTATTTATAGCG GTGGTAGCACATTCT ACGCAGACTCCGTGA AGGGCAGATTCTCCA TCTCCAGAGACAACT CCAATAACACGCTGC	VK1-5	JK1	1342	GACATCCAGATGA CCCAGTCTCCTTC CACCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCCAG TCAGAGTATTAGT AGCTGGTTGGCCT GGTATCAACAGAA ACCAGGGAAAGC CCCTAAGCTCCTG ATCTATAAGGCGT CTAGTTTAGAAAG TGGGGTCCCATCA AGGTTCAGCGGC AGTGGATCTGGGA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATCTTCAAATGAACA GCCTGAGAGTCGAG GACACGGCTGTTTAT TACTGTGCGAGAGAT CTTGTCGTGTGTGGGGC ATGGACGTCTGGGG CCAAGGGACCACGG TCACCGTCTCCTCAG				CAGAATTCACTCT CACCATCAGCAGC CTGCAGCCTGATG ACTTTGCAACTTA TTACTGCCAACAG TATAATAGTTATAC GTGGACGTTCGG CCAAGGGACCAA GGTGGAAATCAAA C
	B2092	Delta BT	Singlet	VH3-48	JH6	1343	GAGGTGCAGCTGGT GGAGTCTGGGGGAG GCTTGGTACAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCGGCC TCTGGATTCACCTTC AGTAGTTTTAACATGA ATTGGGTCCGCCAGG CTCCAGGGAAGGGG CTGGAGTGGGTTTCA TACATTAGTACTAGT GGTAGTACCATATAC TACACGGCTGTATAT TACTGTGCGAGAGGA GTGGGACCTAGGTCT TATTACTACTACGGTA TGGACGTCTGGGGC CAAGGGACCACGGT CACCGTCTCCTCAG	VK1-39	JK5	1344	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT CAGAGCATTAGCA GCTTTTTAAATTG GTATCAGCAGAAA CCAGGGAAAGCC CCAAACCTCCTGA TCTATGCTGCATC CAGTTTGGCAAGC GGGGTCCCATCAA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACTCT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTACCC TCCCGATCACCTT CGGCCAAGGGAC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
											ACGACTGGAGATT AAAC
	B2093	Delta BT	Singlet	VH3-33	JH4	1345	CAGGTGCAGCTGGT GGAGTCTGGGGGAG GCGTGGTCCAGCCT GGTAATTCCCTGAGA CTCTCCTGTGCAGCG TCTGGATTCACCTTC AGTACCTATGGCATG CACTGGGTCCGCCA GGCTCCAGGCAAGG GGCTGGAGTGGGTG GCAATTATCTGGTAT GATGGAAATAATAAA TTCTATGGAGACTCC GTGAAGGGCCGATTC ACCATCTCCAGAGAC AATTCCAAGAACAAA CTATATCTGCAAATG AACAGCCTGAGAGCC GAGGACACGGCTGT GTATTACTGTGCGAG ATCGGGTATACGATT TTCGGAGTGGTTATT GCAAGACTACTGGGG CCAGGGAACCCTGGT CACCGTCTCCTCAG	VK3-20	JK2	1346	GAAATTGTGTTGA CGCAGTCTCCAG GCACCCTGTCTCT GTCTCCAGGGGA AAGAGCCACCCTC TCCTGCAGGGCC AGTCAGAGTATTA GCATCAGCTACTT AGCCTGGTACCAG CAGAAACCTGGCC AGGCTCCCAGGC TCCTCATCTATGG TGCATCCAGCAGG GCCACTGGCATCC CAGACAGGTTCAG TGGCAGTGGGTCT GGGACAGACTTCA CTCTCACCATCAG CAGACTGGAGCCT GAAGATTTTGCAG TGTATTACTGTCA GCAGTTTGGTAGT ACACGGGCCACTT TTGGCCAGGGGA CCAAGCTGGAGAT CAAAC
	B2094	Delta BT	Singlet	V4-59	JH2	1347	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGGCTT CGGAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGACTCCATCA	VK1-39	JK3	1348	GACATCCAGATGA CCCAGTCTCCATC CTCCCTGTCTGCA TCTGTAGGAGACA GAGTCACCATCAC TTGCCGGGCAAGT

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							GTCGTTACTACTGGA GCTGGATCCGGCAG CCCCCAGGGAAGGG ACTGGAGTGGATTGG GTATATCTATGACAG TAGGAGCACCAACTA CAACCCCTCCCTCAA GAGTCGAGTCACCAT ATCAATAGACACGTC CAAGAACCACTTCTC CCTGAAGCTGAGCTC TGTGACCGCCGCAGA CACGGCCGTGTATTA CTGTGCGAGACATGA AGTGTTGACTGCTAT TCTCCCGTACTTCGA TCTCTGGGGCCGTG GCACCCTGGTCACTG TCTCCTCAG				CAGAGCATTAACA GGTACTTAAATTG GTATCAGCAAAAA CCAGGGAAAGCC CCTAAGCTCCTGA TCTATGCTGCATC CACTTTGCAAAGT GAGGTCCCATCGA GGTTCAGTGGCA GTGGATCTGGGA CAGATTTCACACT CACCATCAGCAGT CTGCAACCTGAAG ATTTTGCAACTTA CTACTGTCAACAG AGTTACAGTCCTC GGGGGATCACTTT CGGCCCTGGGAC CAAGGTGGATGTC AAAC
	B2095	Delta BT	Singlet	VH4-59	JH2	1349	CAGGTGCAGCTGCA GGAGTCGGGCCCAG GACTGGTGAAGGCTT CGGAGACCCTGTCCC TCACCTGCACTGTCT CTGGTGACTCCATCA GTCGTTACTACTGGA GCTGGATCCGGCAG CCCCCAGGGAAGGG ACTGGAGTGGATTGG GTATATCTATGACAG TAGGAGCACCAACTA CAACCCCTCCCTCAA GAGTCGAGTCACCAT	VL6-57	JL2	1350	AATTTTATGCTGA CTCAGCCGCACTC TGTGTCGGAGTCT CCGGGGAAGACG GTAACCATCTCCT GCACCCGCAGCA GTGGCAGCATTGA CAGCAACTATGTT CAGTGGTACCAGC AGCGCCCGGGCA GTGCCCCCACCA CTGTGATCTTTGA GGATAACCAAAGA CCCTCTGGGGTC

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							ATCAATAGACACGTC CAAGAACCACTTCTC CCTGAAGCTGAGCTC TGTGACCGCCGCAGA CACGGCCGTGTATTA CTGTGCGAGACATGA AGTGTTGACTGCTAT TCTCCCGTACTTCGA TCTCTGGGGCCGTG GCACCCTGGTCACCG TCTCCTCAG				CCTGATCGCTTCT CTGGCTCCATCGA CACCTCATCCAAC TCTGCCTCCCTCA CCATCTCTGGACT GAAGACTGAGGA CGAGGCTGACTAC TACTGTCAGTCTT ATGATAGCAGCAT CCATGTGGTATTC GGCGGAGGGACC AAGCTGACCGTCC TAG
	B2096	Delta BT	Singlet	VH3-53	JH4	1351	GAGGTGCAGCTGGT GGAGTCTGGAGGCG GCTTGATCCAGCCTG GGGGGTCCCTGAGA CTCTCCTGTGCAGCC TCTGGGCTCACCGTC AGTAGCAACTACATG AGCTGGGTCCGCCA GGCTCCAGGGAAGG GGCTGGAGTGGGTC TCAGTTATTTATAGCG GTGGTAGCACATTTT ATTCAGACTCCGTGA AGGGCCGATTTACCA TCTCCAGAGACAATT CCAAGAACACTCTGT ATCTTCAAATGAACA GCCTGAGAGCCGAA GACACGGCCGTGTAT TACTGTGCGAGAGAT CGAAAGGAAAACTAC	VL2-14	JL1	1352	CAGTCTGCCCTGA CTCAGCCTGCCTC CGTGTCTGGGTCT CCTGGACAGTCGA TCATCATCTCCTG CACTGGAACCAGC AGTGACGTTGGTG GTTTTCATTATGTC TCTTGGTACCAAC AGCACCCAGGCA AAGCCCCCAAACT CATGATTTATGAT GTCAGTAATCGGC CCTCGGGGGTTTC TAATCGCTTCTCT GGCTCCAAGTCTG GCAACACGGCCT CCCTGACCATCTC TGGGCTCCAGCCT GAGGACGAGGCT GATTATTACTGCA

Patient ID	Antibody ID	Timepoint	Clone	IGH V gene	IGH J gene	SEQ ID NO	IGH VDJ (nt)	IGL V gene	IGL J gene	SEQ ID NO	IGL VJ (nt)
							TTTGACTACTGGGGC CAGGGAACCCTGGTC ACCGTCTCCTCAG				GCTCATATACAAG CGGCAGCACTCTC TTTTTATGTCTTCG GAACTGGGACCAA GGTCACCGTCC

Table 2 (continued)

							Neutralization [ng/ml]	
			EC50 [ng/ml]				Wuhan-Hu-1/293TAce2	
Patient ID	Antibody ID	Class	RBD Wuhan-Hu-1	RBD Delta	SPIKE			
			Wuhan-Hu-1	Delta	Omicron BA.1		IC50	IC90
B030	B2000	C3	3.632	19.105	38.07		5.14	26.39
	B2002	ND	2.9525	5.889	11.86		16.28	53.07
	B2003	None	1.358	49.92	1.89		1000.00	1000.00
	B2004	C2/3	4.065	506.05	8.946		45.53	464.39
	B2005	ND	3.026	<1000	32.865		13.52	229.75
	B2006	None	2.223	5.7425	9.078		1000.00	1000.00
	B2007	ND	<1000	<1000	<1000		N.A.	N.A.
	B2008	C1/2	226.25	<1000	<1000		1000.00	1000.00
	B2009	ND	2.6305	16.315	10.945		528.47	1000.00
	B2010	ND	<1000	<1000	<1000		N.A.	N.A.
	B2011	ND	3.1275	27.695	9.6535		1000.00	1000.00
	B2012	ND	<1000	<1000	<1000		N.A.	N.A.
	B2014	ND	2.1455	11.665	41.005		10.24	55.73
	B2097	ND	3.2665	5.0675	11.93		1000.00	1000.00
	B2098	ND	5.27	8.9615	55.89		3.16	26.46
	B2099	ND	<1000	<1000	<1000		N.A.	N.A.
	B2100	ND	<1000	<1000	<1000		N.A.	N.A.
	B2101	ND	<1000	<1000	<1000		N.A.	N.A.
	B2102	ND	7.2815	42.83	20.455		115.97	1000.00
	B2103	ND	6.483	53.195	515.55		1000.00	1000.00
	B2104	ND	7.6905	15.545	46.33		1000.00	1000.00
	B2105	ND	<1000	<1000	<1000		N.A.	N.A.
	B2106	ND	3.248	<1000	<1000		156.52	1000.00
	B2107	ND	<1000	<1000	<1000		N.A.	N.A.
	B2108	ND	1.635	<1000	318.25		31.47	366.78
	B2109	ND	<1000	<1000	<1000		N.A.	N.A.
	B2111	ND	3.565	199.1	14.41		15.83	334.64

B039	B001	ND	1.5345	114.56	13.94		246.65	1000.00
	B002	None	2.956	6.386	6.0155		1000.00	1000.00
	B003	C1/2	3.3765	7.4945	7.893		9.31	58.76
	B004	ND	<1000	<1000	<1000		N.A.	N.A.
	B005	ND	<1000	<1000	12.46		N.A.	N.A.
	B006	ND	5.5555	50.035	6.044		719.47	1000.00
	B007	ND	1.425	2.711	50.22		1000.00	1000.00
	B008	ND	2.7145	6.347	152.3		8.39	54.08
	B009	ND	208.05	<1000	<1000		1000.00	1000.00
	B010	ND	3.7095	5.5875	12.325		80.23	1000.00
	B011	ND	4.455	218.45	418.4		1000.00	1000.00
	B012	ND	<1000	<1000	<1000		N.A.	N.A.
	B013	None	3.6475	14.355	9.1685		1000.00	1000.00
	B014	ND	2.9035	41.16	65.96		1000.00	1000.00
	B015	ND	3.738	<1000	30.14		11.51	60.15
	B016	ND	3.38	471.3	2.962		11.12	198.29
	B017	ND	2.344	2.8195	<1000		1.45	10.84
	B018	ND	<1000	<1000	<1000		N.A.	N.A.
	B019	ND	2.4205	24.46	14.93		1000.00	1000.00
	B020	ND	4.392	40.96	57.95		1000.00	1000.00
	B023	ND	1.8705	6.906	33.67		1000.00	1000.00
	B024	ND	<1000	<1000	<1000		N.A.	N.A.
	B026	ND	15.075	451.05	<1000		1000.00	1000.00
	B028	ND	608.7	<1000	<1000		1000.00	1000.00
	B029	ND	<1000	<1000	<1000		N.A.	N.A.
	B030	ND	<1000	<1000	<1000		N.A.	N.A.
	B031	ND	<1000	<1000	<1000		N.A.	N.A.
	B034	ND	85.23	<1000	<1000		1000.00	1000.00
	B035	ND	7.0625	<1000	<1000		1000.00	1000.00
B046	B1058	C2/3	1.637	<1000	<1000		11.64	577.50
	B1059	C2/3	1.4265	31.235	10.285		14.41	49.87
	B1060	C1/2	2.7005	15.725	218.4		4.66	16.64
	B1061	ND	2.6335	23.81	9.5725		2.86	8.72
	B1062	ND	2.679	14.75	67.625		3.82	19.64

	B1063	C1/2	2.6285	2.3935	5.422		4.45	16.67
	B1064	C1/2	2.263	17.575	<1000		7.63	34.29
	B1065	C2/3	2.545	3.899	10.651		6.49	20.32
	B1066	C2/3	1.7565	2.5215	5.173		7.44	43.72
	B1067	C4	2.973	6.2955	15.015		1000.00	1000.00
	B1068	C1/4	2.3215	9.612	40.65		45.85	535.61
	B1069	C2/3	3.3075	6.9965	2.943		76.32	1000.00
	B1070	C1/4	2.4595	5.4585	8.1385		17.69	265.00
	B1071	C2/3	3.261	<1000	4.1535		2.62	27.53
	B1072	C4	3.6325	6.7775	<1000		14.23	111.33
	B1073	C2/3	2.4485	<1000	5.9275		8.00	102.95
	B1074	C3	4.432	17.03	5.6905		1000.00	1000.00
	B1075	C1/2	4.703	4.4855	<1000		8.16	28.23
	B1107	ND	<1000	<1000	<1000		N.A.	N.A.
	B1108	ND	<1000	<1000	<1000		N.A.	N.A.
	B1109	ND	3.238	<1000	<1000		1000.00	1000.00
	B1110	ND	3.8795	<1000	<1000		831.83	1000.00
	B1111	ND	6.274	<1000	157.8		36.46	503.50
	B1112	ND	2.413	29.395	27.225		146.38	1000.00
	B1113	ND	3.7945	15.835	11.01		1000.00	1000.00
	B1114	ND	<1000	<1000	<1000		N.A.	N.A.
	B1115	ND	<1000	<1000	<1000		N.A.	N.A.
	B1116	ND	3.246	14.48	40.965		850.67	1000.00
	B1117	ND	2.5735	11.795	57.53		618.31	1000.00
	B1118	ND	3.6785	21.855	8.0985		1000.00	1000.00
	B1119	ND	3.0115	63.71	114.3		1000.00	1000.00
	B1120	ND	2.796	9.5755	37.42		1000.00	1000.00
	B1121	ND	2.531	31.245	<1000		8.56	61.92
B048	B2052	C4	2.346	8.452	22.505		25.75	341.14
	B2053	ND	1.0505	13.225	7.933		212.84	1000.00
	B2054	C4	3.3855	7.666	42.25		1000.00	1000.00
	B2055	C3	2.4985	16.595	23.04		3.51	20.38
	B2056	None	2.13	31.04	7.4615		1000.00	1000.00
	B2057	C1/2	1.985	6.6705	7.318		22.68	475.50

	B2058	ND	1.855	12.435	145.45		6.34	94.43
	B2059	ND	2.9135	9.1315	5.358		1000.00	1000.00
	B2060	C1/2	7.792	56.02	22.375		1000.00	1000.00
	B2061	C4	2.9005	8.517	34.675		57.95	570.46
	B2062	ND	<1000	<1000	<1000		N.A.	N.A.
	B2063	ND	4.0185	12.515	7.6265		162.19	1000.00
	B2064	ND	9.91	1.891	34.46		12.70	174.93
	B2065	ND	2.714	143.05	2.506		1.76	15.03
	B2066	C4	7.718	14.53	13.32		1000.00	1000.00
	B2112	ND	11.54	<1000	774.25		1000.00	1000.00
	B2113	ND	7.3295	170.4	362		600.16	1000.00
	B2114	ND	<1000	<1000	<1000		N.A.	N.A.
	B2115	ND	<1000	<1000	<1000		N.A.	N.A.
	B2116	ND	2.4525	<1000	<1000		2.63	19.14
	B2117	ND	3.99	7.5485	60.745		11.48	52.81
	B2118	ND	2.3695	39.21	<1000		180.71	1000.00
	B2119	None	1.7615	42.235	51.39		1000.00	1000.00
	B2120	None	4.1245	13.55	5.3585		1000.00	1000.00
	B2121	ND	2.295	7.1095	118.8		1000.00	1000.00
	B2122	ND	1.319	22.8	93.09		670.35	1000.00
	B2123	C1/2	12.23	<1000	<1000		1000.00	1000.00
	B2124	ND	2.487	10.275	11.695		10.43	395.10
	B2125	ND	<1000	<1000	<1000		N.A.	N.A.
	B2126	ND	2.503	2.61	48.03		5.99	30.29
C018	B2015	ND	3.7825	5.889	5.7525		123.64	1000.00
	B2016	ND	1.232	<1000	<1000		18.36	127.16
	B2017	ND	4.6915	32.34	8.0995		1000.00	1000.00
	B2018	ND	2.696	<1000	<1000		21.52	117.43
	B2019	ND	2.3385	7.1995	16.175		36.58	900.49
	B2020	ND	9.999	<1000	<1000		1000.00	1000.00
	B2021	ND	2.351	10.32	4.3385		1000.00	1000.00
	B2023	ND	22.945	712.65	148.1		1000.00	1000.00
	B2024	ND	1.501	9.5185	20.955		6.25	40.08
	B2025	ND	10.405	13.11	<1000		13.42	91.93

