Table SI. Characteristics of 9 patients chosen from 60 patients with hepatocellular carcinoma.

| Characteristic       | No. of patients (%) |
|----------------------|---------------------|
| **Age, years**       |                     |
| <50                  | 3 (33.3)            |
| ≥50                  | 6 (66.7)            |
| **Sex**              |                     |
| Female               | 4 (44.4)            |
| Male                 | 5 (55.6)            |
| **Albumin, g/l**     |                     |
| ≥35                  | 8 (88.9)            |
| <35                  | 1 (11.1)            |
| **AFP, ng/ml**       |                     |
| ≤20                  | 2 (22.2)            |
| >20                  | 7 (77.8)            |
| **Tumor diameter, cm** |                   |
| ≤5                   | 3 (33.3)            |
| >5                   | 6 (66.7)            |
| **Portal vein invasion** |                 |
| Without              | 3 (33.3)            |
| With                 | 6 (66.7)            |
| **BCLC stage**       |                     |
| A                    | 2 (22.2)            |
| B/C                  | 7 (77.8)            |

AFP, α-fetoprotein; BCLC, Barcelona Clinic Liver Cancer.
Table SII. List of the gene symbol and relative expression of six significant clusters.

| Gene symbol | SPOT   | Profile | Day 0 | Day 3  | Day 7   | Day 14 | Day 21 |
|-------------|--------|---------|-------|--------|---------|--------|--------|
| ALCAM       | ID_10  | 16      | 0     | -356.5 | 378.5   | 0.1    | 307.8  |
| ANGPT2      | ID_13  | 16      | 0     | -45.7  | 197.2   | 96     | 60.2   |
| CD80        | ID_24  | 16      | 0     | -177   | 362     | -29    | 187    |
| CTNNB1      | ID_29  | 16      | 0     | -58    | 294     | 83     | 49     |
| BMP4        | ID_37  | 16      | 0     | -107   | 189     | 0      | 53     |
| CCL28       | ID_49  | 16      | 0     | -307   | 856     | 491    | 347    |
| CCR1        | ID_50  | 16      | 0     | -189   | 391     | 236    | 112    |
| CCR4        | ID_53  | 16      | 0     | -101   | 361     | 89     | 240    |
| CCR7        | ID_56  | 16      | 0     | -98    | 361     | 103    | 66     |
| CLC         | ID_70  | 16      | 0     | -147   | 274     | 0      | 188    |
| CRIM1       | ID_74  | 16      | 0     | -642   | 229     | -48    | -112   |
| CXCL14      | ID_83  | 16      | 0     | -434   | 1,154.00| 778    | 376    |
| CXCL16      | ID_84  | 16      | 0     | -128   | 800     | 477    | 180    |
| DKK3        | ID_97  | 16      | 0     | -199   | 610     | 107    | 3      |
| FGFBP1      | ID_129 | 16      | 0     | -224   | 484     | -155   | 37     |
| FGF20       | ID_147 | 16      | 0     | -113   | 264     | -32    | -4     |
| WFIKKN1     | ID_163 | 16      | 0     | -195   | 544     | 262    | 41     |
| GFRα1       | ID_175 | 16      | 0     | -536   | 443     | 29     | 280    |
| GFRα4       | ID_178 | 16      | 0     | -211   | 208     | -47    | 116    |
| TNFSF18     | ID_180 | 16      | 0     | -14    | 246     | 89     | 68     |
| GPC5        | ID_187 | 16      | 0     | -180   | 1,345.00| 298    | 509    |
| GH1         | ID_194 | 16      | 0     | -596   | 206     | 10     | -9     |
| CCHCR1      | ID_198 | 16      | 0     | -108   | 322     | 50     | 238    |
| NRG1        | ID_200 | 16      | 0     | -81    | 378.5   | 170.5  | 187    |
