

## SUPPLEMENTARY METHODS

### KEY RESOURCES TABLE

| REAGENT or RESOURCE             | SOURCE                                                                                                                              | IDENTIFIER                                                                                                                                                                                                                        |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Biological Samples</b>       |                                                                                                                                     |                                                                                                                                                                                                                                   |
| PBMCs from COVID-19 patients    | YouAn hospital and Puren hospital                                                                                                   |                                                                                                                                                                                                                                   |
| Plasma from COVID-19 patients   | YouAn hospital and Puren hospital                                                                                                   |                                                                                                                                                                                                                                   |
| Umbilical-cord MSCs             | Qingdao Co-orient Watson Biotechnology Group, Co., Ltd.<br>Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences |                                                                                                                                                                                                                                   |
| scRNA-seq data of infusion MSCs |                                                                                                                                     | <a href="http://www.ncmi.cn/user_data.html">http://www.ncmi.cn/user_data.html</a>                                                                                                                                                 |
| <b>Software and Algorithms</b>  |                                                                                                                                     |                                                                                                                                                                                                                                   |
| Cell Ranger (3.1.0)             | 10x Genomics                                                                                                                        | <a href="https://support.10xgenomics.com/single-cell-gene-expression/software/pipelines/latest/what-is-cell-ranger">https://support.10xgenomics.com/single-cell-gene-expression/software/pipelines/latest/what-is-cell-ranger</a> |
| Seurat (3.1.3)                  | Satija et al., 2015                                                                                                                 | <a href="https://satijalab.org/seurat/">https://satijalab.org/seurat/</a>                                                                                                                                                         |
| SCSA                            | Cao et al., 2020                                                                                                                    | <a href="https://github.com/bioinfo-ibms-pumc/SCSA">https://github.com/bioinfo-ibms-pumc/SCSA</a>                                                                                                                                 |
| clusterProfiler (3.14.3)        | Yu et al., 2012                                                                                                                     | <a href="https://guangchuangyu.github.io/software/clusterProfiler/">https://guangchuangyu.github.io/software/clusterProfiler/</a>                                                                                                 |
| pysam (0.15.0)                  | Li et al., 2009                                                                                                                     | <a href="https://pysam.readthedocs.io/en/latest/">https://pysam.readthedocs.io/en/latest/</a>                                                                                                                                     |
| GATK (3.7)                      | The Broad Institute                                                                                                                 | <a href="https://github.com/broadgsga/gatk/releases/tag/3.7">https://github.com/broadgsga/gatk/releases/tag/3.7</a>                                                                                                               |
| PLINK (1.9)                     | Purcell et al., 2007                                                                                                                | <a href="http://zzz.bwh.harvard.edu/plink/contact.shtml#cite">http://zzz.bwh.harvard.edu/plink/contact.shtml#cite</a>                                                                                                             |
| Flashpca (2.0)                  | Abraham et al., 2017                                                                                                                | <a href="https://github.com/gabraham/flashpca">https://github.com/gabraham/flashpca</a>                                                                                                                                           |
| <b>Chemicals and Antibodies</b> |                                                                                                                                     |                                                                                                                                                                                                                                   |
| PBS                             | Gibco                                                                                                                               | 10010023                                                                                                                                                                                                                          |
| BSA                             | Thermo Scientific                                                                                                                   | 23208                                                                                                                                                                                                                             |
| Chloral hydrate                 | Sigma-Aldrich                                                                                                                       | C8383-100G                                                                                                                                                                                                                        |
| LPS                             | eBioscience                                                                                                                         | 00-4976-03                                                                                                                                                                                                                        |
| DMEM                            | Gibco                                                                                                                               | 11965092                                                                                                                                                                                                                          |
| FBS                             | Gibco                                                                                                                               | 16140071                                                                                                                                                                                                                          |
| IL-3                            | eBioscience                                                                                                                         | # 34-8031-82                                                                                                                                                                                                                      |
| IL-6                            | eBioscience                                                                                                                         | # 14-8061-80                                                                                                                                                                                                                      |
| SCF                             | eBioscience                                                                                                                         | # 14-8341-62                                                                                                                                                                                                                      |

|                                                  |                      |               |
|--------------------------------------------------|----------------------|---------------|
| Transwell plates                                 | Corning              | CLS3412-24EA  |
| RPMI 1640                                        | Gibco                | A1049101      |
| Glutamine                                        | Sigma-Aldrich        | G7513         |
| β-mercaptoethanol                                | Sigma-Aldrich        | M3148         |
| Non-essential amino acids                        | Sigma-Aldrich        | TMS-001-C     |
| IL-2                                             | eBioscience          | # RP-8605     |
| phytohemagglutinin, PHA                          | Sigma-Aldrich        | L1668         |
| CD3                                              | eBioscience          | # 78-0032-80  |
| CD69                                             | eBioscience          | # 14-0691-81  |
| CD25                                             | eBioscience          | # 17-0251-81  |
| CFSE living cells dye                            | BD Horizon           | 565082        |
| MTS reagent                                      | Promega              | G1112         |
| Human cytokine/chemokine magnetic bead panel kit | Millipore            | HCYTOMAG-60K  |
| TRIzol reagent                                   | Invitrogen           | 15596018      |
| SYBR premix Ex Taq                               | Takara               | RR420A        |
| RIPA lysis buffer                                | Thermo Scientific    | 89901         |
| PMSF proteinase inhibitors cocktail              | Beyotime             | ST506         |
| Phosphatase inhibitors cocktail                  | Yeasen               | 20104ES03     |
| HRP-conjugated secondary antibodies              | Neobioscience        | 16738         |
| Chemiluminescent ECL reagent                     | Invitrogen           | WP20005       |
| Sytox Green solution                             | Invitrogen           | S7020         |
| BCA Protein Assay kit                            | Beyotime             | P0012S        |
| Reverse Transcription kit                        | Thermo Scientific    | K1691         |
| Agilent 2100 High Sensitivity DNA Assay kit      | Agilent Technologies | 5990-4417CHCN |
| Mouse SCA1 Positive Selection kit                | Stemcell             | 18756RF       |
| Cell lines                                       |                      |               |
| MRC-5                                            | Cell Bank of IBMS    | N/A           |