	B2026	ND	3.3145	10.034	8.748		5.60	144.98
	B2027	ND	2.437	15.245	5.939		1000.00	1000.00
	B2028	ND	11.575	97.92	48.545		1000.00	1000.00
	B2029	ND	2.366	49.17	<1000		3.60	22.83
	B2030	ND	0.7198	<1000	3.681		3.66	22.71
	B2031	ND	2.581	51.16	7.8635		17.57	119.96
	B2032	ND	2.7795	8.4075	29.49		31.63	198.05
	B2033	ND	3.5425	28.365	8.357		1000.00	1000.00
	B2141	ND	2.447	14.71	55.9		5.69	69.17
	B2143	ND	3.25	13.655	6.7945		1000.00	1000.00
	B2144	ND	1.182	45.38	8.299		1000.00	1000.00
	B2034	ND	2.447	<1000	3.415		4.39	31.64
	B2035	ND	2.5155	42.7	4.7155		17.24	360.68
	B2036	ND	6.365	26.855	42.72		1000.00	1000.00
	B2037	None	2.4355	18.485	38.92		1000.00	1000.00
	B2038	ND	1.573	21.11	2.462		2.09	19.27
	B2039	ND	1.2595	15.25	9.8485		9.98	131.36
	B2041	ND	1.9565	<1000	<1000		4.53	21.90
	B2042	ND	2.5695	16.49	35.655		1000.00	1000.00
	B2043	ND	3.152	4.684	2.429		89.12	1000.00
	B2044	ND	2.5075	3.6495	1.5725		4.86	19.30
	B2045	ND	<1000	<1000	<1000		N.A.	N.A.
	B2046	ND	4.3495	3.8805	<1000		20.58	106.61
	B2047	ND	3.086	8.6265	4.067		1000.00	1000.00
	B2048	C4	5.149	18.165	46.595		22.10	1000.00
	B2049	None	1.7075	10.205	9.5285		1000.00	1000.00
	B2050	C2/3	2.6525	7.1445	19.12		1000	1000
	B2051	C2/3	1.0455	10.9875	6.1555		21.22	205.04
	B2127	ND	2.052	6.253	19.585		1000.00	1000.00
	B2128	ND	2.795	3.655	<1000		6.09	29.01
	B2129	C4	3.8645	22.57	59.97		1000.00	1000.00
	B2130	ND	3.9265	<1000	<1000		819.18	1000.00
	B2131	ND	3.216	16.875	632.95		7.49	64.69
	B2132	ND	12.415	<1000	<1000		6.42	26.34

	B2133	ND	<1000	<1000	<1000		N.A.	N.A.
	B2134	ND	<1000	<1000	<1000		N.A.	N.A.
	B2135	ND	<1000	<1000	<1000		N.A.	N.A.
	B2136	ND	2.321	<1000	7.143		10.06	103.63
	B2137	ND	8.322	<1000	<1000		1000.00	1000.00
	B2138	ND	2.8075	7.9275	212.9		4.80	19.08
C023	B1001	C1/2	1.472	<1000	<1000		1.61	10.81
	B1002	C1/2	6.1365	32.69	<1000		14.16	68.58
	B1003	C1/4	2.6995	10.075	6.9015		23.87	423.88
	B1004	C4	2.986	9.587	6.7875		41.93	448.49
	B1005	C1/2	4.328	353.1	<1000		11.53	62.57
	B1006	C1/2	6.104	<1000	804.05		4.57	28.48
	B1007	ND	10.165	51.285	87.35		912.52	1000.00
	B1008	ND	5.5985	38.74	17.7		915.88	1000.00
	B1009	ND	9.195	2.656	<1000		915.88	1000.00
	B1010	ND	2.927	31.235	2.486		10.34	73.83
	B1011	C2/3	2.934	76.265	0.58025		8.10	49.16
	B1012	ND	3.989	206.6	4.759		5.52	52.90
	B1013	ND	4.6405	42.785	30.93		21.56	285.28
	B1014	ND	2.9585	49.735	35.105		29.76	493.13
	B1015	ND	1.0255	5.551	1.8855		1000.00	1000.00
	B1016	ND	2.796	507.3	10.595		9.53	423.74
	B1017	ND	3.815	236.55	46.52		53.63	1000.00
	B1018	ND	7.388	183.15	27.075		35.55	778.60
	B1019	ND	3.3795	6.4155	8.2655		27.43	238.42
	B1021	ND	3.1685	48.68	4.6695		382.89	1000.00
	B1022	ND	5.3635	<1000	18.125		9.34	106.18
	B1023	ND	3.216	<1000	44.2		18.39	72.51
	B1024	ND	2.005	9.981	17.825		75.49	371.82
	B1025	ND	3.856	10.667	7.908		19.69	115.10
	B1026	ND	2.6505	273.8	21.61		2.57	16.48
	B1027	ND	5.566	8.88	16.905		173.13	1000.00
	B1028	ND	2.871	<1000	9.5615		8.87	109.45
	B1029	ND	2.7405	10.69	8.103		72.41	1000.00

	B1030	ND	2.4115	58.5	15.19		1.18	13.57
	B1032	ND	2.6875	10.96	5.8315		14.45	137.74
	B1033	ND	2.973	316.55	12.405		9.32	615.60
	B1034	ND	4.054	303.85	2.813		4.35	42.21
	B1035	C3	4.553	7.964	10.7255		1000.00	1000.00
	B1036	ND	3.767	13.81	5.952		1000.00	1000.00
	B1037	ND	3.4445	20.72	50.335		19.95	254.70
	B1038	ND	2.195	21.365	15.175		679.63	1000.00
	B1039	ND	3.241	5.5055	2.11		1000.00	1000.00
	B1040	ND	2.0795	76.27	9.7255		4.87	796.20
	B1041	ND	3.4405	15.805	3.396		85.21	1000.00
	B1042	ND	2.7405	434.85	<1000		18.59	400.01
	B1043	ND	3.228	<1000	16.05		3.54	10.34
	B1044	ND	4.798	387.85	148.65		52.53	1000.00
	B1045	ND	1.987	25.435	<1000		0.91	6.54
	B1046	ND	3.3085	579.8	20.95		47.99	993.96
	B1047	ND	3.333	12.475	<1000		6.22	79.22
	B1048	ND	2.908	732.2	<1000		3.16	20.75
	B1049	ND	<1000	<1000	<1000		N.A.	N.A.
	B1050	ND	<1000	<1000	<1000		N.A.	N.A.
	B1051	ND	2.208	6.8055	17.34		25.81	88.67
	B1052	ND	1.878	74.24	<1000		1.32	6.50
	B1053	ND	2.7525	8.157	6.6745		34.14	259.60
	B1054	ND	268.8	<1000	<1000		1000.00	1000.00
	B1056	ND	<1000	<1000	<1000		N.A.	N.A.
	B1057	ND	2.557	13.505	<1000		69.67	1000.00
B001	B601	C1/2	2.6575	3.831	<1000		5.14	23.74
	B602	C1/2	2.2955	3.482	<1000		5.25	21.54
	B605	C1/2	1.956	2.558	<1000		1.91	11.92
	B606	C1/2	3.1945	9.8975	<1000		7.81	74.23
	B609	C1/2/3	3.0325	24	<1000		1.35	4.22
	B610	ND	2.5835	12.49	<1000		8.63	37.22
	B612	C1/2	3.1685	5.4455	<1000		8.10	41.09
	B614	C1/2	1.7565	4.627	<1000		7.56	30.85

	B615	ND	<1000	<1000	<1000		N.A.	N.A.
	B618	ND	1.8925	3.6785	22.22		70.73	530.68
	B621	ND	<1000	<1000	<1000		N.A.	N.A.
	B623	C4	1.9445	16.255	41.68		1000.00	1000.00
	B624	C1/2/3	1.313	50.535	24.56		1000.00	1000.00
	B625	ND	<1000	<1000	<1000		N.A.	N.A.
	B626	ND	1.5755	4.857	222.65		85.99	1000.00
	B628	C2/3	0.7748	74.095	18.705		36.99	520.33
	B630	ND	<1000	<1000	<1000		N.A.	N.A.
	B631	C4	6.853	191.65	984.65		1000.00	1000.00
	B632	C1/4	2.8015	3.172	14.195		32.08	361.94
	B633	C1/4	3.418	29.315	<1000		14.77	119.75
	B634	ND	8.9645	26.91	<1000		32.33	121.25
	B635	C1/2	2.156	6.288	<1000		11.13	39.37
B007	B1076	C1/2	3.787	17.22	<1000		8.25	84.28
	B1077	C3	4.244	19.17	26.96		1000.00	1000.00
	B1078	ND	3.0605	22.535	88.16		1000.00	1000.00
	B1079	ND	3.356	23.485	<1000		25.04	804.17
	B1080	ND	<1000	<1000	<1000		N.A.	N.A.
	B1081	C4	2.4225	12.2	<1000		7.75	424.16
	B1082	None	4.785	13.685	3.4345		1000.00	1000.00
	B1083	None	6.901	552.05	90.155		214.84	1000.00
	B1084	None	2.0595	38.04	2.753		1000.00	1000.00
	B1085	C4	2.4375	31.075	12.67		245.45	1000.00
	B1086	ND	2.188	3.734	35.98		53.04	1000.00
	B1087	C1/2	2.1195	3.8255	<1000		2.20	12.83
	B1088	C3	2.8945	148.6	100.775		171.19	1000.00
	B1089	C4	1.932	231.9	<1000		60.63	1000.00
	B1090	C4	0.28	53.79	32.77		1000.00	1000.00
	B1091	C1/4	0.6977	16.61	9.3305		27.46	607.54
	B1092	ND	654.25	<1000	<1000		1000.00	1000.00
	B1093	ND	2.2015	18.04	<1000		1.75	11.07
	B1094	ND	1.6765	62.835	54.93		2.62	16.14
	B1095	ND	1.8145	66.195	<1000		2.36	23.22

	B1096	ND	1.8725	6.2435	<1000		4.54	61.97
	B1097	C1/4	2.8105	14.5	26.46		10.75	184.42
	B1098	C1/4	8.7835	<1000	<1000		1000.00	1000.00
	B1099	ND	<1000	<1000	<1000		N.A.	N.A.
	B1100	C2/3	1.9155	14.425	3.4665		9.68	150.59
	B1101	C2/3	2.7285	22.335	3.9305		82.79	810.72
	B1102	ND	1.1265	256.15	139.85		3.42	17.93
	B1103	ND	6.171	757.45	1113.2		1000.00	1000.00
	B1104	C3	2.206	90.205	124.7		1000.00	1000.00
	B1105	None	3.5265	97.87	17.645		1000.00	1000.00
	B1106	ND	2.704	4.8515	32.24		1000.00	1000.00
B008	B651	None	0.8558	7.33	27.765		1000.00	1000.00
	B652	None	0.7551	4.4155	2.868		1000.00	1000.00
	B653	ND	1.3195	3.0435	<1000		6.76	13.60
	B654	ND	0.8187	1.4625	714.55		4.24	9.82
	B655	ND	1.116	3.0005	<1000		8.59	31.62
	B656	None	2.4785	6.8015	5.8575		1000.00	1000.00
	B657	ND	1.098	3.872	<1000		9.67	31.94
	B658	ND	2.485	3.568	30.27		13.52	43.22
	B659	ND	1.4895	2.234	6.8615		36.66	236.81
	B660	ND	5.607	71.79	<1000		72.79	1000.00
	B661	ND	0.98155	6.252	<1000		8.51	41.83
	B662	ND	1.3315	9.439	<1000		3.47	25.04
	B663	ND	1.434	3.6	10.164		1000.00	1000.00
	B664	ND	2.5995	61.98	35.125		26.41	438.93
	B666	ND	2.6025	8.2695	3.478		1000.00	1000.00
	B667	ND	2.664	5.0765	2.9685		1000.00	1000.00
	B668	ND	0.865	4.0425	3.723		1000.00	1000.00
	B669	None	1.1017	3.496	2.575		1000.00	1000.00
	B671	ND	<1000	<1000	<1000		N.A.	N.A.
	B672	None	1.166	7.58	2.722		1000.00	1000.00
	B673	ND	1.047	16.19	<1000		7.65	47.30
	B674	ND	1.483	25.55	<1000		14.33	99.52
	B675	ND	<1000	<1000	<1000		N.A.	N.A.

	B676	ND	1.9265	17.85	4.173		839.43	1000.00
	B677	ND	7.731	<1000	289.15		7.20	38.41
	B678	ND	2.7745	3.083	<1000		5.13	22.63
	B679	ND	<1000	<1000	<1000		N.A.	N.A.
	B680	ND	2.043	12.035	13.565		1000.00	1000.00
	B681	ND	2.675	2.383	3.023		11.86	33.04
	B682	ND	3.288	47.6	2.627		1000.00	1000.00
	B684	ND	2.297	7.8805	24.22		3.42	20.98
	B685	ND	2.732	750.7	<1000		12.04	241.07
	B686	ND	<1000	<1000	<1000		N.A.	N.A.
B014	B2067	None	1.575	13.48	24.005		1000.00	1000.00
	B2068	ND	<1000	<1000	<1000		N.A.	N.A.
	B2070	ND	<1000	<1000	<1000		N.A.	N.A.
	B2071	ND	3.198	6.5015	84.645		29.37	271.05
	B2072	None	1.8345	71.53	48.075		538.01	1000.00
	B2073	C1/2	10.674	146.5	189.55		863.88	1000.00
	B2074	ND	<1000	<1000	<1000		N.A.	N.A.
	B2075	ND	1.619	2.6775	24.985		1.56	7.23
	B2076	ND	3.2	<1000	40.05		4.15	18.09
	B2077	ND	<1000	<1000	<1000		N.A.	N.A.
	B2078	ND	2.9645	<1000	124.7		5.78	60.27
	B2079	ND	2.7465	<1000	132.6		1.49	17.43
	B2080	C4	3.7235	38.23	<1000		1000.00	1000.00
	B2081	C1/4	3.3175	27.09	279		1000.00	1000.00
	B2082	C1/2	1.2765	11.005	<1000		8.51	52.00
	B2083	ND	4.796	<1000	134.7		26.77	860.75
	B2084	ND	<1000	<1000	<1000		N.A.	N.A.
	B2085	ND	4.0295	47.695	<1000		4.09	28.40
	B2086	ND	3.5905	10.6455	39.855		1000.00	1000.00
	B2087	ND	2.4805	11.685	31.695		15.47	385.89
	B2088	ND	4.651	34.685	222.05		1000.00	1000.00
	B2089	ND	<1000	<1000	<1000		N.A.	N.A.
	B2090	ND	5.4345	34.82	310.45		1000.00	1000.00
	B2091	ND	7.6485	<1000	<1000		319.53	1000.00

	B2092	ND	<1000	<1000	<1000		N.A.	N.A.
	B2093	ND	3.771	<1000	<1000		1000.00	1000.00
	B2094	ND	<1000	<1000	<1000		N.A.	N.A.
	B2095	C2/3	6.7665	47.265	30.035		16.02	186.39
	B2096	C1/2	11.03	91.635	<1000		21.68	140.60

CLAIMS

1. An antibody or antigen-binding fragment thereof that binds to the S polypeptide of a Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), wherein the antibody or antigen-binding fragment thereof comprises:

a. a variable heavy chain CDR1 (HCDR1) comprising an amino acid sequence selected from SEQ ID NO: 1354, 1360, 1366, 1372, and 1378;

b. a variable heavy chain CDR2 (HCDR2) comprising an amino acid sequence of SEQ ID NO: 1355, 1361, 1367, 1373, and 1379;

c. a variable heavy chain CDR3 (HCDR3) comprising an amino acid sequence selected from SEQ ID NO: 1356, 1362, 1368, 1374, and 1380;

d. a variable light chain CDR1 (LCDR1) comprising an amino acid sequence selected from SEQ ID NO: 1357, 1363, 1369, 1375, and 1381;

e. a variable light chain CDR2 (LCDR2) comprising an amino acid sequence selected from SEQ ID NO: 1358, 1364, 1370, 1376, and 1382; and

f. a variable light chain CDR3 (LCDR3) comprising an amino acid sequence selected from SEQ ID NO: 1359, 1365, 1371, 1377, and 1383.

2. The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody or antigen-binding fragment thereof comprises: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1354, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1355, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1356, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1357, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1358, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1359.

3. The antibody or antigen-binding fragment thereof of claim 2, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 25, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 26.

4. The antibody or antigen-binding fragment thereof of claim 2 or claim 3, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH)

comprising or consisting of the amino acid sequence of SEQ ID NO: 25, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 26.