| ICAM1       | ID_207 | 16      | 0     | -136   | 98      | -17    | 63     |
| IFNβ1       | ID_213 | 16      | 0     | -87    | 233     | 143    | 29     |
| IGFBP3      | ID_218 | 16      | 0     | -1,311.00| 609    | -368   | -178   |
| IGFBP4      | ID_219 | 16      | 0     | -255   | 104     | -115   | 21     |
| IL1RAPL1    | ID_237 | 16      | 0     | -149   | 432     | 89     | 209    |
| IL2RG       | ID_245 | 16      | 0     | -184   | 600     | 87     | 264    |
| IL10RA      | ID_259 | 16      | 0     | -35    | 722     | 205    | 36     |
| IL17RB      | ID_274 | 16      | 0     | -111   | 128     | 66     | 4      |
| IL20        | ID_286 | 16      | 0     | -204   | 565     | 127    | 68     |
| LBP         | ID_314 | 16      | 0     | -312   | 977     | 109    | -35    |
| CSF1        | ID_337 | 16      | 0     | -387   | 756     | 167    | 31     |
| PPBP        | ID_370 | 16      | 0     | -54    | 52      | 9      | 24     |
| NCAM1       | ID_371 | 16      | 0     | -113   | 578     | 251    | 234    |
| NTF4        | ID_384 | 16      | 0     | -156   | 256     | 125    | 50     |
| ARTN        | ID_22  | 18      | 0     | -466   | 935     | 656    | 487    |
| TNFRSF13C   | ID_25  | 18      | 0     | -385   | 398     | 118    | 509    |
| BMP6        | ID_39  | 18      | 0     | -160   | 125     | 164    | 182    |
| CD40LG      | ID_64  | 18      | 0     | -656   | 679     | 1,410.00| 592    |
| CNTF        | ID_71  | 18      | 0     | -365   | 432     | 312    | 126    |
| CXC2R1      | ID_86  | 18      | 0     | -251   | 689     | 324    | 754    |
| TNFRSF21    | ID_100 | 18      | 0     | -806   | 867     | 120    | 1,102.00| 592    |
| FAS         | ID_126 | 18      | 0     | -502   | 262     | 201    | 566    |
| FZD6        | ID_159 | 18      | 0     | -421   | 12      | -31    | 148    |
| MSTN        | ID_170 | 18      | 0     | -1,622.00| 412    | 170    | 695    |
| GDNF        | ID_174 | 18      | 0     | -70    | 166     | 61     | 137    |
| GFRα2       | ID_176 | 18      | 0     | -430   | 224     | 284    | 385    |
| SLC2A1      | ID_182 | 18      | 0     | -36    | 207     | 237    | 158    |
| CSF2RA      | ID_189 | 18      | 0     | -190   | 591     | 447    | 630    |
| GREM1       | ID_191 | 18      | 0     | -393   | 679     | 333    | 800    |
| CCL1        | ID_206 | 18      | 0     | -206   | 59      | 84     | 72     |
| ICAM2       | ID_208 | 18      | 0     | -156   | 270     | 162    | 120    |
| ICAM5       | ID_210 | 18      | 0     | -53    | 161     | 251    | 145    |
| IFNG        | ID_214 | 18      | 0     | -721   | 1,000.00| 715    | 777    |
| IGFBP1      | ID_216 | 18      | 0     | -92    | 416     | 273    | 332    |
| IL36B       | ID_231 | 18      | 0     | -537   | 677     | 403    | 595    |
Table SII. Continued.

| Gene symbol | SPOT | Profile | Day 0 | Day 3 | Day 7 | Day 14 | Day 21 |
|-------------|------|---------|-------|-------|-------|--------|--------|
| IL1RL1      | ID_235 | 18 | 0 | -400 | 555 | 147 | 412 |
| IL5         | ID_250 | 18 | 0 | -1,504.00 | 228 | 39 | 875 |
| IL17RC      | ID_280 | 18 | 0 | -98 | 396 | 451 | 544 |
| KNG1        | ID_310 | 18 | 0 | -6 | 279 | 184 | 262 |
| CSF1R       | ID_338 | 18 | 0 | -188 | 152 | 261 | 83 |
| CCL19       | ID_350 | 18 | 0 | -88 | 161 | 158 | 224 |
| MMP1        | ID_351 | 18 | 0 | -82 | 150 | 216 | 124 |
| MMP19       | ID_364 | 18 | 0 | -122 | 329 | 280 | 313 |
| MMP24       | ID_366 | 18 | 0 | -34 | 88 | 141 | 93 |
| MUSK        | ID_369 | 18 | 0 | -522 | 816 | 749 | 554 |
| NRG3        | ID_382 | 18 | 0 | 1,134.00 | 1,204.00 | 1,265.00 |
| GPMB        | ID_388 | 18 | 0 | -59 | 119 | 152 | 133 |
| CCL18       | ID_392 | 18 | 0 | -233 | 307 | 292 | 447 |
| PDGFRB      | ID_395 | 18 | 0 | -6 | 210 | 253 | 214 |
| PRL         | ID_409 | 18 | 0 | -222 | 108 | 174 | 106 |
| S100A8:S100A9 | ID_417 | 18 | 0 | -109 | 372 | 169 | 270 |
| FRZB        | ID_424 | 18 | 0 | -42 | 266 | 135 | 304 |
| SLPI        | ID_430 | 18 | 0 | -135 | 53 | -5 | 93 |
| IL27RA      | ID_443 | 18 | 0 | -112 | 113 | 148 | 292 |
| THBS4       | ID_459 | 18 | 0 | -33 | 289 | 185 | 186 |
| TEK         | ID_462 | 18 | 0 | -59 | 183 | 120 | 240 |
| TLR1        | ID_468 | 18 | 0 | -23 | 229 | 199 | 231 |
| TNF         | ID_474 | 18 | 0 | -510 | 967 | 1,727.00 | 1,030.00 |
| INHBB       | ID_2 | 28 | 0 | -81.75 | 153.1 | -44.1 | 183.05 |
| ACVR1       | ID_4 | 28 | 0 | -560.4 | 413.2 | 108 | 1,412.80 |
| ADIPOQQ     | ID_8 | 28 | 0 | -288.9 | 643.7 | 62.9 | 694.5 |
| PLG         | ID_18 | 28 | 0 | 33 | 651 | 333 | 858 |
| TNFSF13     | ID_20 | 28 | 0 | 284 | 1,189.00 | 226 | 1,323.00 |
| GDF10       | ID_36 | 28 | 0 | -23 | 155 | -11 | 143 |
| CTF1        | ID_47 | 28 | 0 | -34 | 187 | 18 | 449 |
| CCR5        | ID_54 | 28 | 0 | -149 | 399 | -50 | 676 |
| CCR6        | ID_55 | 28 | 0 | -294 | 562 | 0 | 568 |
| RARRES2     | ID_67 | 28 | 0 | -52 | 75 | 0 | 179 |
| ESM1        | ID_110 | 28 | 0 | -147 | 148 | -46 | 256 |
| FGFR3       | ID_130 | 28 | 0 | -180 | 372 | 216 | 642 |
| FGFR18      | ID_145 | 28 | 0 | -424 | 487 | 208 | 899 |
| FGFR21      | ID_148 | 28 | 0 | 0 | 64 | -22 | 90 |
| GPC3        | ID_186 | 28 | 0 | -1 | 120 | 18 | 224 |
| GZMA        | ID_190 | 28 | 0 | -18 | 1,224.00 | -28 | 1,692.00 |
| CXCL1       | ID_192 | 28 | 0 | -137.5 | 558 | 605.5 | 2,173.00 |
| TNFRSF14    | ID_205 | 28 | 0 | 107 | 321 | 36 | 454 |
| IGFBP2      | ID_217 | 28 | 0 | -188 | 116 | 46 | 479 |
| IL36G       | ID_232 | 28 | 0 | 70 | 614 | 194 | 761 |
| IL4         | ID_248 | 28 | 0 | -89 | 270 | 101 | 410 |
| IL13        | ID_266 | 28 | 0 | -511 | 135 | -247 | 857 |
| IL17RA      | ID_279 | 28 | 0 | -19 | 473 | 183 | 529 |
| NRTN        | ID_375 | 28 | 0 | 55 | 300 | 170 | 354 |
| HCRTR2      | ID_386 | 28 | 0 | -50 | 140 | 140 | 475 |
| S100A10     | ID_418 | 28 | 0 | -66 | 141 | 118 | 311 |
| TNFRSF19    | ID_486 | 28 | 0 | -47 | 135 | 4 | 118 |
| GDF11       | ID_172 | 41 | 0 | 541 | 1,171.00 | 1,002.00 | 1,543.00 |
| MET         | ID_202 | 41 | 0 | 1,058.00 | 675 | 1,346.00 | 1,858.00 |
| IL1B        | ID_227 | 41 | 0 | 88 | 191 | 151 | 214 |
| IL1F10      | ID_233 | 41 | 0 | 23 | 527 | 477 | 629 |
| IL10        | ID_258 | 41 | 0 | 618 | 1,784.00 | 2,284.00 | 2,209.00 |
| LIF         | ID_321 | 41 | 0 | 0 | 212 | 194 | 297 |
| TNFRSF14    | ID_323 | 41 | 0 | -51 | 226 | 367 | 462 |
| SELL        | ID_328 | 41 | 0 | 134 | 230 | 217 | 315 |
| MMP12       | ID_359 | 41 | 0 | 70 | 110 | 207 | 192 |
| Gene symbol | SPOT | Profile | Day 0 | Day 3 | Day 7 | Day 14 | Day 21 |
|-------------|------|---------|-------|-------|-------|--------|--------|
| MMP16       | ID_363 | 41 | 0 | -59 | 88 | 114 | 307 |