5. The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1360, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1361, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1362, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1363, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1364, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1365.

6. The antibody or antigen-binding fragment thereof of claim 5, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 395, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 396.

7. The antibody or antigen-binding fragment thereof of claim 5 or claim 6, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 395, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 396.

8. The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1366, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1367, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1368, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1369, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1370, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1371.

9. The antibody or antigen-binding fragment thereof of claim 8, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 397, and a light chain variable domain (VL) comprising

an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 398.

10. The antibody or antigen-binding fragment thereof of claim 8 or claim 9, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 397, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 398.

11. The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1372, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1373, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1374, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1375, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1376, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1377.

12. The antibody or antigen-binding fragment thereof of claim 11, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 191, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 192.

13. The antibody or antigen-binding fragment thereof of claim 11 or claim 12, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 191, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 192.

14. The antibody or antigen-binding fragment thereof of claim 1, wherein the antibody or antigen-binding fragment thereof comprises a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1378, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1379, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1380, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1381, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1382, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1383.

15. The antibody or antigen-binding fragment thereof of claim 14, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 219, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to SEQ ID NO: 220.

16. The antibody or antigen-binding fragment thereof of claim 14 or claim 15, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 219, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 220.

17. The antibody or antigen-binding fragment thereof of any one of claims 1-16, wherein the antibody or antigen-binding fragment thereof is a fully human antibody or antigen-binding fragment thereof.

18. The antibody or antigen-binding fragment thereof of any one of claims 1-17, wherein the antibody or antigen-binding fragment thereof binds to an epitope within the receptor binding domain (RBD) or the N-terminal domain (NTD) of the S polypeptide.

19. The antibody or antigen-binding fragment thereof of any one of claims 1-16, wherein the antibody or antigen-binding fragment thereof binds to an epitope selected from the following:

a. the supersite b-hairpin (residues 152-158 of SEQ ID NO: 1353);
b. the β8-strand (residue 97-102 of SEQ ID NO: 1353);
c. N4-loop (residues 178-188 of SEQ ID NO: 1353)
d. N-linked glycans at positions N122 and N149 of the spike polypeptide of SEQ ID NO: 1353;
e. residues 27-32, 57-60, 210-218, and/or 286-303 of the spike polypeptide of SEQ ID NO: 1353; and/or
f. residues 600-606 of the spike polypeptide of SEQ ID NO: 1353.

20. An antibody or antigen-binding fragment thereof, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100%

identical to a SEQ ID NO selected from column 7 of Table 2, and a light chain variable domain (VL) comprising an amino acid sequence that is at least about 75%, at least 85%, at least 90%, at least 95%, at least 99%, or 100% identical to a SEQ ID NO selected from column 11 of Table 2, wherein the VH SEQ ID No and the VL SEQ ID No are selected from the same row.

21. The antibody or antigen-binding fragment thereof of claim 20, wherein the antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of a SEQ ID NO selected from column 7 of Table 2, and a light chain variable domain (VL) comprising or consisting of a SEQ ID NO selected from column 11 of Table 2, wherein the VH SEQ ID No and the VL SEQ ID No are selected from the same row.

22. The antibody or antigen-binding fragment thereof of any one of claims 1-19, wherein the antibody or antigen-binding fragment thereof neutralizes SARS-CoV-2.

23. The antibody or antigen-binding fragment thereof of claim 22, wherein the antibody or antigen-binding fragment thereof inhibits the fusion of SARS-CoV-2 and a host cell membrane.

24. The antibody or antigen-binding fragment thereof of any one of claims 1-23, wherein the antibody or antigen-binding fragment thereof is cytotoxic to a SARS-CoV-2 infected host cell.

25. The antibody or antigen-binding fragment thereof of any one of the preceding claims, wherein the antibody or antigen-binding fragment thereof is a multivalent antibody or antigen-binding fragment comprising (a) a first target binding site that specifically binds to an epitope within the spike polypeptide, and (b) a second target binding site that binds to an epitope on a different epitope on the spike polypeptide or a different molecule.

26. The antibody or the antigen-binding fragment thereof of any one of the preceding claims, further comprising a variant Fc constant region.

27. The antibody or antigen-binding fragment thereof of any one of the preceding claims, wherein the antibody or antigen-binding fragment thereof is a chimeric antibody, a humanized antibody, or humanized antibody.

28. The antibody or antigen-binding fragment thereof of any one of the preceding claims, wherein the antibody or antigen-binding fragment thereof is a single-chain antibody, Fab, or Fab2 fragment.

29. The antibody or antigen-binding fragment thereof of any one of the preceding claims, wherein the antibody or antigen-binding fragment thereof is detectably labeled or conjugated to a toxin, a therapeutic agent, a polymer, a receptor, an enzyme, or a receptor ligand, preferably wherein the polymer is polyethylene glycol (PEG).

30. A polynucleotide encoding the antibody or antigen-binding fragment thereof of any one of claims 1-29.

31. A vector, comprising the polynucleotide of claim 30.

32. A cultured host cell comprising the vector of claim 31

33. A pharmaceutical composition comprising the antibody or antigen-binding fragment thereof of any one of claims 1-29, the polynucleotide of claim 30, or the vector of claim 31.

34. A pharmaceutical composition comprising two or more of monoclonal antibodies or antigen-binding fragments thereof, wherein the two or more monoclonal antibodies or antigen-binding fragments thereof are selected from:

a. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1354, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1355, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1356, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1357, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1358, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1359;
b. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1360, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1361, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1362, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1363, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1364, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1365;

c. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1366, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1367, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1368, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1369, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1370, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1371;

d. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1372, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1373, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1374, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1375, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1376, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1377; and

e. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1378, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1379, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1380, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1381, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1382, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1383.

35. The pharmaceutical compositions of claim 34, wherein the two or more monoclonal antibodies or antigen-binding fragments thereof are selected from:

a. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 25, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 26;

b. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 395, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 396;

c. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO:

397, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 398;

d. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 191, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 192; and

e. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 219, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 220.

36. The pharmaceutical composition of any one of claims 33-35, wherein the pharmaceutical composition further comprises a pharmaceutically acceptable carrier.

37. The pharmaceutical composition of any one of claims 33-36, for use in treating a SARS-CoV-2 infection in a subject.

38. A method of treating a SARS-CoV-2 infection in a subject, comprising administering to the subject therapeutically effective amount of the antibody or antigen-binding fragment thereof of any one of claims 1-29 or a therapeutically effective amount of the pharmaceutical composition of any one of claims 33-36.

39. A method of neutralizing SARS-CoV-2 in a subject, comprising administering to a subject in need thereof a therapeutically effective amount of the antibody or antigen-binding fragment thereof of any one of claims 1-29 or a therapeutically effective amount of the pharmaceutical composition of any one of claims 33-36.

40. A method of preventing a SARS-CoV-2 infection in a subject, comprising administering to a subject in need thereof a therapeutically effective amount of the antibody or antigen-binding fragment thereof of any one of claims 1-29 or a therapeutically effective amount of the pharmaceutical composition of any one of claims 33-36.

41. The method of any one of claims 38-40, wherein the subject is immunocompromised.

42. The method of any one of claims 38-41, wherein the method further comprises administering a second therapeutic agent, preferably wherein the second therapeutic agent comprises an anti-inflammatory drug or an antiviral compound.

43. The method of claim 42, wherein: (a) the antiviral compound comprises: a nucleoside analog, a peptoid, an oligopeptide, a polypeptide, a protease inhibitor, a 3C-like protease inhibitor, a papain-like protease inhibitor, or an inhibitor of an RNA dependent RNA polymerase; or (b) the antiviral compound is selected from: acyclovir, ganciclovir, vidarabine, foscarnet, cidofovir, amantadine, ribavirin, trifluorothymidine, zidovudine, didanosine, zalcitabine, and an interferon, and preferably wherein the interferon is an interferon-α or an interferon-β.

44. The method of claim 42 or claim 43, wherein the second therapeutic agent is administered before, after, or concurrently with the antibody or antigen-binding fragment thereof or the pharmaceutical composition thereof.

45. The method of any one of claims 38-40, wherein the pharmaceutical composition is administered to the subject after an exposure to SARS-CoV-2.

46. A kit for detecting a SARS-CoV-2 infection in a subject, comprising the antibody or antigen-binding fragment thereof of any one of claims 1-29.

47. A method of detecting the presence of a SARS-CoV-2 in a sample, comprising (1) contacting the sample with the antibody or antigen-binding fragment thereof of any one of claims 1-29, and (2) detecting the presence of an antibody-antigen complex, wherein the presence of the antibody-antigen complex indicates the presence of SARS-CoV-2.

48. The method of claim 47, wherein the antibody or antigen-binding fragment thereof is conjugated to a label, preferably wherein the label is selected from a fluorescent label, a chemiluminescent label, a radiolabel, and an enzyme.

49. The method of claim 47 or claim 48, further comprising contacting a secondary antibody with the antibody or antigen-binding fragment thereof, wherein the secondary antibody comprises a label.

50. The method of claim 49, further comprising detecting fluorescence or chemiluminescence of the label, preferably wherein the step of detecting the presence of an antibody-antigen complex comprises a competitive binding assay or ELISA.

51. The method of any one of claims 47-50, further comprising binding the sample to a solid support, preferably wherein the solid support is selected from microparticles, microbeads, magnetic beads, and an affinity purification column.

52. The method of any one of claims 47-51, wherein the sample is a blood sample, a nasal swab, or a throat swab.

53. A method of preparing an antibody or antigen-binding fragment thereof, comprising:

a. obtaining the cultured host cell of claim 32;
b. culturing the cultured host cell in a medium under conditions permitting expression of a polypeptide encoded by the vector and assembling of an antibody or antigen-binding fragment thereof; and
c. purifying the antibody or fragment from the cultured cell or the medium of the cell.

54. A kit comprising a pharmaceutically acceptable dose unit of the antibody or antigen-binding fragment thereof of any one of claims 1-29 or the pharmaceutical composition of any one of claims 33-36.

55. A kit for the diagnosis, prognosis or monitoring treatment of SARS-CoV-2 in a subject, comprising: the antibody or antigen-binding fragment thereof of any one of claims 1-29; and a least one detection reagent that binds specifically to the antibody or antigen-binding fragment thereof.

56. A method of neutralizing SARS-CoV-2 in a subject, comprising administering to a subject in need thereof a therapeutically effective amount of two or more monoclonal antibodies or antigen-binding fragments thereof of any one of claims 1-29.

57. A method of treating a SARS-CoV-2 in a subject in need thereof, comprising administering to a subject in need thereof a therapeutically effective amount of two or more monoclonal antibodies or antigen-binding fragments thereof of any one of claims 1-29.

58. A method of preventing a SARS-CoV-2 in a subject in need thereof, comprising administering to a subject in need thereof a therapeutically effective amount of two or more monoclonal antibodies or antigen-binding fragments thereof of any one of claims 1-29.

59. The method of any one of claims 56-58, wherein the two or more monoclonal antibodies or antigen-binding fragments thereof are selected from:

a. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1354, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1355, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1356, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1357, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1358, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1359;
b. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1360, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1361, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1362, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1363, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1364, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1365;
c. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1366, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1367, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1368, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1369, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1370, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1371;
d. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1372, a HCDR2 comprising an amino acid sequence of SEQ ID NO: 1373, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1374, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1375, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1376, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1377; and
e. an antibody or antigen-binding fragment thereof comprising: a HCDR1 comprising an amino acid sequence of SEQ ID NO: 1378, a HCDR2 comprising an amino acid

sequence of SEQ ID NO: 1379, a HCDR3 comprising an amino acid sequence of SEQ ID NO: 1380, a LCDR1 comprising an amino acid sequence of SEQ ID NO: 1381, a LCDR2 comprising an amino acid sequence of SEQ ID NO: 1382, and a LCDR3 comprising an amino acid sequence of SEQ ID NO: 1383.

60. The method of claim 59, wherein the two or more monoclonal antibodies or antigen-binding fragments thereof are selected from:

a. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 25, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 26;
b. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 395, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 396;
c. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 397, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 398;
d. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 191, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 192; and
e. an antibody or antigen-binding fragment thereof comprises a heavy chain variable domain (VH) comprising or consisting of the amino acid sequence of SEQ ID NO: 219, and a light chain variable domain (VL) comprising or consisting of the amino acid sequence of SEQ ID NO: 220.

61. The method of any one of claims 56-60, wherein the first antibody or antigen-binding fragment thereof and the second antibody or antigen-binding fragment thereof exhibit synergistic activity.

62. The method of any one of claims 56-61, further comprising administering to the subject a therapeutically effective amount of a second therapeutic agent or therapy.

63. The method of claim 62, wherein the second therapeutic agent comprises an anti-inflammatory drug or an antiviral compound.

64. The method of claim 63, wherein: (a) the antiviral compound comprises: a nucleoside analog, a peptoid, an oligopeptide, a polypeptide, a protease inhibitor, a 3C-like protease inhibitor, a papain-like protease inhibitor, or an inhibitor of an RNA dependent RNA polymerase; or (b) the antiviral compound is selected from: acyclovir, ganciclovir, vidarabine, foscarnet, cidofovir, amantadine, ribavirin, trifluorothymidine, zidovudine, didanosine, zalcitabine, and an interferon, and preferably wherein the interferon is an interferon-α or an interferon-β.

65. The method of any one of claims 56-64, wherein the first antibody or antigen-binding fragment thereof is administered before, after, or concurrently with the second antibody or antigen-binding fragment thereof.

66. The method of any one of claims 38-45 or 56-65, wherein the antibody or antigen-binding fragment thereof is administered to the subject intravenously, subcutaneously, or intraperitoneally.

FIG. 1A

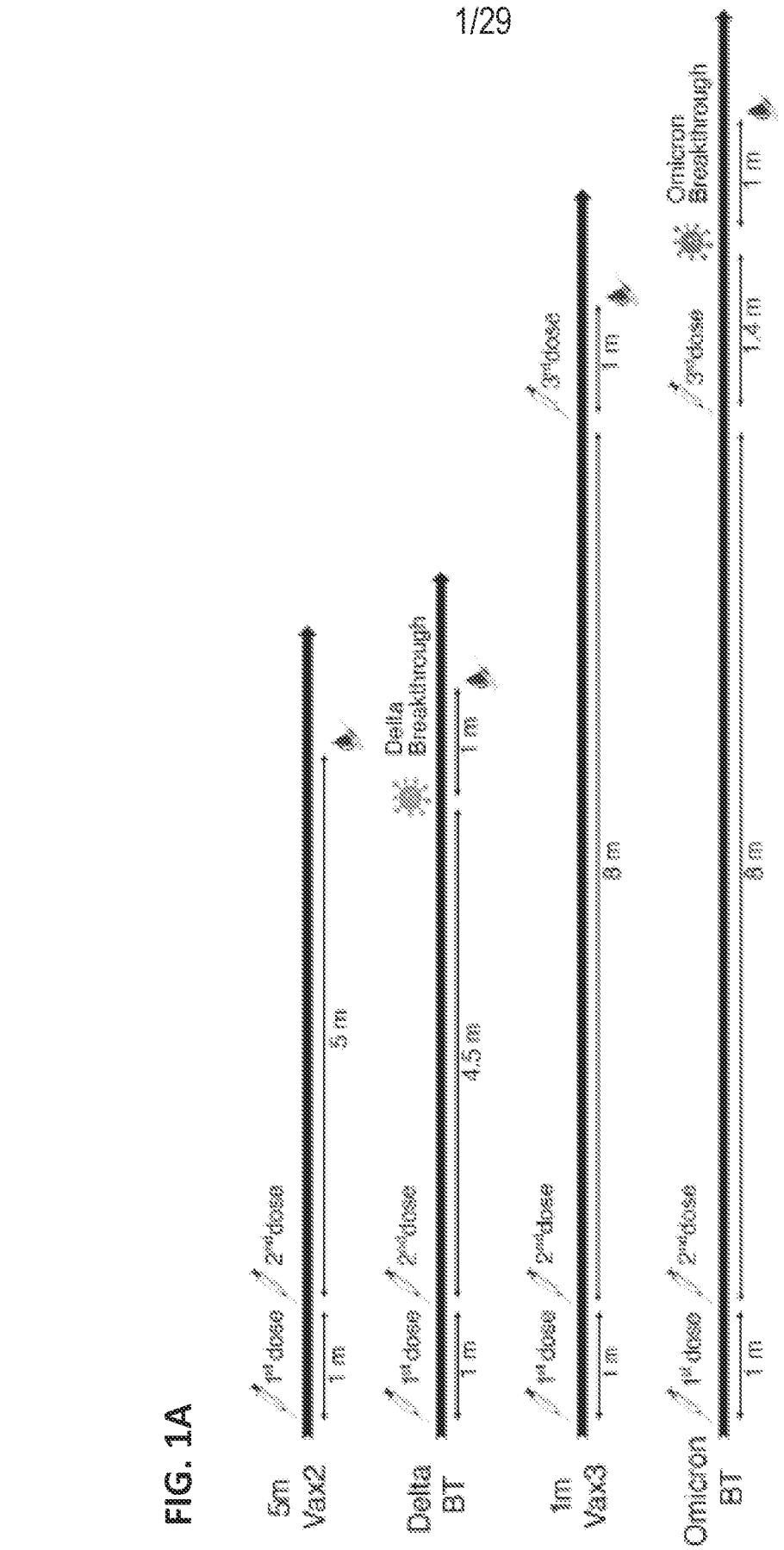

5m Vax2
1st dose
2nd dose
1 m
5 m
Delta BT
1st dose
2nd dose
Delta Breakthrough
1 m
4.5 m
1m Vax3
1st dose
2nd dose
3rd dose
1 m
8 m
Omicron BT
1st dose
2nd dose
3rd dose
Omicron Breakthrough
1 m
1.4 m
8 m