| NRP2        | ID_374 | 41 | 0 | 21 | 265 | 195 | 289 |
| OSTN        | ID_389 | 41 | 0 | 215 | 587 | 419 | 673 |
| PECAM1      | ID_401 | 41 | 0 | 34 | 71 | 262 | 265 |
| CCL5        | ID_413 | 41 | 0 | 124 | 113 | 359 | 552 |
| SMAD7       | ID_434 | 41 | 0 | 47 | 200 | 140 | 263 |
| CCL17       | ID_442 | 41 | 0 | -37 | 41 | 73 | 160 |
| TGFβ2       | ID_448 | 41 | 0 | -2 | 188 | 238 | 525 |
| TLR4        | ID_471 | 41 | 0 | 29 | 179 | 198 | 237 |
| TNFRSF1A    | ID_476 | 41 | 0 | 21 | 240 | 395 | 371 |
| TNFRSF10C   | ID_482 | 41 | 0 | -5 | 92 | 71 | 160 |
| ACVR1B      | ID_5 | 42 | 0 | 58.3 | 811.8 | 192.5 | 162.6 |
| ACVR2B      | ID_6 | 42 | 0 | -75.1 | 731.4 | 169.8 | 636.9 |
| ACVR2A      | ID_7 | 42 | 0 | 13.9 | 1,079.00 | 582.8 | 1,110.40 |
| AGRP        | ID_9 | 42 | 0 | -136 | 987 | 90.1 | 510.8 |
| ANGPTL1     | ID_15 | 42 | 0 | 362.7 | 890.3 | 266.1 | 595.9 |
| AXL         | ID_23 | 42 | 0 | -119 | 412 | -2 | 272 |
| BMP5        | ID_38 | 42 | 0 | 129 | 890 | 243 | 340 |
| BMP7        | ID_40 | 42 | 0 | -41 | 1,060.00 | 165 | 784 |
| PTGDR2      | ID_76 | 42 | 0 | 75 | 610 | 277 | 194 |
| BMPER       | ID_82 | 42 | 0 | 138 | 539 | 335 | 506 |
| CXCR1       | ID_85 | 42 | 0 | -306 | 2,621.00 | 931 | 1,808.00 |
| EDN1        | ID_113 | 42 | 0 | 74 | 784 | 538 | 772 |
| S100A12     | ID_114 | 42 | 0 | 352 | 1,557.00 | 798 | 545 |
| EPO         | ID_122 | 42 | 0 | 161 | 763 | 208 | 576 |
| FGF2        | ID_128 | 42 | 0 | 51 | 517 | 331 | 457 |
| FZD4        | ID_157 | 42 | 0 | 260 | 864 | 400 | 460 |
| WIF1KKN2    | ID_162 | 42 | 0 | 101 | 684 | 143 | 491 |
| CCL16       | ID_197 | 42 | 0 | 41 | 385 | 237 | 430 |
| IFNγR1      | ID_215 | 42 | 0 | 92 | 421 | -10 | 300 |
| IL1RN       | ID_239 | 42 | 0 | -110 | 644 | 128 | 466 |
| IL17D       | ID_276 | 42 | 0 | 76 | 574 | 285 | 432 |
| IL20RB      | ID_288 | 42 | 0 | -86 | 458 | -8 | 351 |
| INS         | ID_305 | 42 | 0 | -52 | 313 | 63 | 181 |
| LECT2       | ID_316 | 42 | 0 | 133 | 473 | 251 | 316 |
| LCN1        | ID_324 | 42 | 0 | 189 | 854 | 13 | 319 |
| MIF         | ID_343 | 42 | 0 | 10 | 227 | 128 | 224 |
| MMP13       | ID_360 | 42 | 0 | 169 | 389 | 45 | 341 |
| NTF3        | ID_383 | 42 | 0 | 148 | 565 | 286 | 191 |
| TNFRSF1B    | ID_477 | 42 | 0 | 60 | 283 | 154 | 182 |
| TREM1       | ID_485 | 42 | 0 | 5 | 257 | -4 | 118 |
| TNFAIP6     | ID_487 | 42 | 0 | 0 | 338 | 183 | 245 |
| VCAM1       | ID_495 | 42 | 0 | 152 | 277 | 169 | 230 |
| BMP3        | ID_35 | 43 | 0 | 178 | 527 | 338 | 236 |
| CCR9        | ID_58 | 43 | 0 | 100 | 879 | 644 | 617 |
| CHRD1       | ID_68 | 43 | 0 | -178 | 928 | 695 | 225 |
| PROK1       | ID_107 | 43 | 0 | 141 | 487 | 315 | 247 |
| FGF9        | ID_138 | 43 | 0 | 139 | 477 | 413 | 279 |
| FGF13       | ID_142 | 43 | 0 | 281 | 777 | 781 | 325 |
| FGF17       | ID_144 | 43 | 0 | 123 | 284 | 311 | 252 |
| FZD3        | ID_156 | 43 | 0 | 12 | 518 | 287 | 213 |
| SLC2A5      | ID_185 | 43 | 0 | 116 | 982 | 539 | 228 |
| IL36RN      | ID_228 | 43 | 0 | 231 | 590 | 509 | 409 |
| IL37        | ID_230 | 43 | 0 | -2 | 136 | 87 | 42 |
| IL1RAP      | ID_234 | 43 | 0 | 81 | 415 | 300 | 355 |
| IL2RB       | ID_244 | 43 | 0 | 77 | 417 | 496 | 344 |
| IL10RB      | ID_260 | 43 | 0 | 69 | 298 | 218 | 287 |
| IL12A;IL12B | ID_263 | 43 | 0 | 57 | 441 | 320 | 195 |
| IL20RA      | ID_287 | 43 | 0 | -30 | 533 | 495 | 432 |
Table SII. Continued.