FIG. 1

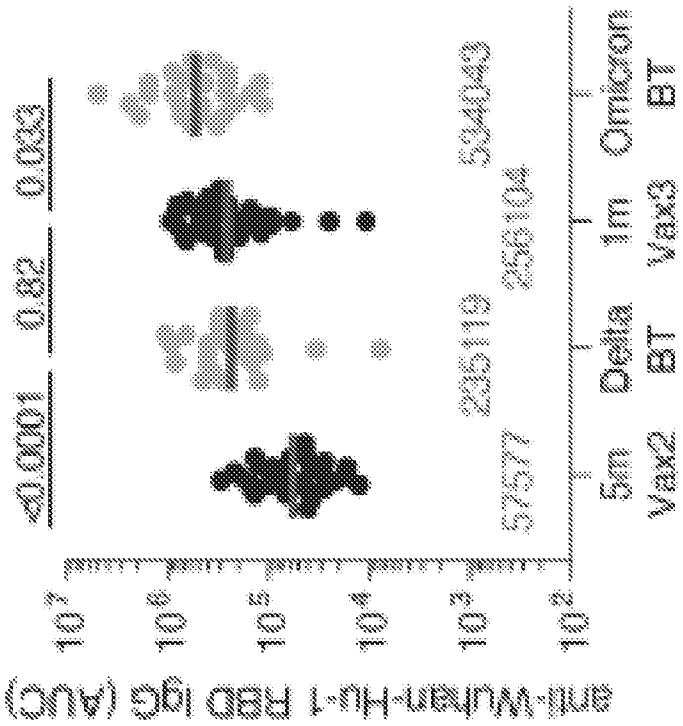


FIG. 1B

FIG. 1 (Continued)

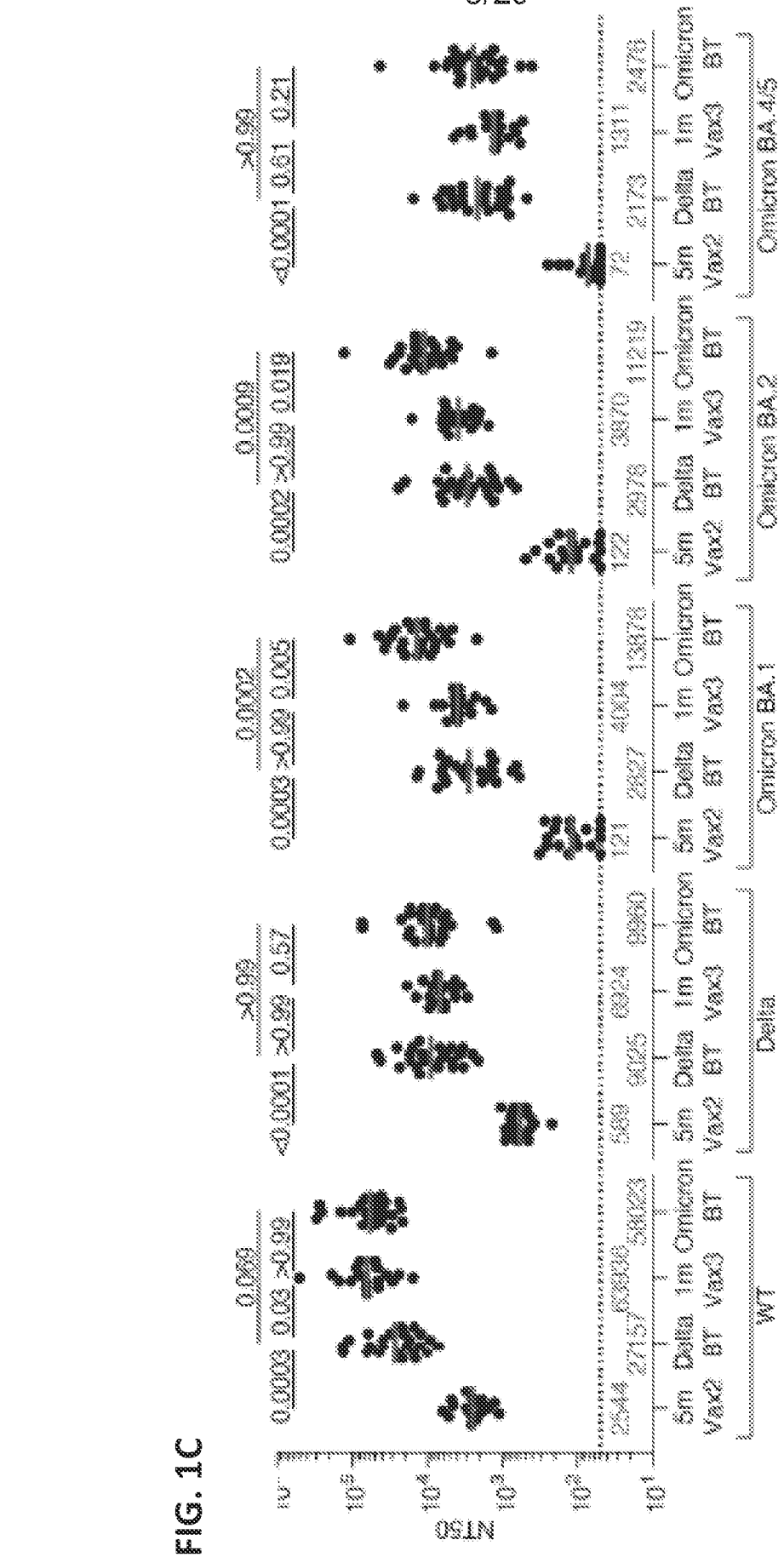


FIG. 1C

FIG. 1 (Continued)

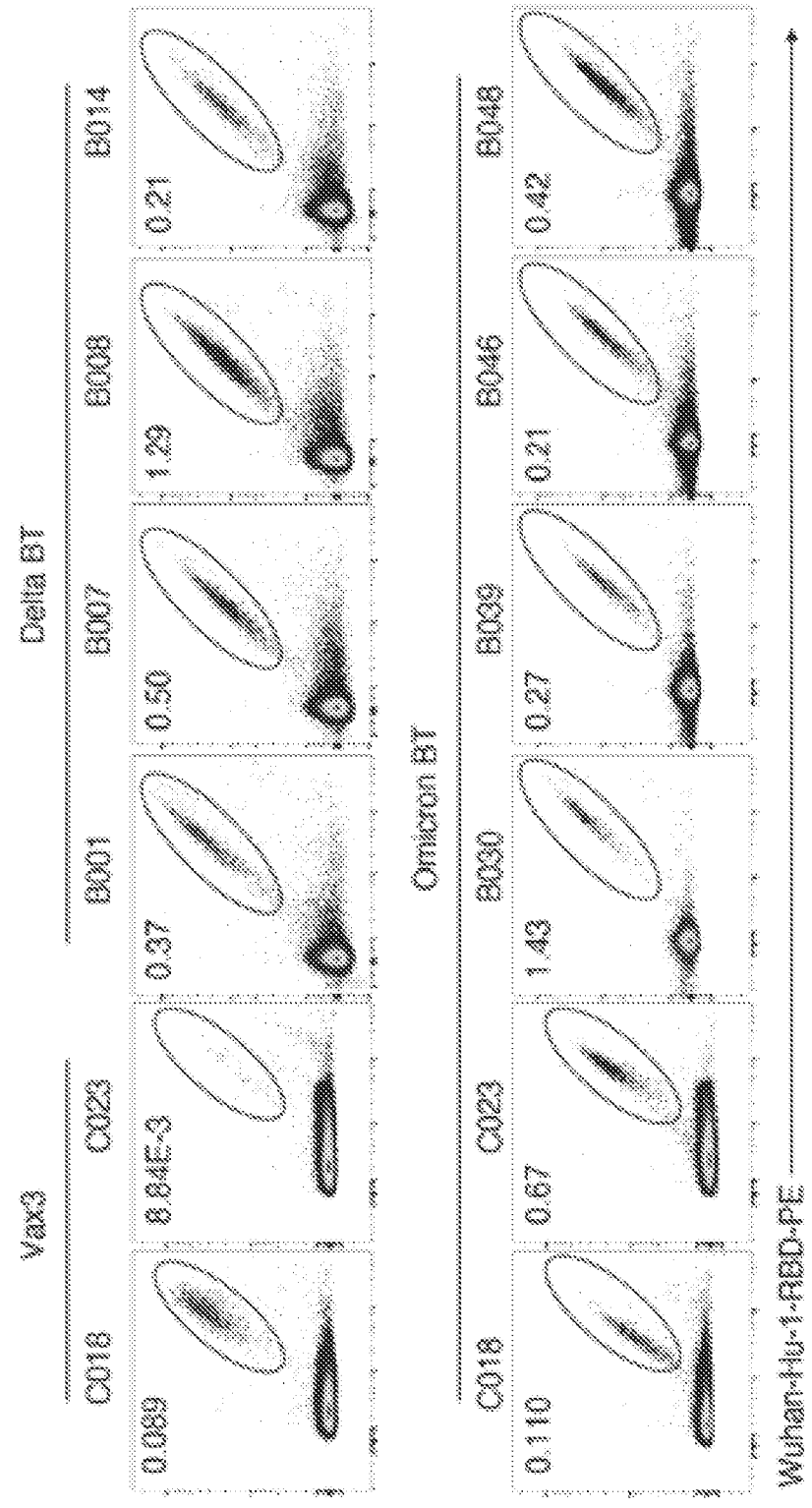

Vax3
Delta BT
C016
C023
B001
B007
B008
B014
0.089
0.84E-3
0.37
0.50
1.29
0.21
Omicron BT
C016
C023
B030
B039
B046
B048
0.110
0.67
1.43
0.27
0.21
0.42
Wuhan-Hu-1-RBD-AF647
Wuhan-Hu-1-RBD-PE

FIG. 2A

FIG. 2

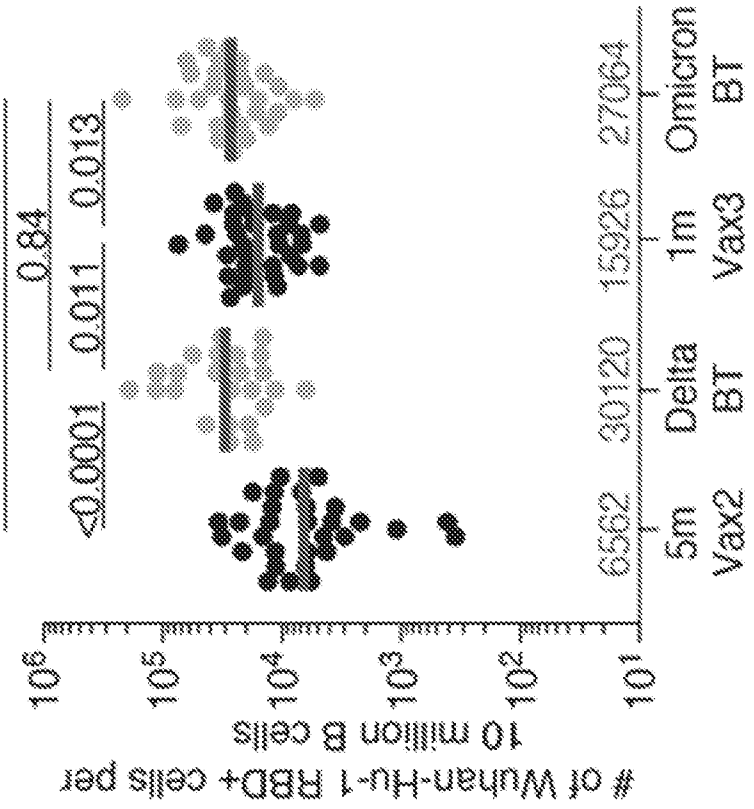


FIG. 2B

FIG. 2 (Continued)

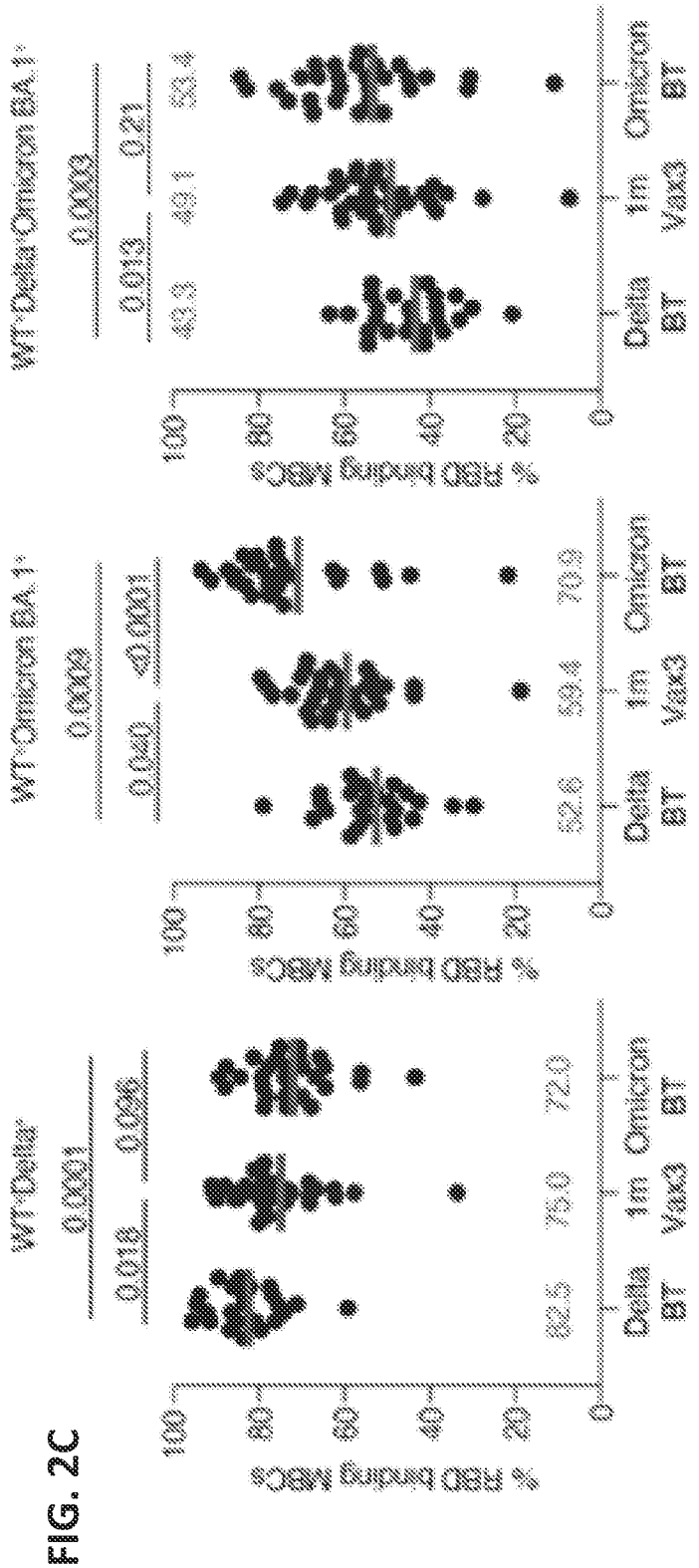


FIG. 2C

FIG. 2 (Continued)

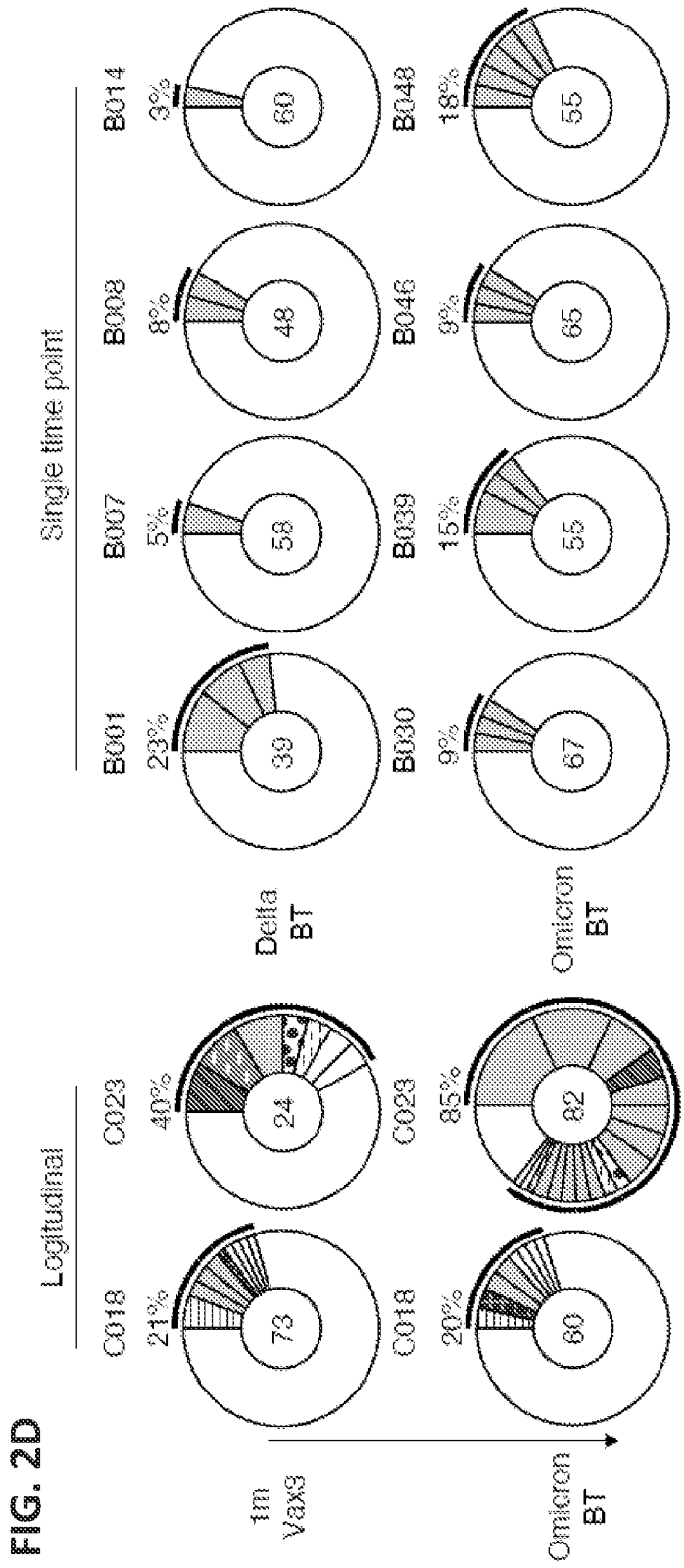


FIG. 2D

FIG. 2 (Continued)