| Gene symbol | SPOT | Profile | Day 0 | Day 3 | Day 7 | Day 14 | Day 21 |
|-------------|------|---------|-------|-------|-------|--------|--------|
| ITGAL       | ID_320 | 43 | 0 | 30 | 509 | 308 | 180 |
| LCN2        | ID_325 | 43 | 0 | 0 | 198 | 228 | 96 |
| ITGAM       | ID_332 | 43 | 0 | -112 | 403 | 376 | 164 |
| CCL2        | ID_333 | 43 | 0 | 303 | 853 | 700 | 450 |
| CXCL2       | ID_348 | 43 | 0 | 126 | 528 | 415 | 102 |
| MMP3        | ID_353 | 43 | 0 | 104 | 276 | 282 | 105 |
| MMP9        | ID_356 | 43 | 0 | 6 | 879 | 446 | 266 |
| NGFR        | ID_376 | 43 | 0 | 40 | 287 | 235 | 262 |
| PDGFA; PDGFB | ID_397 | 43 | 0 | 0 | 274 | 174 | 96 |
| PGF         | ID_405 | 43 | 0 | 102 | 253 | 204 | 174 |
| GRN         | ID_408 | 43 | 0 | 41 | 287 | 173 | 69 |
| SELP        | ID_410 | 43 | 0 | 79 | 319 | 242 | 324 |
| RETNLB      | ID_414 | 43 | 0 | -21 | 330 | 333 | 174 |
| ROBO4       | ID_416 | 43 | 0 | -4 | 468 | 392 | 138 |
| SIGLEC5     | ID_428 | 43 | 0 | 143 | 551 | 363 | 214 |
| SIGLEC9     | ID_429 | 43 | 0 | 50 | 672 | 505 | 445 |
| TEMPO       | ID_460 | 43 | 0 | 32 | 304 | 231 | 182 |
| TIE1        | ID_461 | 43 | 0 | 0 | 236 | 235 | 73 |
| TNFRSF10A   | ID_480 | 43 | 0 | 67 | 194 | 349 | 162 |
| VASN        | ID_494 | 43 | 0 | 160 | 297 | 275 | 193 |
| FLT4        | ID_499 | 43 | 0 | -12 | 463 | 674 | 275 |
| FIGF        | ID_502 | 43 | 0 | 74 | 539 | 364 | 198 |

SPOT, UniGene, Gnomon and control sequences; Profile, cytokine expression cluster.
### Table SIII. Genomes pathway enrichment analysis according to the cytokines clustered in each of the 6 significant cluster profiles.

| Profile | Description                                | P-value       | Gene                                                                 |
|---------|--------------------------------------------|---------------|----------------------------------------------------------------------|
| 16      | Cytokine-cytokine receptor interaction     | $9.19 \times 10^{-17}$ | BMP4/CCL28/CCR1/CCR4/CCR7/CXCL14/CXCL16/TNFSF18/GH1/IFNB1/IL2RG/IL10RA/IL17RB/IL20/CSF1/PPBP |
| 16      | Chemokine signaling pathway                | $2.59 \times 10^{-6}$ | CCL28/CCR1/CCR4/CCR7/CXCL14/CXCL16/PPBP                             |
| 16      | Kaposi sarcoma-associated herpesvirus infection | $3.21 \times 10^{-5}$ | ANGPT2/CTNNB1/CCR1/CCR4/ICAM1/IFNB1                                |
| 16      | PI3K-Akt signaling pathway                 | $0.000146$    | ANGPT2/PDG20/GH1/IFNB1/IL2RG/CSF1/NTF4                              |
| 16      | JAK-STAT signaling pathway                | $0.000198$    | GH1/IFNB1/IL2RG/IL10RA/IL20                                       |
| 16      | Cell adhesion molecules (CAMs)             | $0.001451$    | ALCAM/CD80/ICAM1/NCAM1                                              |
| 16      | Rheumatoid arthritis                      | $0.003617$    | CD80/ICAM1/CSF1                                                     |
| 16      | Rap1 signaling pathway                     | $0.005056$    | ANGPT2/CTNNB1/FGF20/CSF1                                           |
| 16      | Toll-like receptor signaling pathway       | $0.005263$    | CD80/IFNB1/LBP                                                      |
| 16      | TNF signaling pathway                      | $0.006153$    | ICAM1/IFNB1/CSF1                                                    |
| 16      | Human cytomegalovirus infection            | $0.006898$    | CTNNB1/CCR1/IFNB1/ICAM1                                             |
| 16      | Ras signaling pathway                      | $0.007677$    | ANGPT2/FGF20/CSF1/NTF4                                             |
| 16      | Fluid shear stress and atherosclerosis     | $0.011686$    | CTNNB1/BMP4/ICAM1                                                   |
| 16      | Intestinal immune network for IgA production | $0.012159$ | CD80/CCL28                                                          |
| 16      | Viral myocarditis                          | $0.013721$    | CD80/ICAM1                                                          |
| 16      | MAPK signaling pathway                     | $0.017405$    | ANGPT2/FGF20/CSF1/NTF4                                             |
| 16      | Basal cell carcinoma                       | $0.019605$    | CTNNB1/BMP4                                                         |
| 16      | Tuberculosis                               | $0.022895$    | IFNB1/IL10RA/LBP                                                    |
| 18      | NF-kappa B signaling pathway               | $0.041909$    | ICAM1/LBP                                                           |
| 18      | Cytokine-cytokine receptor interaction     | $1.32 \times 10^{-22}$ | TNFRSF13C/BMP6/CD40LG/CNTF/CXCR2/TNFRSF21/MSTN/CSF2RA/ICAM1/IFNG/IL36B/IL1RL/IL5/IL17RC/CSF1/ICAM1/THBS4/TNFRSF13C/CD40LG/PRL/IL27RA/TNF |
| 18      | Allograft rejection                         | $4.38 \times 10^{-7}$ | CD40LG/FAS/IFNG/IL5/TNF                                            |
| 18      | JAK-STAT signaling pathway                 | $3.84 \times 10^{-6}$ | CNTF/CSF2RA/IFNG/IL5/PDGFRB/PRL/IL27RA                             |
| 18      | African trypanosomiasis                    | $1.56 \times 10^{-3}$ | FAS/IFNG/KNG1/TNF                                                   |
| 18      | IL-17 signaling pathway                    | $3.85 \times 10^{-3}$ | IFNG/IL5/IL17RC/MMP1/TNF                                           |
| 18      | Malaria                                    | $4.82 \times 10^{-3}$ | CD40LG/IFNG/THBS4/TNF                                              |
| 18      | Asthma                                     | $0.000282$    | CD40LG/IL5/TNF                                                      |
| 18      | Rheumatoid arthritis                       | $0.000537$    | IFNG/MMP1/TEK/TNF                                                   |
| 18      | TGF-beta signaling pathway                 | $0.00056$     | BMP6/GREM1/IFNG/TNF                                                 |
| 18      | NF-kappa B signaling pathway               | $0.000632$    | TNFRSF13C/CD40LG/CCL19/TNF                                          |
| 18      | Transplantation disease                    | $0.00065$     | FAS/IFNG/TNF                                                        |
| 18      | Hematopoietic cell lineage                 | $0.000684$    | CSF2RA/IL5/CSF1/TFN                                                 |
| 18      | Type I diabetes mellitus                   | $0.000748$    | FAS/IFNG/TNF                                                        |
| 18      | T cell receptor signaling pathway           | $0.000797$    | CD40LG/IFNG/IL5/TNF                                                |
| 18      | Chagas disease (American trypanosomiasis) | $0.000858$    | FAS/IFNG/KNG1/TNF                                                   |
| 18      | Intestinal immune network for IgA production | $0.001097$ | TNFRSF13C/CD40LG/IL5/TNF                                           |
| 18      | Autoimmune thyroid disease                 | $0.001379$    | CD40LG/FAS/IL5                                                      |
| 18      | Natural killer cell mediated cytotoxicity  | $0.002093$    | FAS/ICAM2/IFNG/TNF                                                  |
| 18      | Inflammatory bowel disease (IBD)           | $0.002485$    | IFNG/IL5/TNF                                                        |
| 18      | MAPK signaling pathway                     | $0.00728$     | FAS/CSF1/PI3K-Akt/PDGFRB/TEK/TNF                                    |
| 18      | Chemokine signaling pathway                | $0.007893$    | CXCR2/CCL1/CCL19/THBS4/TNF                                          |
| 18      | HIF-1 signaling pathway                    | $0.008325$    | SLC2A1/IFNG/TEK                                                     |
| 18      | Primary immunodeficiency                   | $0.010437$    | TNFRSF13C/CD40LG                                                    |
| 18      | Human papillomavirus infection             | $0.011526$    | FAS/FZD6/PDGFRB/THBS4/TNF                                           |
| 18      | Toxoplasmosis                              | $0.011617$    | CD40LG/IFNG/TNF                                                      |
| 18      | PI3K-Akt signaling pathway                 | $0.01527$     | CSF1/PI3K-Akt/PDGFRB/PRL/THBS4/TEK                                  |
| 18      | Osteoclast differentiation                 | $0.016231$    | IFNG/CSF1/TFN                                                       |
| 18      | Systemic lupus erythematosus               | $0.017968$    | CD40LG/IFNG/TNF                                                      |
| 18      | Hepatitis C                                | $0.026809$    | FAS/IFNG/TNF                                                        |
| 18      | Necrosis                                   | $0.030033$    | FAS/IFNG/TNF                                                        |
| 18      | Central carbon metabolism in cancer        | $0.030301$    | SLC2A1/PDGFRB                                                       |
| 18      | Fc epsilon RI signaling pathway            | $0.032927$    | IL5/TNF                                                             |
| 18      | Adipocytokine signaling pathway            | $0.033822$    | SLC2A1/TNF                                                           |
| 18      | Influenza A                                | $0.034469$    | FAS/IFNG/TNF                                                        |
| Profile | Description | P-value  | Gene                                      |
|---------|-------------|----------|-------------------------------------------|
| 18      | Leishmaniasis | 0.038438 | IFNG/TNF                                  |
| 18      | Tuberculosis  | 0.038685 | IFNG/TLR1/TNF                             |