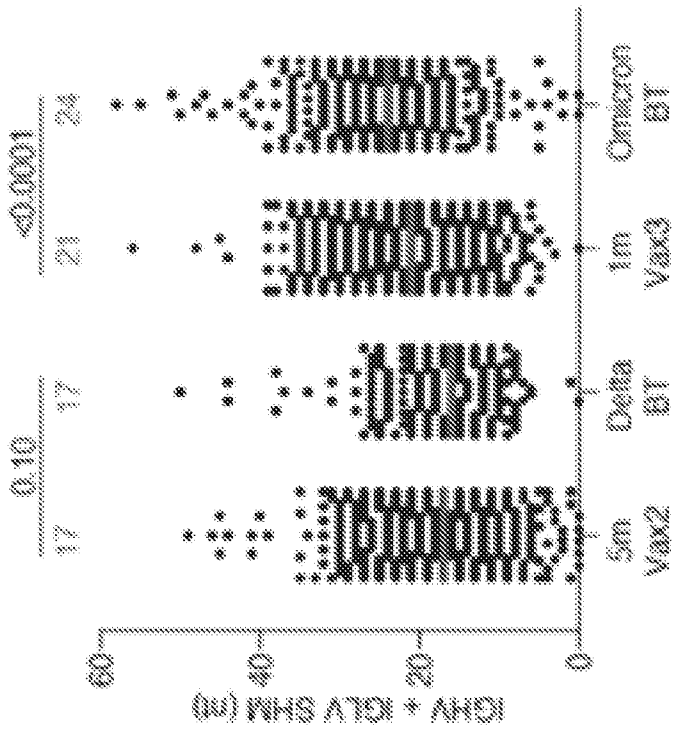


FIG. 2E

FIG. 2 (Continued)

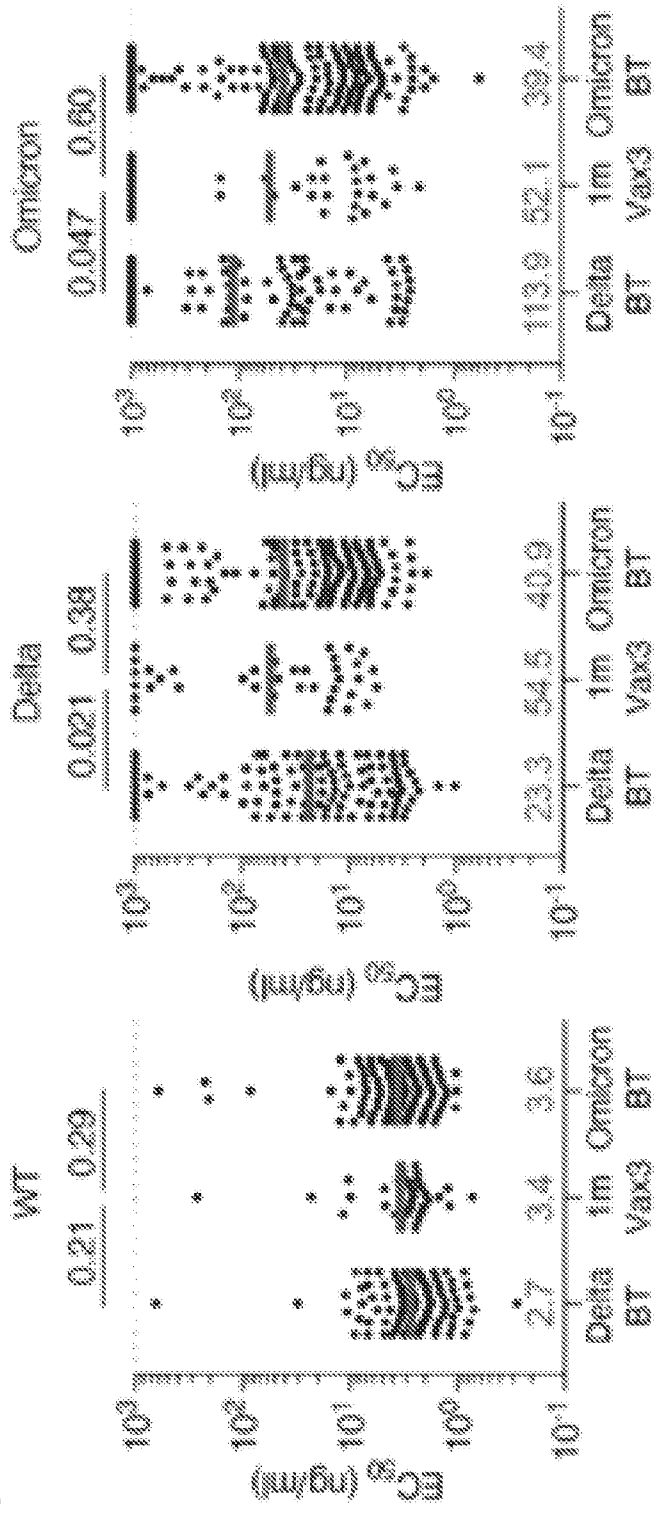

WT
Delta
Omicron
0.21 0.29
0.021 0.38
0.047 0.60
EC50 (ng/ml)
10^2
10^1
10^0
10^-1
2.7
34
3.6
23.3
64.5
40.9
113.9
52.1
39.4
Delta BT
1m Vax3
Omicron BT

FIG. 3A

FIG. 3

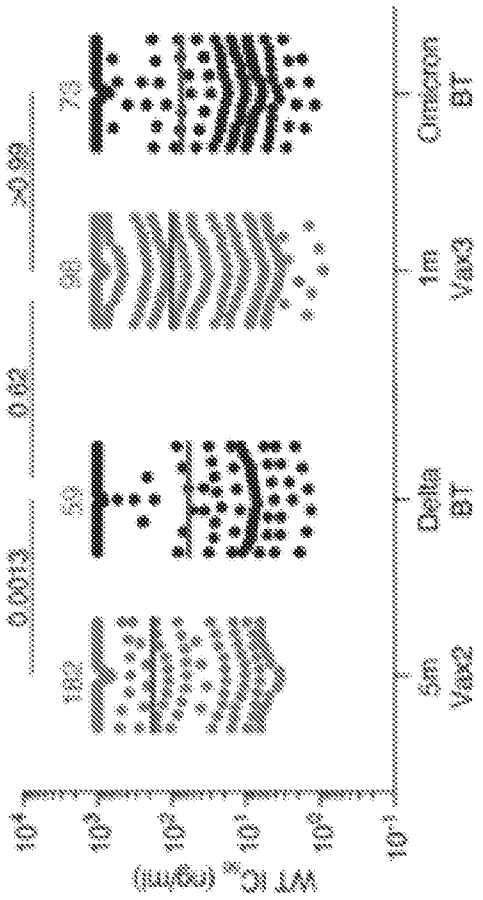


FIG. 3B

FIG. 3 (Continued)

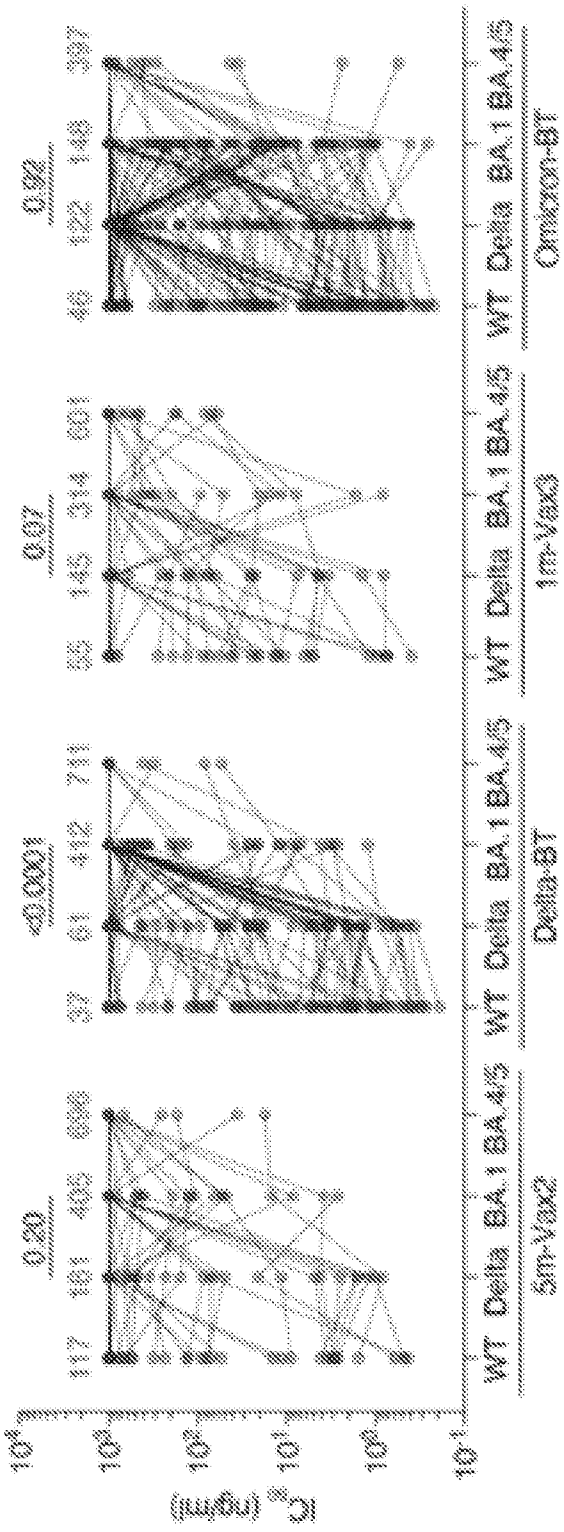


FIG. 3C

FIG. 3 (Continued)

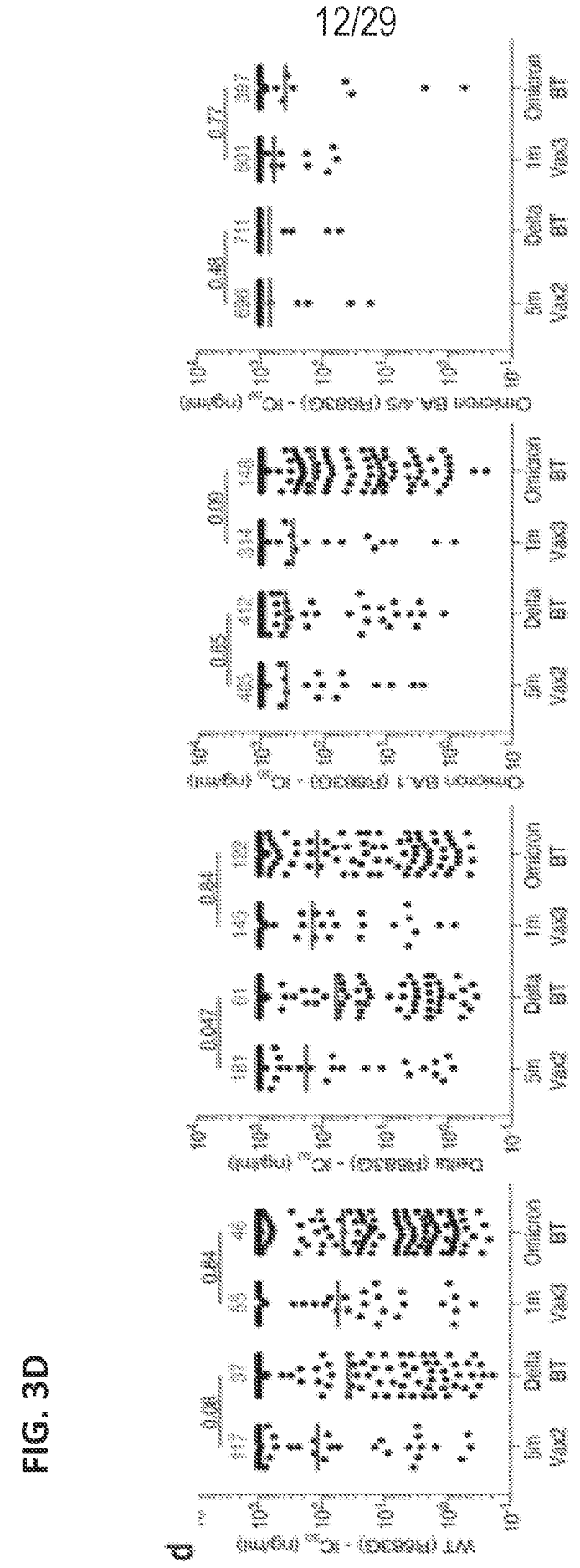


FIG. 3D

FIG. 3 (Continued)

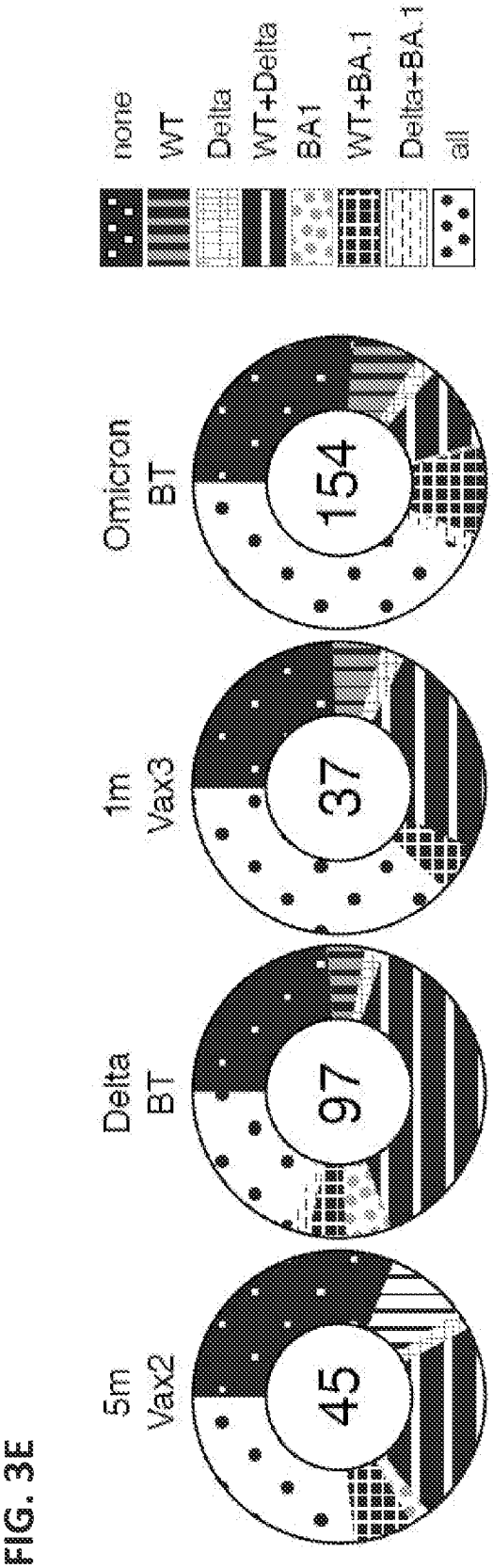


FIG. 3E

FIG. 3 (Continued)

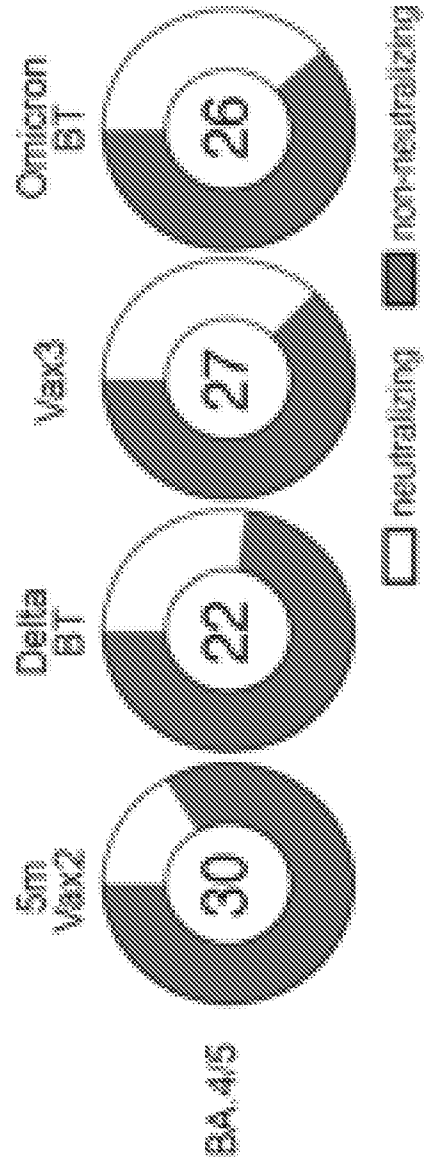


FIG. 3F

FIG. 3 (Continued)