| 18      | Antigen processing and presentation | 0.041318 | IFNG/TNF                                  |
| 28      | Cytokine-cytokine receptor interaction | 1.96x10^{-15} | INHBB/ACVR1/TNFSF13/GDF10/CTF1/CCR5/CCR6/CXCL1/TNFRSF14/IL36G/IL4/IL13/IL17A/TNFRSF19 |
| 28      | IL-17 signaling pathway | 0.000115 | CXCL1/IL4/IL13/IL17A                    |
| 28      | Asthma        | 0.003327 | IL4/IL13                                  |
| 28      | Signaling pathways regulating pluripotency of stem cells | 0.006562 | INHBB/ACVR1/FGFR3                        |
| 28      | Intestinal immune network for IgA production | 0.008162 | TNFSF13/IL4                              |
| 28      | JAK-STAT signaling pathway | 0.009995 | CTF1/IL4/IL13                            |
| 28      | Inflammatory bowel disease (IBD) | 0.014051 | IL4/IL13                                  |
| 28      | Fc epsilon RI signaling pathway | 0.015311 | IL4/IL13                                  |
| 28      | Chemokine signaling pathway | 0.015369 | IL4/IL13                                  |
| 28      | PI3K-Akt signaling pathway | 0.015674 | FGFR3/FGF18/FGF21                        |
| 28      | Melanoma      | 0.017064 | FGFR3/FGF18/FGF21                        |
| 28      | Rap1 signaling pathway | 0.019053 | FGFR3/FGF18/FGF21                        |
| 28      | Regulation of actin cytoskeleton | 0.021064 | FGFR3/FGF18/FGF21                        |
| 28      | Ras signaling pathway | 0.026008 | FGFR3/FGF18/FGF21                        |
| 28      | Rheumatoid arthritis | 0.026477 | TNFSF13/IL4                              |
| 28      | TGF-beta signaling pathway | 0.02702 | INHBB/ACVR1                              |
| 28      | Th1 and Th2 cell differentiation | 0.02702 | IL4/IL13                                  |
| 28      | MAPK signaling pathway | 0.047856 | FGFR3/FGF18/FGF21                        |
| 41      | Cytokine-cytokine receptor interaction | 1.74x10^{-12} | GDF11/IL1B/IL1F10/IL10/LIF/TNFSF14/CCL5/CCL17/TNFSF1A/TNFRSF10/CCCL/CCCL/TGFB2/TNFRSF1A/TNFRSF10/CCCL |
| 41      | Malaria       | 5.10x10^{-10} | MET/IL1B/IL10/PECAM1/TGFB2/TLRF4 |
| 41      | Chagas disease (American trypanosomiasis) | 4.89x10^{-8} | IL1B/IL10/CCL5/TGFB2/TLRF4/TNFRSF1A |
| 41      | Inflammatory bowel disease (IBD) | 9.45x10^{-6} | IL1B/IL10/TGFB2/TLRF4                  |
| 41      | Leishmaniasis | 1.59x10^{-3} | IL1B/IL10/TGFB2/TLRF4                  |
| 41      | Tuberculosis  | 2.91x10^{-3} | IL1B/IL10/TGFB2/TLRF4                  |
| 41      | Rheumatoid arthritis | 3.60x10^{-3} | IL1B/CCL5/TGFB2/TLRF4                  |
| 41      | NF-kappa B signaling pathway | 4.27x10^{-3} | IL1B/TNFSF14/TLRF4/TNFRSF1A |
| 41      | Amoebiasis    | 4.45x10^{-3} | IL1B/IL10/TGFB2/TLRF4                  |
| 41      | TNF signaling pathway | 7.59x10^{-5} | IL1B/LIF/CCL5/TNFSF1A                   |
| 41      | Toxoplasmosis | 8.43x10^{-5} | IL1B/TGFB2/TLRF4/TNFRSF1A               |
| 41      | Influenza A   | 0.000416 | IL1B/CCL5/TLRF4/TNFRSF1A                |
| 41      | Pertussis     | 0.00054  | IL1B/IL10/TLRF4                        |
| 41      | Toll-like receptor signaling pathway | 0.001347 | IL1B/CCL5/TLRF4                        |
| 41      | C-type lectin receptor signaling pathway | 0.001347 | IL1B/IL10/CCL17                        |
| 41      | Osteoclast differentiation | 0.002445 | IL1B/TGFB2/TNFRSF1A                     |
| 41      | Prion diseases | 0.002525 | IL1B/CCL5                               |
| 41      | African trypanosomiasis | 0.002819 | IL1B/IL10                              |
| 41      | Fluid shear stress and atherosclerosis | 0.003091 | IL1B/PECAM1/TNFRSF1A                   |
| 41      | MAPK signaling pathway | 0.00317 | MET/IL1B/TGFB2/TNFRSF1A                 |
| 41      | Necrosis      | 0.004759 | IL1B/TLRF4/TNFRSF1A                     |
| 41      | Legionellosis | 0.006143 | IL1B/TLRF4                             |
| 41      | NOD-like receptor signaling pathway | 0.006189 | IL1B/CCL5/TLRF4                        |
| 41      | Cytosolic DNA-sensing pathway | 0.007997 | IL1B/CCL5                              |
| 41      | Proteoglycans in cancer | 0.008658 | MET/TGFB2/TLRF4                       |
| 41      | Epithelial cell signaling in Helicobacter pylori infection | 0.009269 | MET/CCL5                              |
| 41      | Renal cell carcinoma | 0.009534 | MET/TGFB2                             |
| 41      | Human cytomegalovirus infection | 0.011778 | IL1B/CCL5/TNFRSF1A                   |
| 41      | Salmonella infection | 0.014536 | IL1B/TLRF4                             |
| 41      | TGF-beta signaling pathway | 0.016521 | SMAD7/TGFB2                            |
| 41      | IL-17 signaling pathway | 0.016863 | IL1B/CCL17                             |
| 41      | Herpes simplex virus 1 infection | 0.018946 | IL1B/TNFSF14/CCL5/TNFRSF1A          |
Table SIII. Continued.