FIG. 4A

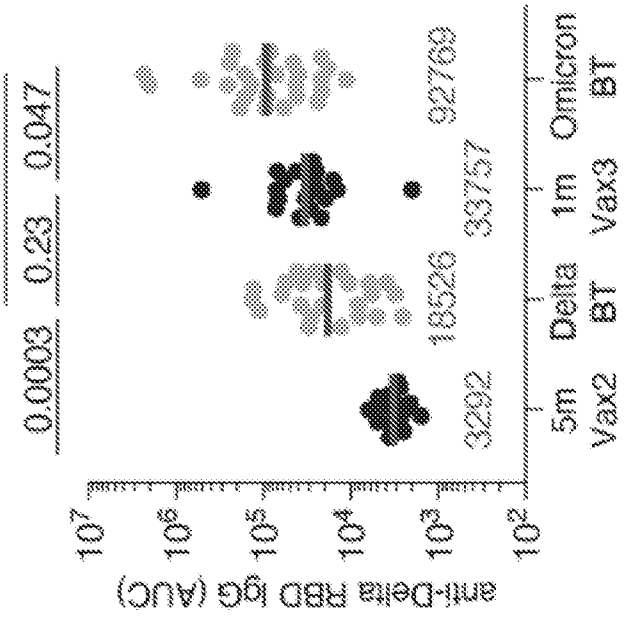


FIG. 4B

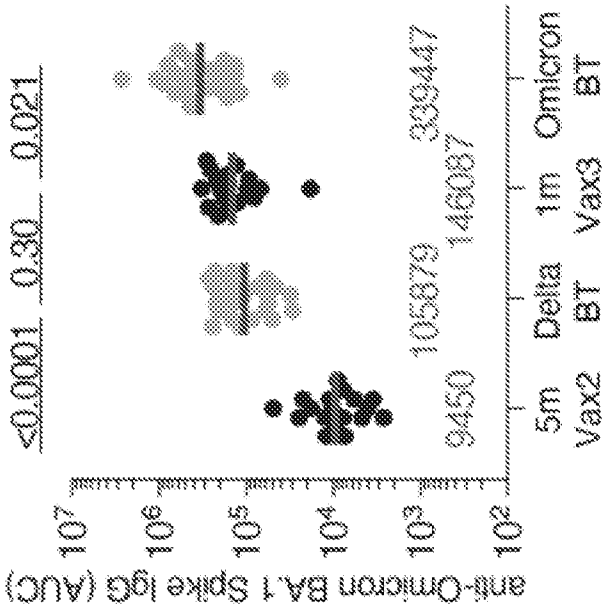


FIG. 4

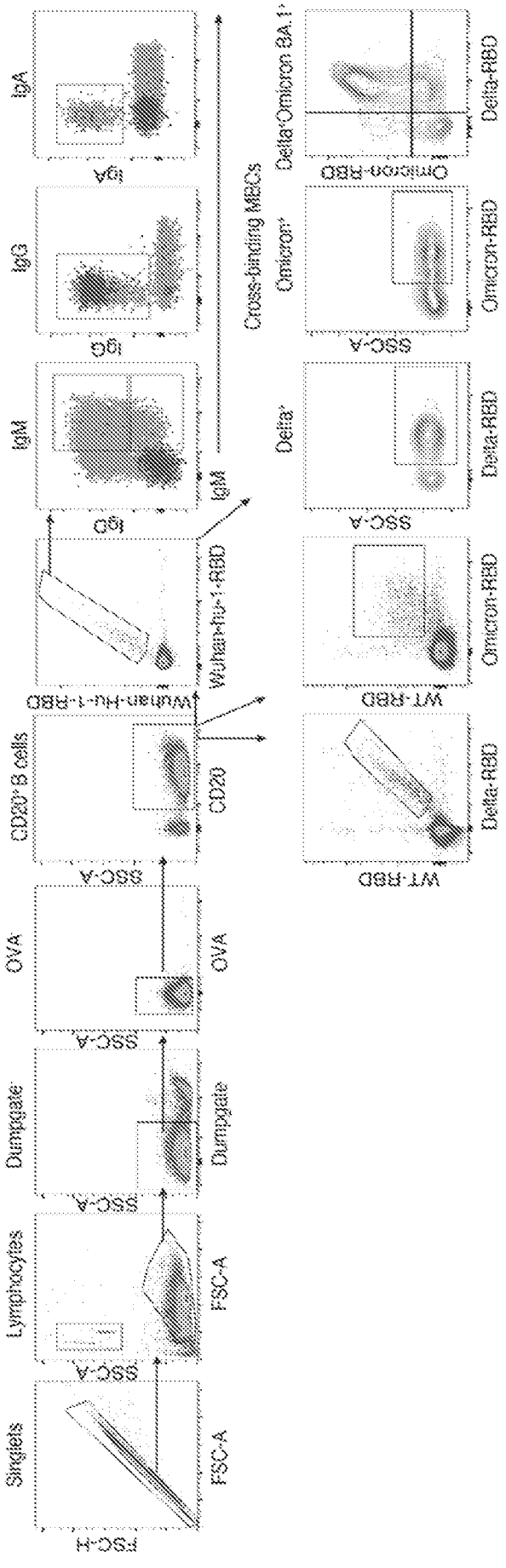

Singlets
FSC-H
FSC-A
Lymphocytes
SSC-A
FSC-A
Dumpgate
SSC-A
Dumpgate
OVA
SSC-A
OVA
CD20+ B cells
SSC-A
CD20
Wuhan-Hu-1-RBD
Wuhan-Hu-1-RBD
IgD
IgM
IgM
IgG
IgG
IgA
IgA
Cross-binding MBCs
Delta+
SSC-A
WT-RBD
Delta-RBD
Omicron+
SSC-A
WT-RBD
Omicron-RBD
Delta+Omicron BA.1+
SSC-A
Omicron-RBD
Delta-RBD

FIG. 5A

FIG. 5

FIG. 5B

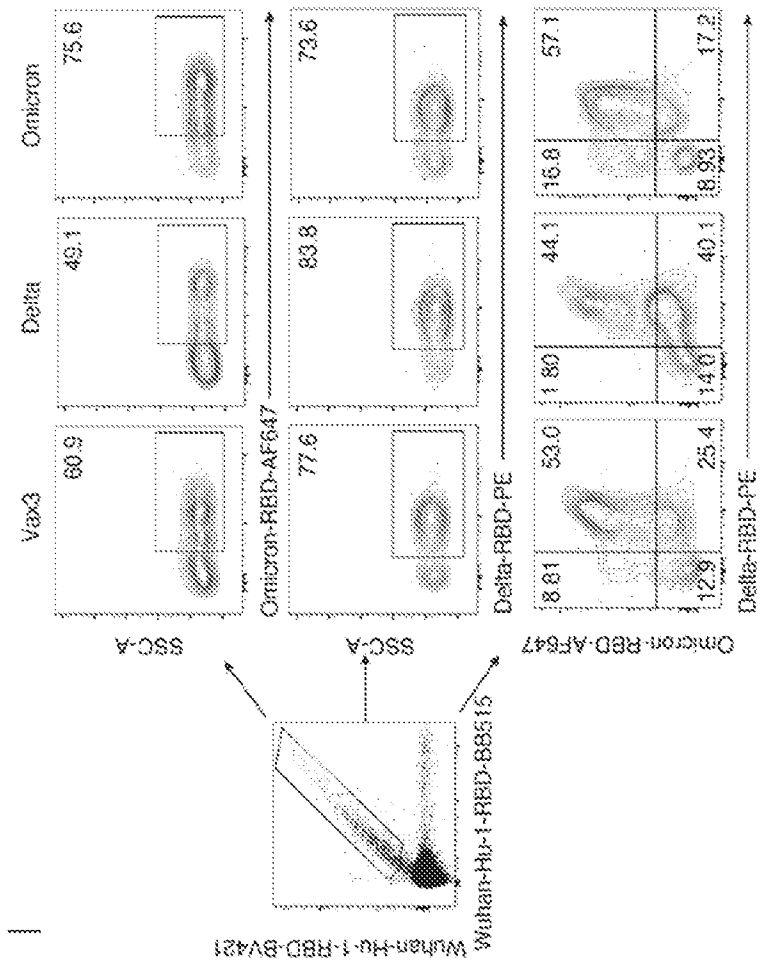


FIG. 5C

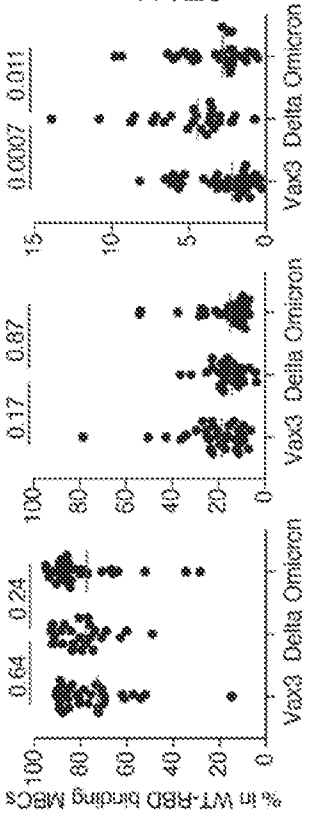


FIG. 5 (Continued)

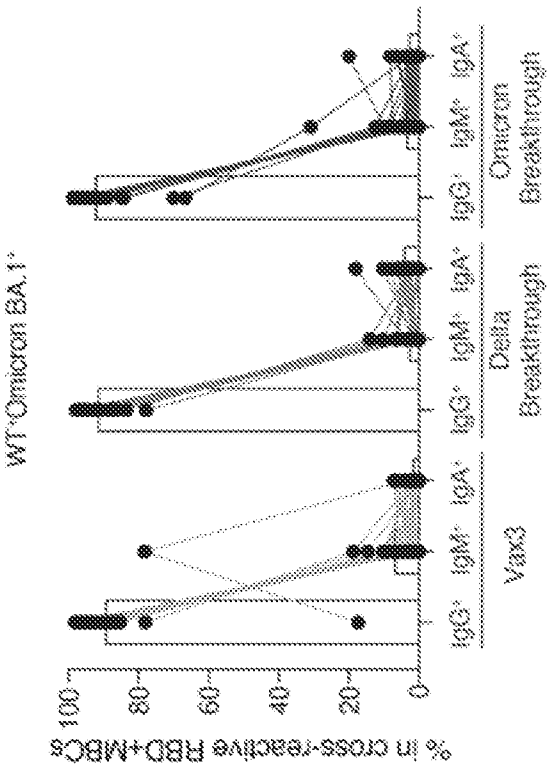


FIG. 5E

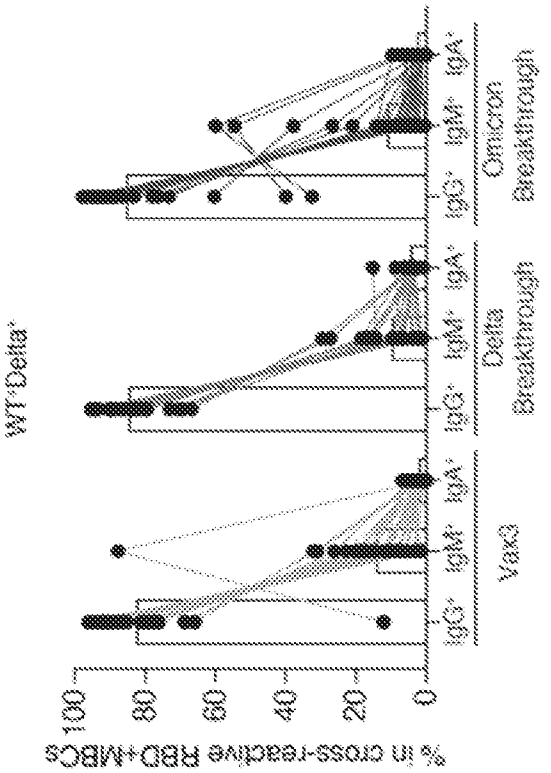


FIG. 5D

FIG. 5 (Continued)

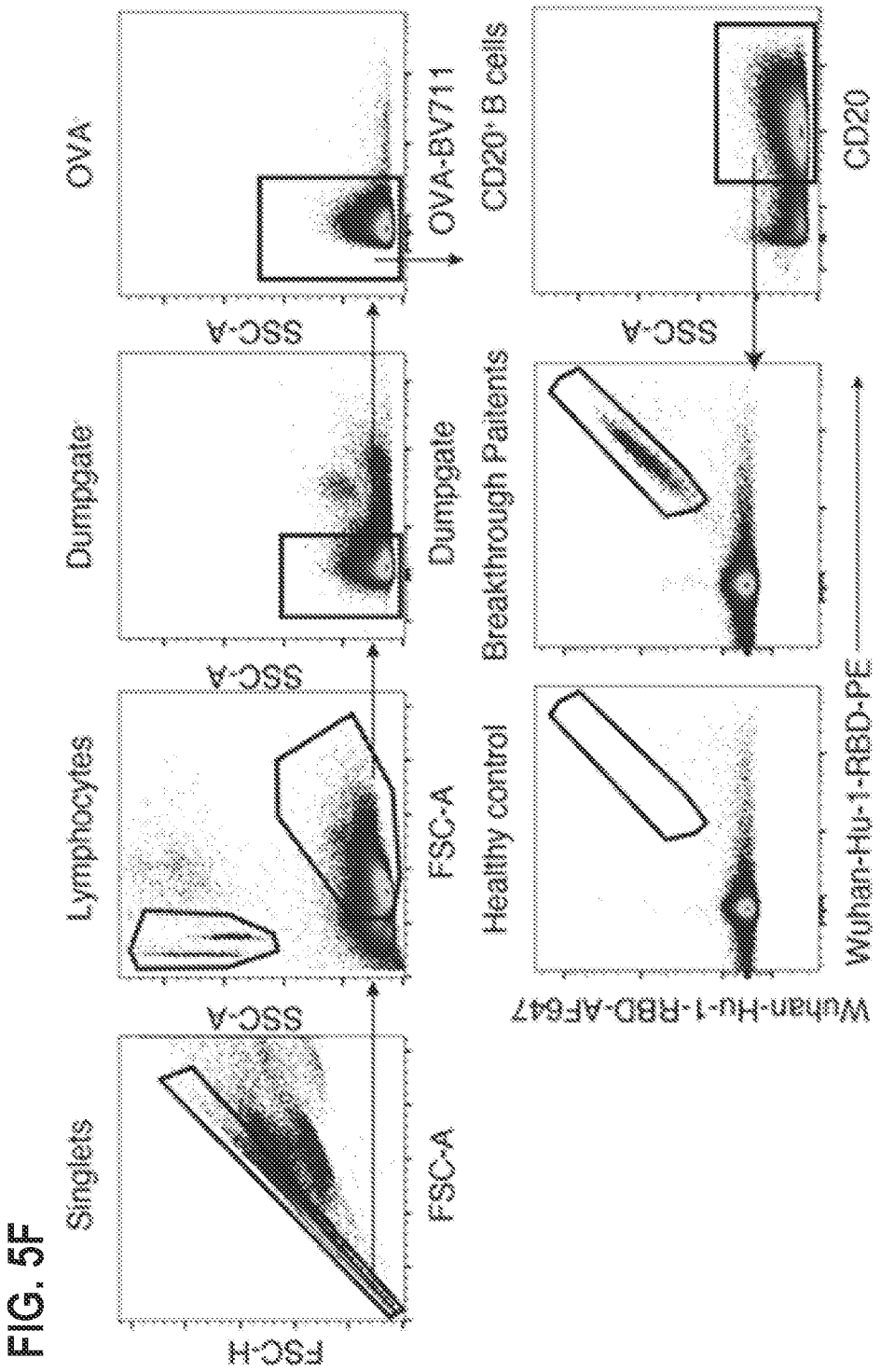


FIG. 5F

FIG. 5 (Continued)

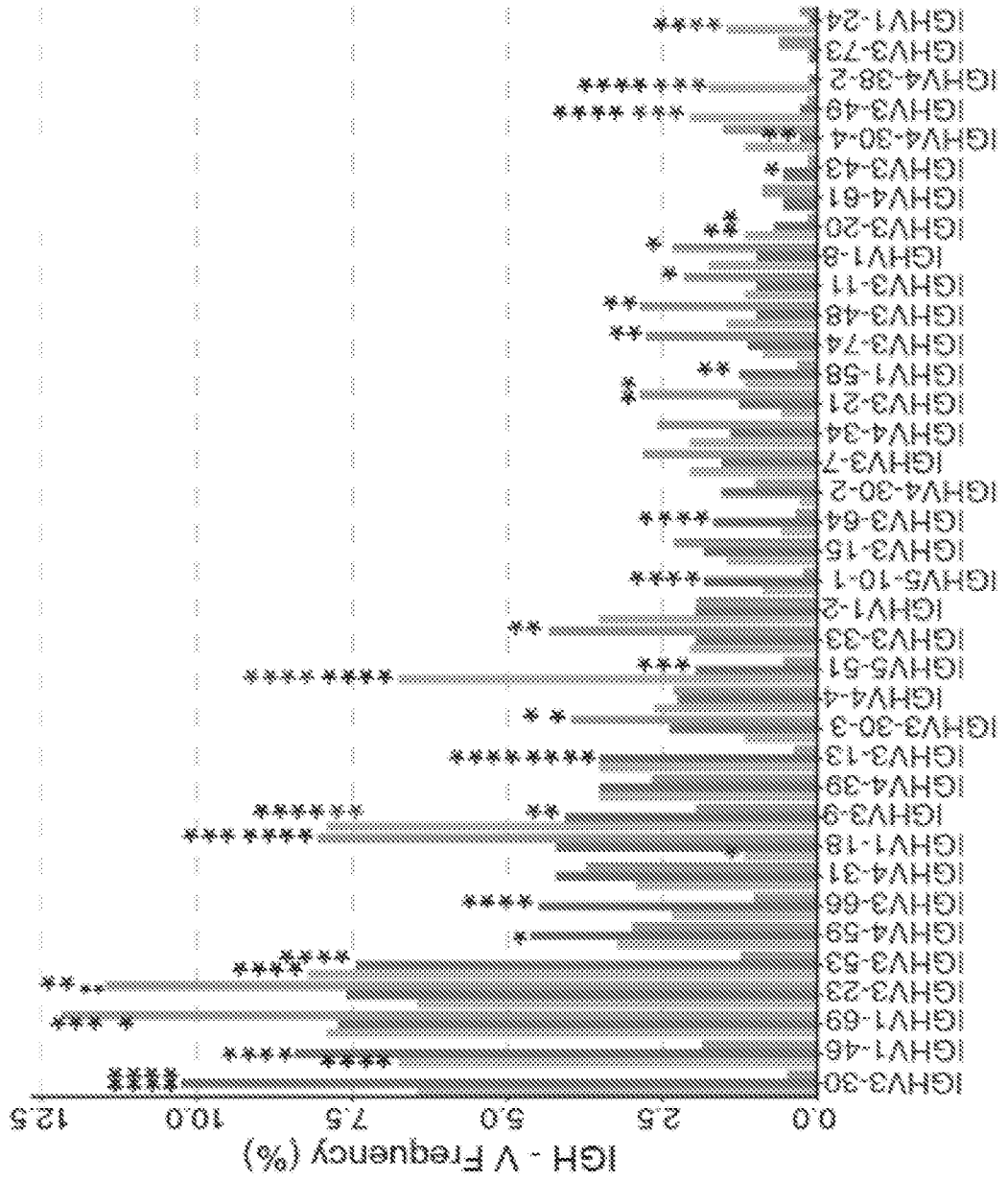

IGHV3-30
IGHV1-46
IGHV1-69
IGHV3-23
IGHV3-53
IGHV4-59
IGHV3-66
IGHV4-31
IGHV1-18
IGHV3-9
IGHV4-39
IGHV3-13
IGHV3-30-3
IGHV4-4
IGHV5-51
IGHV3-33
IGHV1-2
IGHV5-10-1
IGHV3-15
IGHV3-64
IGHV4-30-2
IGHV3-7
IGHV4-34
IGHV3-21
IGHV1-58
IGHV3-74
IGHV3-48
IGHV3-11
IGHV1-8
IGHV3-20
IGHV4-61
IGHV3-43
IGHV4-30-4
IGHV3-49
IGHV4-38-2
IGHV3-73
IGHV1-24
0.0
2.5
5.0
7.5
10.0
12.5
IGH - V Frequency (%)

FIG. 6A

FIG. 6

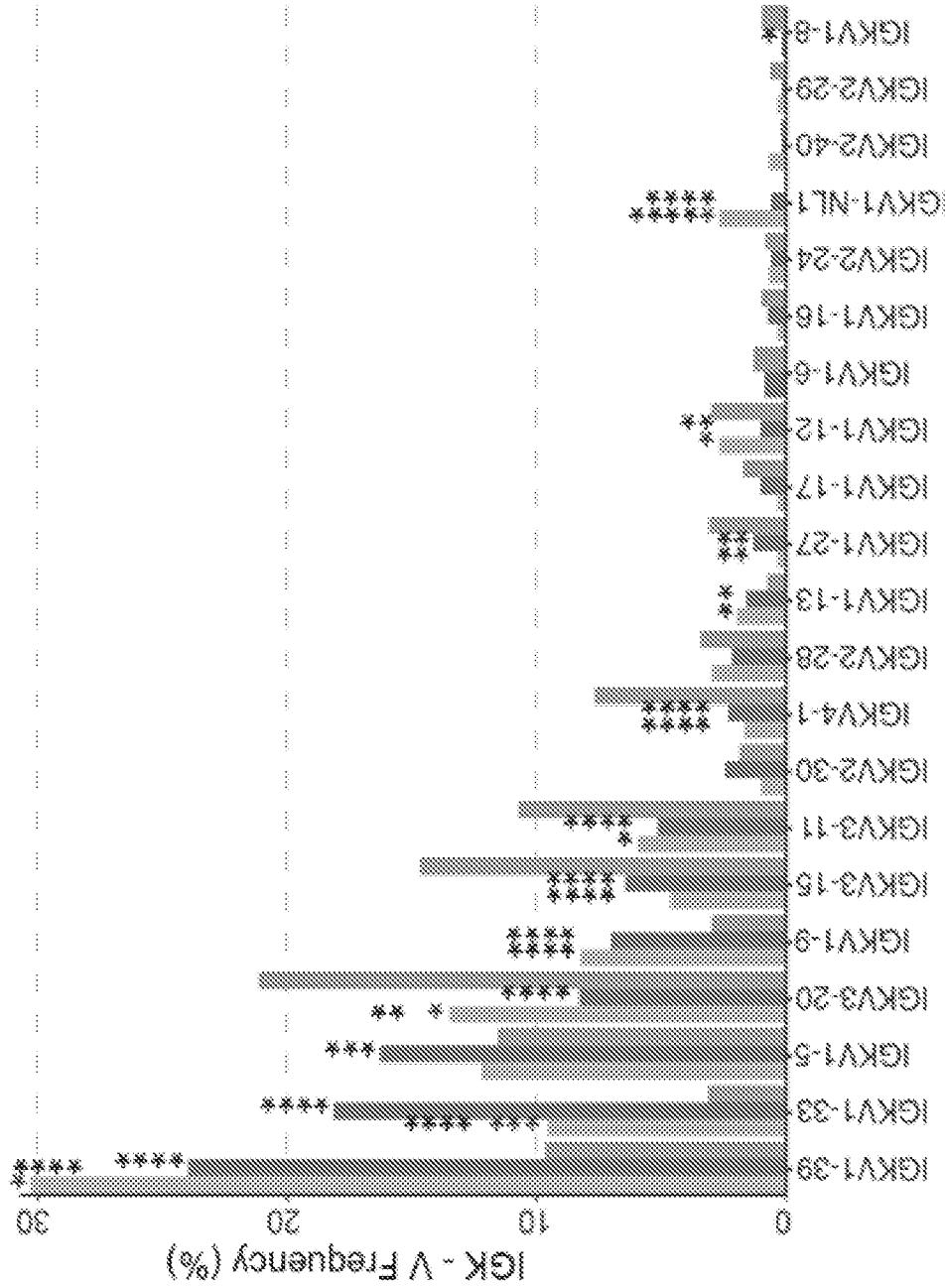


FIG. 6B

FIG. 6 (Continued)

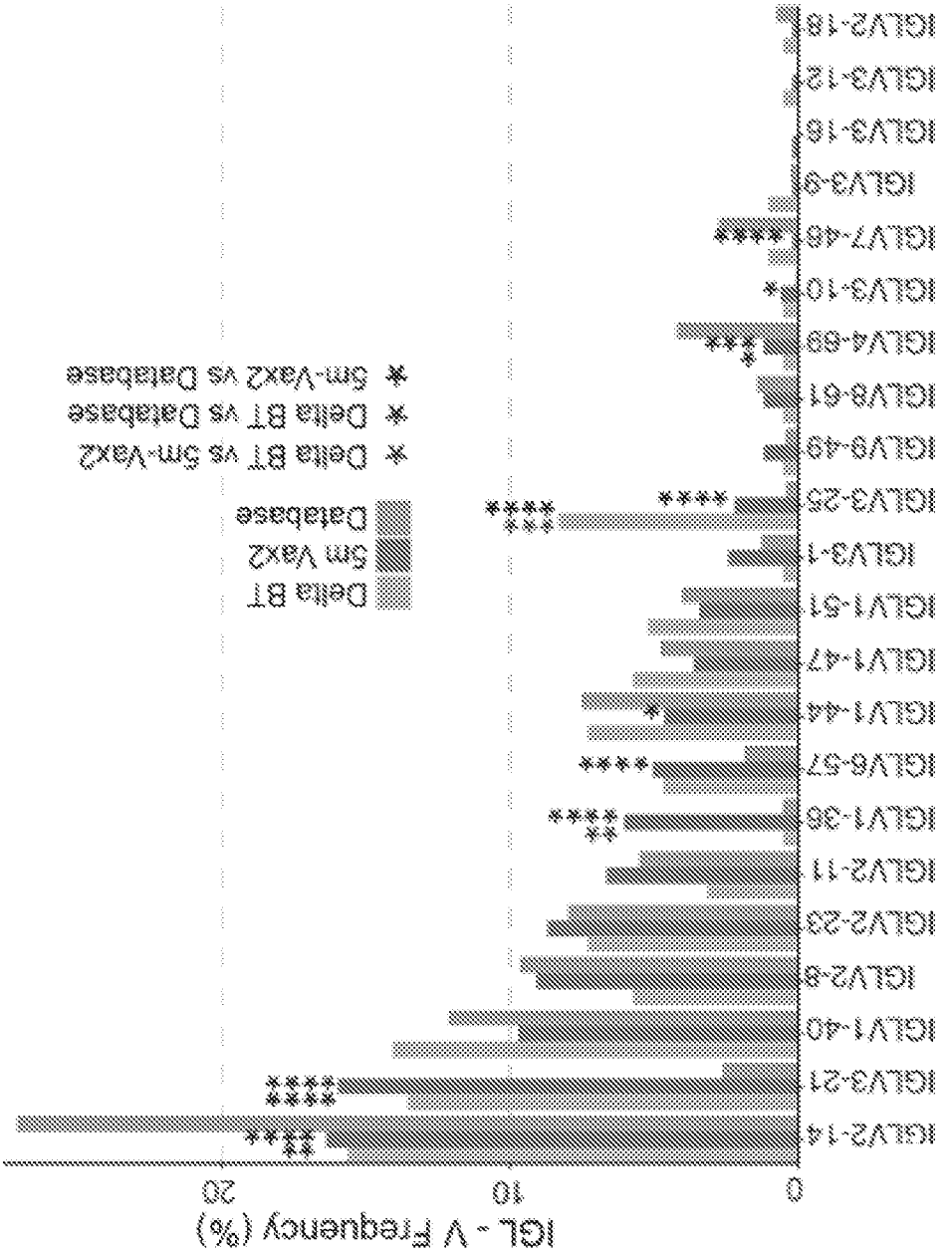


FIG. 6C

FIG. 6 (Continued)

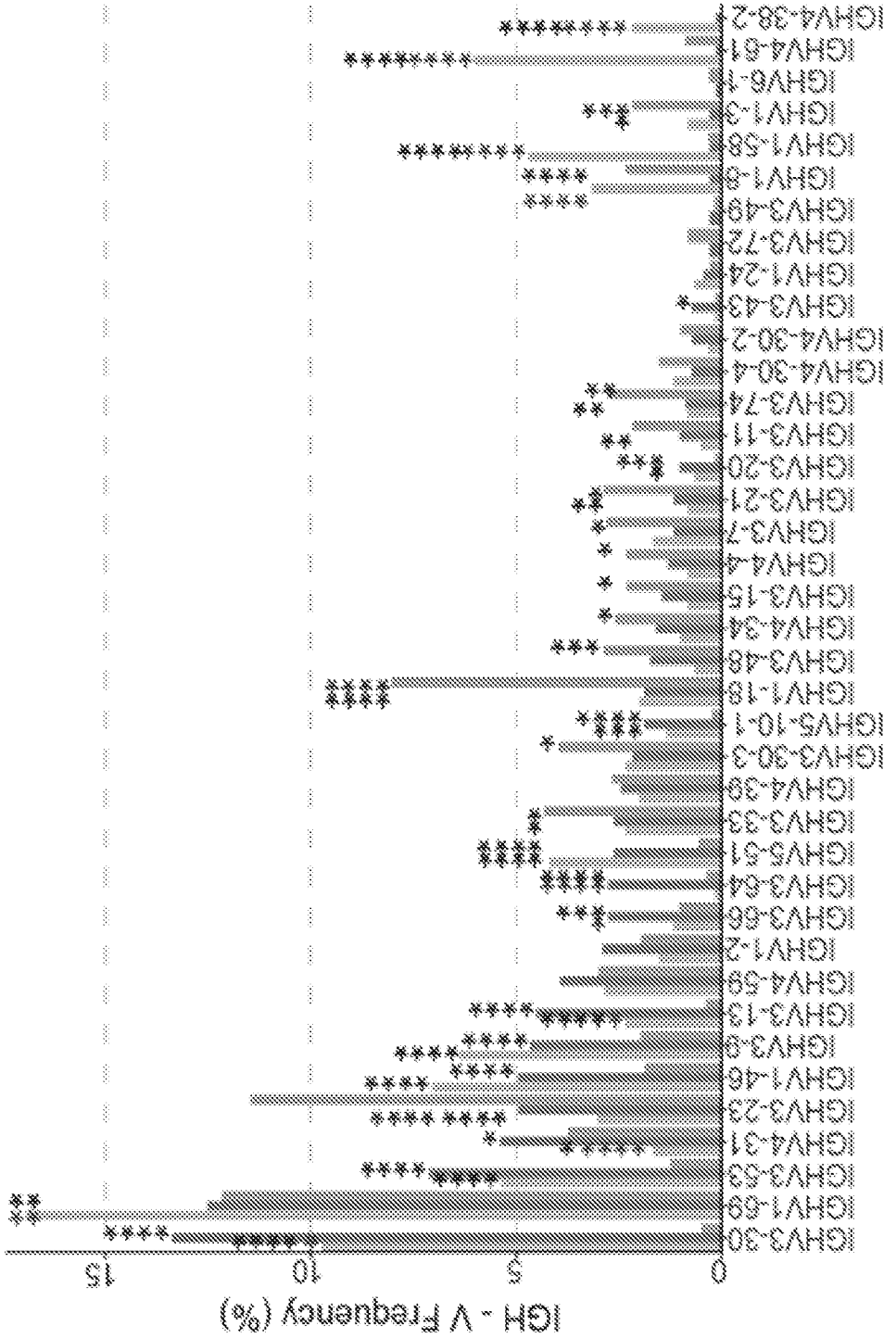


FIG. 6D

FIG. 6 (Continued)

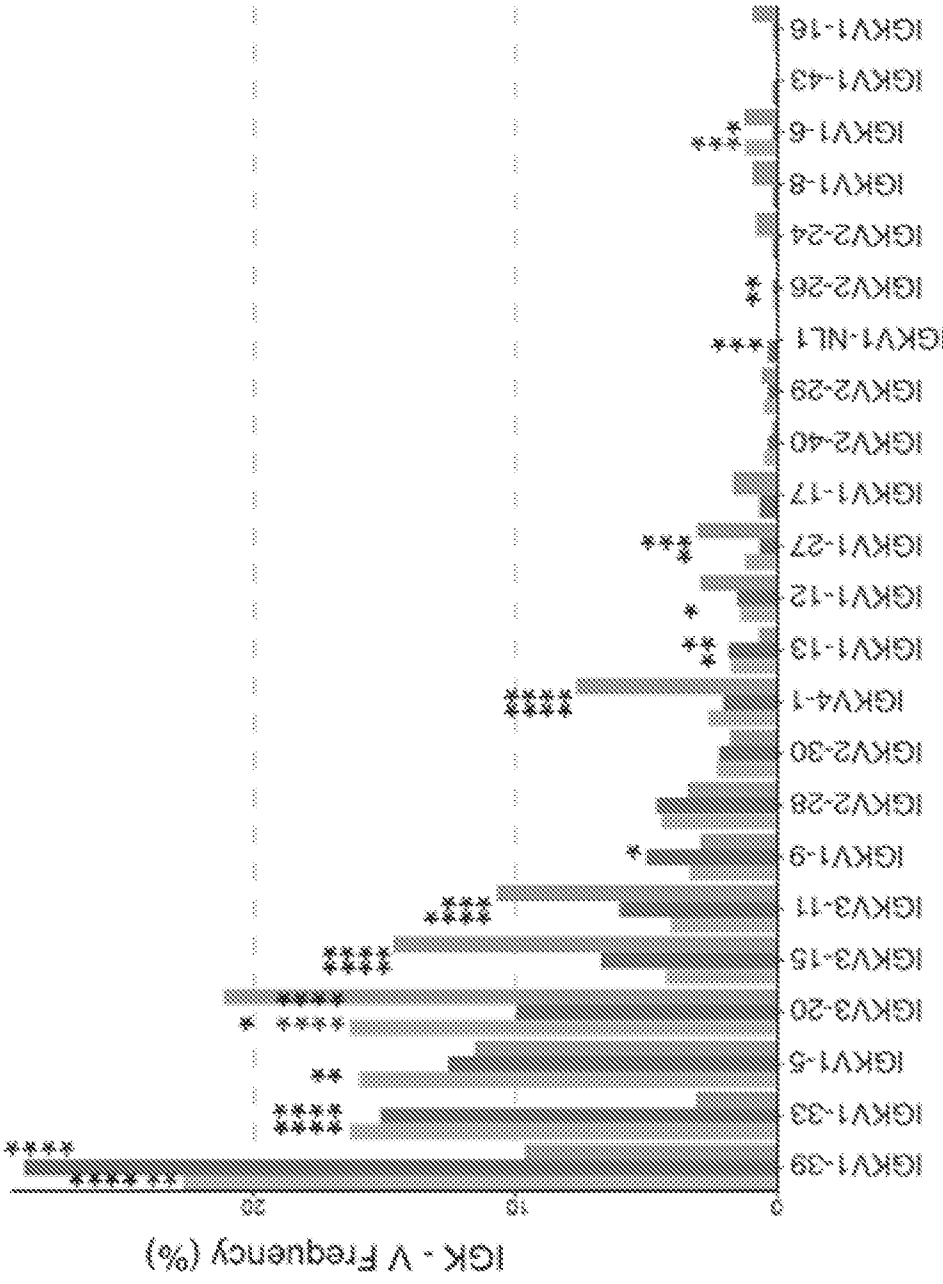


FIG. 6E

FIG. 6 (Continued)