| Profile Description | P-value | Gene |
|---------------------|---------|------|
| AGE-RAGE signaling pathway in diabetic complications | 0.019339 | IL1B/TGFB2 |
| MicroRNAs in cancer | 0.025109 | MET/MMP16/TGFB2 |
| FoxO signaling pathway | 0.032437 | IL10/TGFB2 |
| Measles | 0.035197 | IL1B/TLR4 |
| Cell adhesion molecules (CAMs) | 0.039015 | SELL/PECAM1 |
| Non-alcoholic fatty liver disease (NAFLD) | 0.040487 | IL1B/TNFRSF1A |
| Gastric cancer | 0.040487 | MET/TGFB2 |
| Hippo signaling pathway | 0.042987 | SMAD7/TGFB2 |
| JAK-STAT signaling pathway | 0.047106 | IL10/LIF |
| Hepatitis B | 0.047631 | TGFB2/TLR4 |
| Cytokine-cytokine receptor interaction | 1.82x10^{-13} | ACVR1B/ACVR2B/ACVR2A/BMP5/BMP7/CXCR1/EPO/CCL16/IFNGR1/IL1RN/IL17D/IL20RB/TNFRSF1B |
| TGF-beta signaling pathway | 5.68x10^{-6} | ACVR1B/ACVR2B/ACVR2A/BMP5/BMP7 |
| Signaling pathways regulating pluripotency of stem cells | 4.24x10^{-5} | ACVR1B/ACVR2B/ACVR2A/BMP5/BMP7/CXCR1/EPO/CCL16/IFNGR1/IL1RN/IL17D/IL20RB/TNFRSF1B |
| HIF-1 signaling pathway | 0.000183 | EDN1/EPO/IFNGR1/INS |
| Fluid shear stress and atherosclerosis | 0.000645 | ACVR2B/ACVR2A/EDN1/VCAM1 |
| JAK-STAT signaling pathway | 0.001145 | EPO/IFNGR1/IL17D/IL20RB |
| TNF signaling pathway | 0.00388 | EDN1/TNFRSF1B/VCAM1 |
| Hippo signaling pathway | 0.009866 | BMP5/BMP7/FZD4 |
| Adipocytokine signaling pathway | 0.017144 | AGRP/TNFRSF1B |
| PI3K-Akt signaling pathway | 0.018315 | EPO/FGF2/INS/NTF3 |
| EGFR tyrosine kinase inhibitor resistance | 0.02212 | AXL/FGF2 |
| Ras signaling pathway | 0.029272 | FGF2/INS/NTF3 |
| IL-17 signaling pathway | 0.029963 | IL17D/MMP3/MMP9 |
| AGE-RAGE signaling pathway in diabetic complications | 0.034244 | EDN1/VCAM1 |
| Melanogenesis | 0.034874 | EDN1/FZD4 |
| Th17 cell differentiation | 0.03875 | IFNGR1/IL17D |
| Cytokine-cytokine receptor interaction | 1.12x10^{-11} | BMP3/CCL2/CXCL2/EDN1/FGF9/FGF17/FGF17/IL1RAP/IL2RB/IL10RB/IL20RA/TNFRSF1B |
| Rap1 signaling pathway | 1.85x10^{-6} | FGF9/FGF17/ITGAL/ITGAM/NGFR/PGF/FLT4 |
| IL-17 signaling pathway | 7.50x10^{-6} | LCN2/CCL2/CXCL2/MMP3/MMP9 |
| MAPK signaling pathway | 0.000205 | FGF9/FGF17/IL1RAP/NGFR/PGF/FLT4 |
| Transcriptional misregulation in cancer | 0.00021 | FGF9/FGF17/IL2RB/NGFR/PGF/FLT4 |
| TNF signaling pathway | 0.000314 | CCL2/CXCL2/MMP3/MMP9 |
| Malaria | 0.000423 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| PI3K-Akt signaling pathway | 0.000547 | ITGAL/CXCL2/MMP3/MMP9/NGFR |
| Ras signaling pathway | 0.000583 | ITGAL/CXCL2/MMP3/MMP9 |
| Breast cancer | 0.000941 | ITGAL/CXCL2/MMP3/MMP9/NGFR |
| Staphylococcus aureus infection | 0.001109 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Rheumatoid arthritis | 0.002566 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Regulation of actin cytoskeleton | 0.003733 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Leukocyte transendothelial migration | 0.004617 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Cell adhesion molecules (CAMs) | 0.009614 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Gastric cancer | 0.010162 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Legionellosis | 0.012082 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| JAK-STAT signaling pathway | 0.012747 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Chemokine signaling pathway | 0.019499 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Melanoma | 0.020149 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Prostate cancer | 0.035045 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |
| Th17 cell differentiation | 0.041904 | ITGAL/CXCL2/EDN1/FGF9/FGF17/FZD3/MMP3/MMP9 |

Profile, cytokine expression cluster.