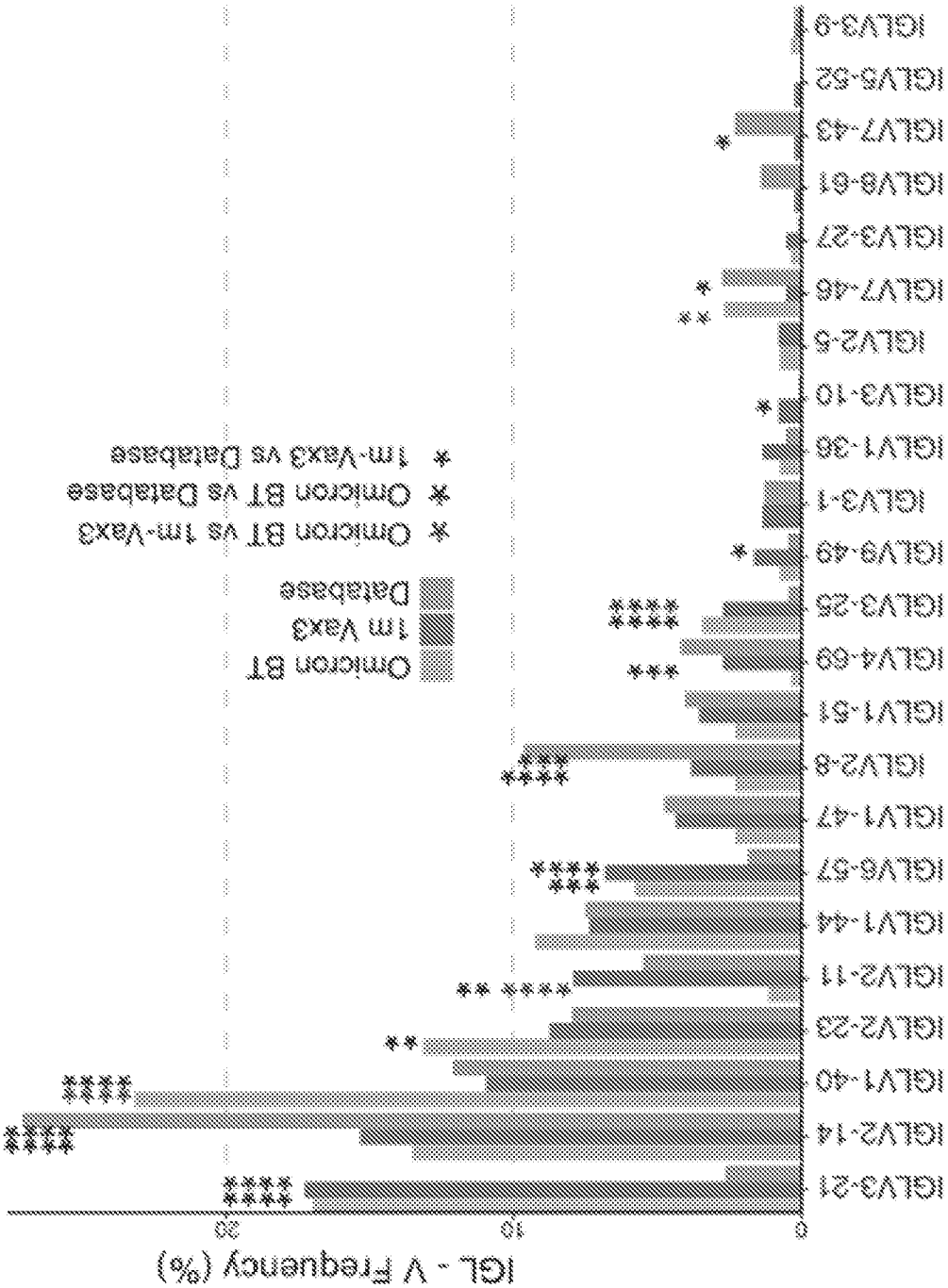


FIG. 6F

FIG. 6 (Continued)

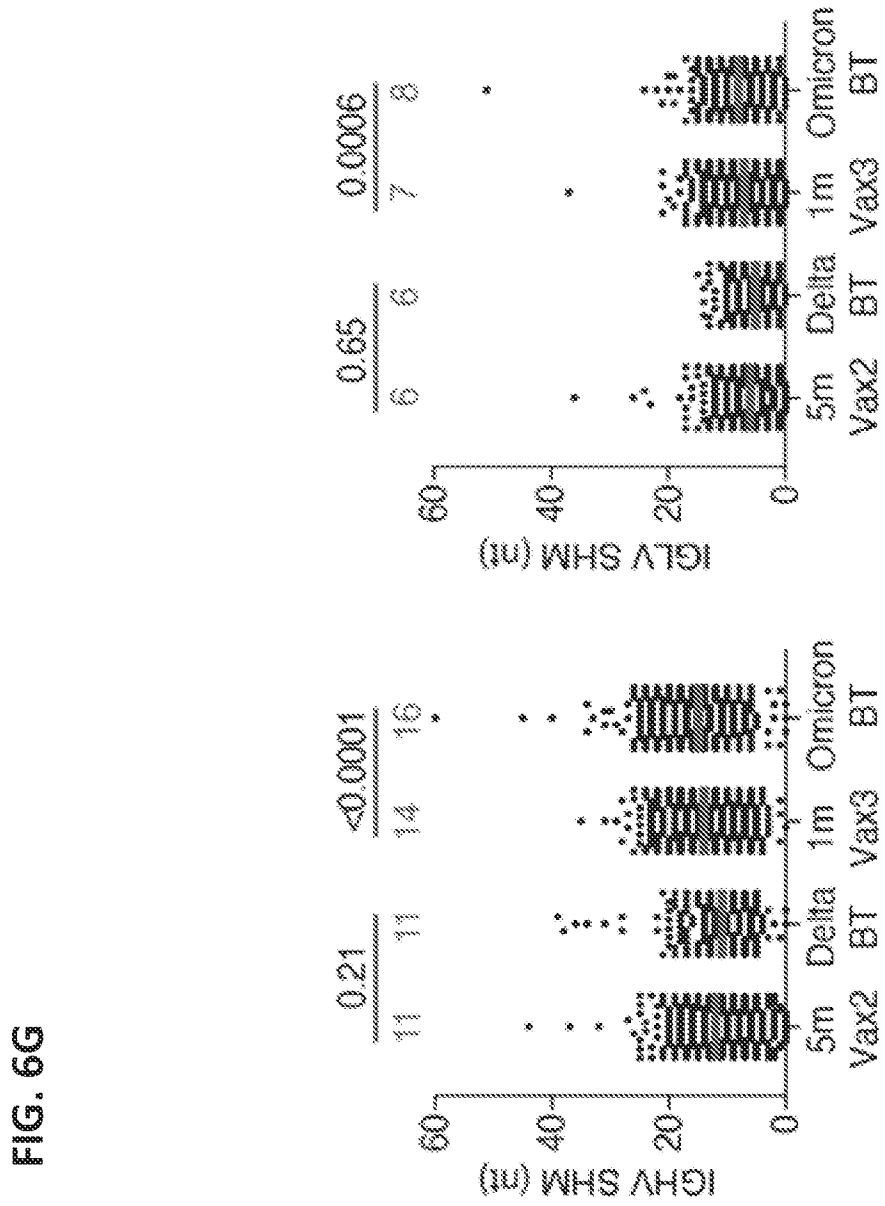


FIG. 6G

FIG. 6 (Continued)

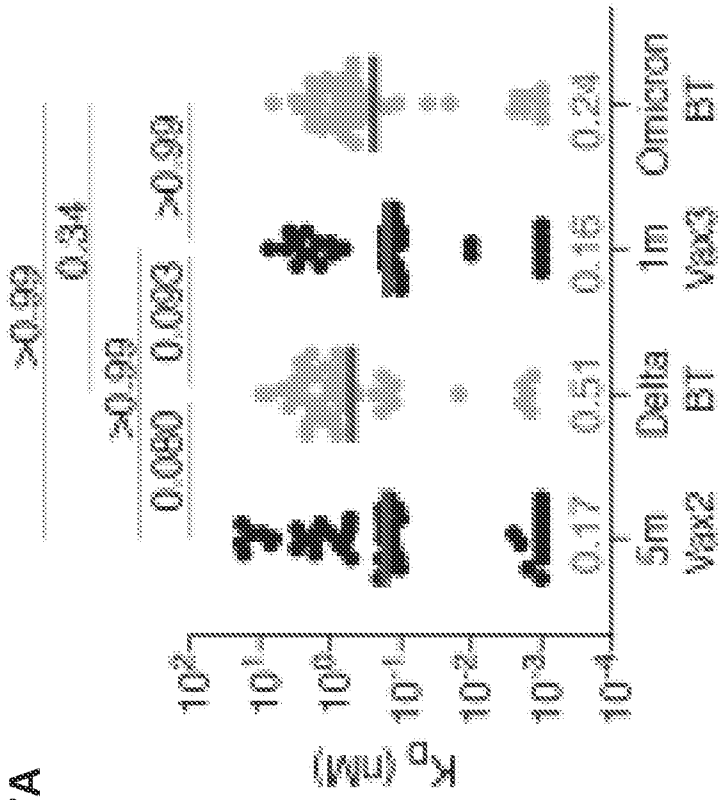

>0.99
0.34
>0.99
0.050
0.023
>0.99
>0.99
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
K_D (nM)
0.17
0.51
0.16
0.24
5m
Delta
1m
Omicron
Vax2
BT
Vax3
BT

FIG. 7A

FIG. 7

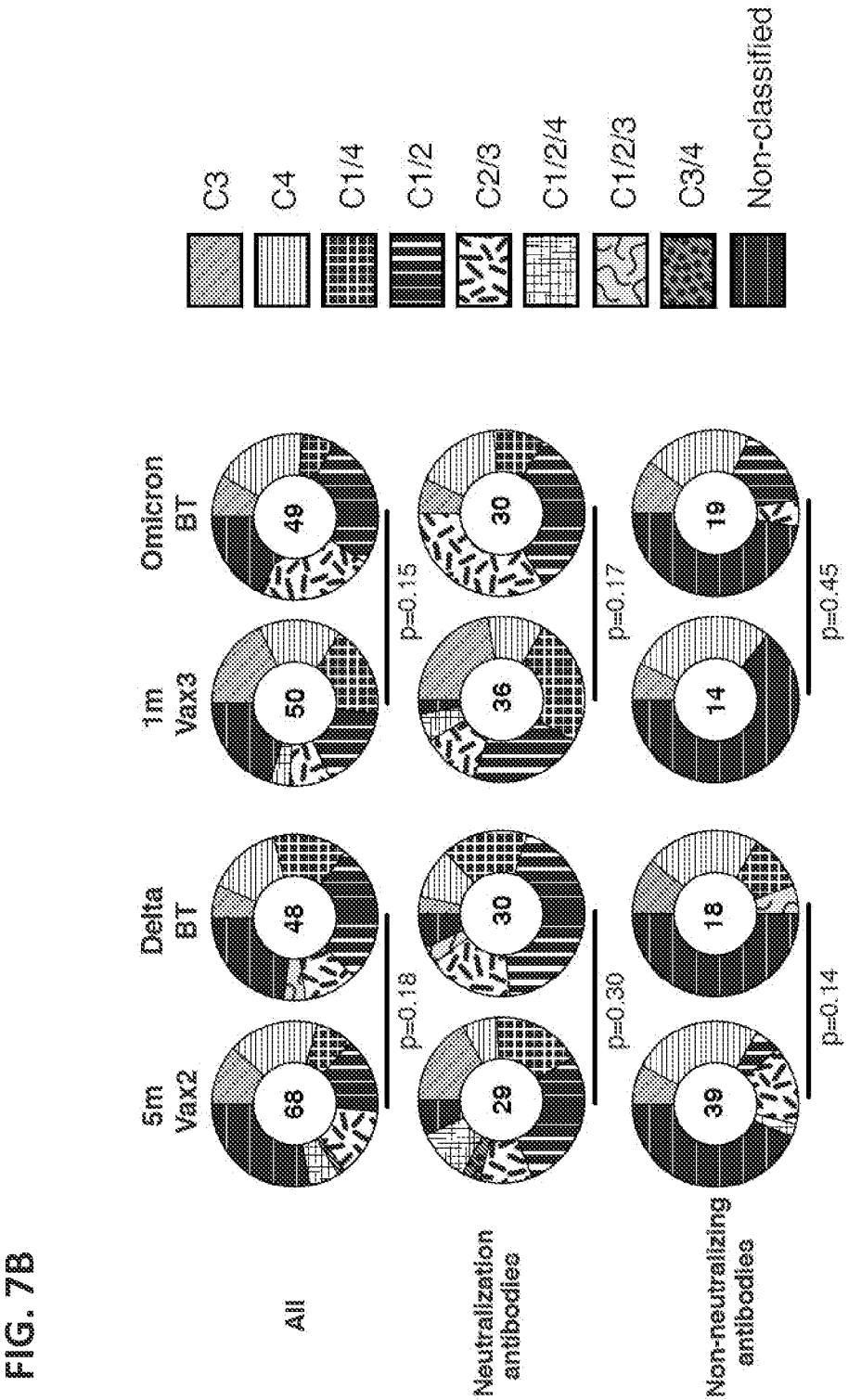


FIG. 7B

FIG. 7 (Continued)

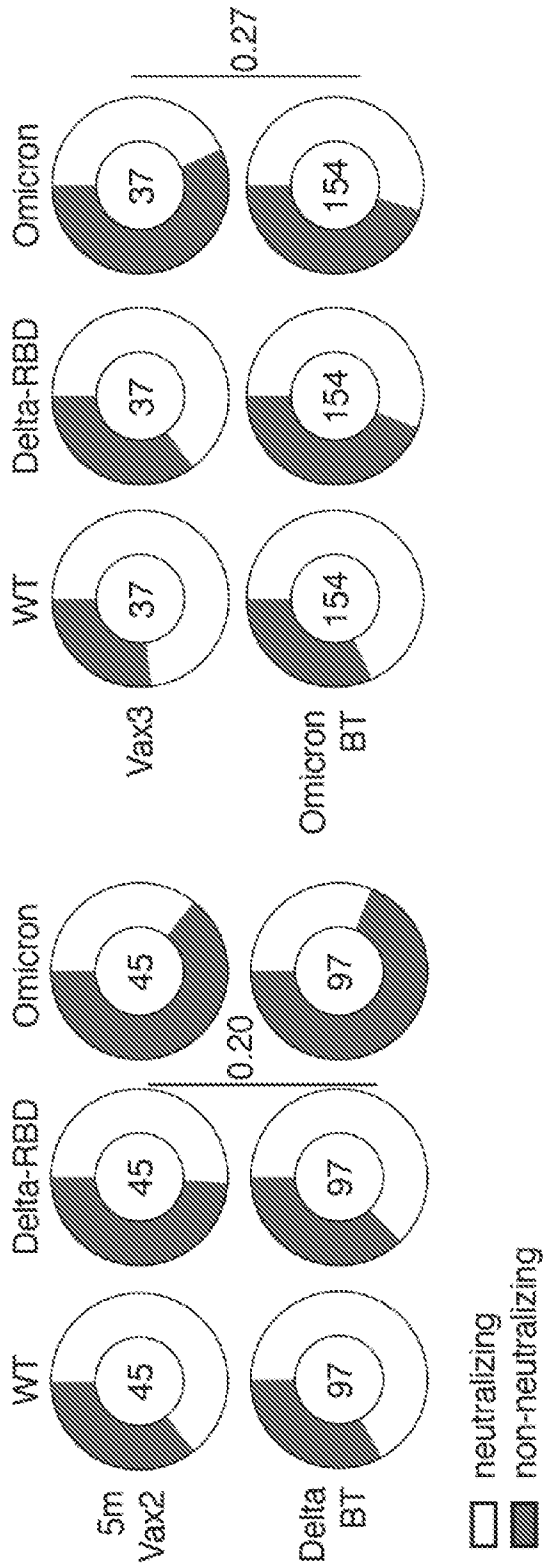

WT
Delta-RBD
Omicron
5m Vax2
45
45
45
0.20
Delta BT
97
97
97
neutralizing
non-neutralizing
Vax3
37
37
37
0.27
Omicron BT
154
154
154

Fig. 8