Construction of a Human Cell Landscape of COVID-19 Infection at Single-cell Level

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Supplementary Figure 1. Bulk data analysis showed prostate and testis have high TMPRSS2 (A) and ACE2 (B) expression level respectively, and liver exhibit high MTHFD1 (C) expression. Placenta cells and thyroid demonstrated high expression level of CTSL (D) and CTSB (E) respectively.
Supplementary Figure 2. ScRNA-seq data analysis showed the cells in different organs were categorized into subclusters. (A) Ascending colon, (B) Duodenum, (C) Epityphlon, (D) Ileum, (E) Jejunum, (F) Rectum, (G) Sigmoid colon, (H) Transverse-colon, (I) Representative for four fetal intestine donors, (J) Representative for three adult kidney donors, (K) Representative for four fetal kidney donors, (L) Representative for three adult lung donors, (M) Representative for two fetal lung donors, (N) Representative for three adult liver donors, (O) Representative for two fetal liver donors, (P) Representative for two adult heart donors, (Q) Representative for two fetal heart donors.
Supplementary Figure 3. ScRNA-seq data analysis showed the cells in different organs of the adult and fetal intestine donors and the grade adult and fetal organs at risk. Enrichment of the five factors in adult (A) and fetal (B) intestine. Enrichment of the five factors in adult (C) and fetal (D) kidney. Enrichment of the five factors in adult (E) and fetal (F) lung. Enrichment of the five factors in adult (G) and fetal (H) liver. Enrichment of the five factors in adult (I) and fetal (J) heart. The size of the dots indicates the proportion of cells in the respective cell type having greater-than-zero expression of these factors, while the color indicates the average log normalized expression of these genes.
Supplementary Figure 4. Cell proportion of adult and fetal intestine (A, F), kidney (B, G), lung (C, H), liver (D, I), heart (E, J).
Supplementary Figure 5. Bar plot of the RNA expression level of TMPRSS2, ACE2, MTHFD1, CTSL, and CTSB in adult (A, C, E, G, I) and fetal (B, D, F, H, J) intestine (A, B), kidney (C, D), lung (E, F), liver (G, H), heart (I, J). Raw expression values were normalized, log transformed and summarized by published cell clustering where available or reproduced clustering annotated using marker genes and cell type nomenclature from the respective studies.

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Supplementary Figure 6. The factors’ co-expression from dataset of adult (C, G, K, O, S) and fetal (D, H, L, P, T) intestine (C, D), kidney (G, H), lung (K, L), liver (O, P), heart (S, T). The dot size and color represent the proportion of cells within the respective cell type co-expressing the genes.

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## Supplementary Table 1. Basic information of samples.

| Organ          | Gender | Age | Source of sample | Cause of death       | Medical history | Sampling location          |
|----------------|--------|-----|------------------|----------------------|----------------|---------------------------|
| Intestine      |        |     |                  |                      |                |                           |
| Adult Ascending Colon1 | F      | 47  | DCD              | Cerebral hemorrhage  | Hypertension   | Partial tissue            |
| Adult Duodenum1 | M      | 52  | DCD              | Traumatic brain injury |               |                           |
| Adult Epityphlon | F      | 47  | DCD              | Cerebral hemorrhage  | Hypertension   | Partial tissue            |
| Adult Ileum2   | M      | 41  | DCD              | Spontaneous brain hemorrhage |       |                           |
| Adult Jejunum2 | M      | 64  | Operation       | Cardia cancer         | Partial tissue | Proximal jejunum         |
| Adult Rectum1  | F      | 47  | DCD              | Cerebral hemorrhage  | Hypertension   | Partial tissue            |
| Adult Sigmoid Colon1 | F      | 47  | DCD              | Cerebral hemorrhage  | Hypertension   | Lower part of the sigmoid colon |
| Adult Transverse Colon1 | F      | 51  | DCD              | Respiratory failure  | Severe asthma  |                           |
| Adult Transverse Colon2 | F      | 83  | Operation       | Colon cancer         | Adjacent normal tissue |                          |
| Fetal Intestine1 | F      | 12  | Abortion         |                      | Intact tissue  |                           |
| Fetal Intestine2 | M      | 10  | Abortion         |                      | Intact tissue  |                           |
| Fetal Intestine4 | F      | 11  | Abortion         |                      | Intact tissue  |                           |
| Fetal Intestine5 | M      | 12  | Abortion         |                      | Intact tissue  |                           |
| Kidney         |        |     |                  |                      |                |                           |
| Adult Kidney2  | M      | 66  | Operation       | Kidney cancer        | Partial tissue |                           |
| Adult Kidney3  | M      | 41  | DCD              | Spontaneous brain hemorrhage |       |                           |
| Adult Kidney4  | M      | 57  | Operation       | Kidney cancer        | Left kidney    |                           |
| Fetal Kidney3  | M      | 13  | Abortion         |                      | Intact tissue  |                           |
| Fetal Kidney4  | M      | 11  | Abortion         |                      | Intact tissue  |                           |
| Fetal Kidney5  | M      | 12  | Abortion         |                      | Intact tissue  |                           |
| Fetal Kidney6  | F      | 11  | Abortion         |                      | Intact tissue  |                           |
| Lung           |        |     |                  |                      |                |                           |
| Adult Lung1    | M      | 21  | DCD              | Traffic accident     | High BMI       | The lower lobe of right lung |
| Adult Lung2    | F      | 21  | DCD              | Traumatic brain injury |                | The lower lobe of right lung |
| Adult Lung3    | F      | 49  | Operation       | Pulmonary nodule     |                | Inferior lobe of right lung |
| Fetal Lung1    | F      | 12  | Abortion         |                      | Intact tissue  |                           |
| Fetal Lung2    | F      | 11  | Abortion         |                      | Intact tissue  |                           |
| Liver          |        |     |                  |                      |                |                           |
| Adult Liver1   | F      | 21  | DCD              | Traumatic brain injury |                | Right lobe                |
| Adult Liver4   | F      | 23  | Operation       | Hocal nodular hyperplasia |            | Left lateral lobe         |
| Fetal Liver1   | F      | 26  | Abortion         |                      | Intact tissue  |                           |
| Heart          |        |     |                  |                      |                |                           |
| Adult Heart1   | M      | 52  | DCD              | Traumatic brain injury |                | Left ventricular apex     |
| Adult Heart2   | F      | 47  | DCD              | Cerebral hemorrhage  | Hypertension   | Left ventricle            |
| Fetal          | F      | 12  | Abortion         |                      | Intact tissue  |                           |
| Fetal          | F      | 11  | Abortion         |                      | Intact tissue  |                           |
| Skin           |        |     |                  |                      |                |                           |
| Fetal Skin2    | F      | 7   | Abortion         |                      | Intact tissue  | Limb                      |
| Fetal Skin3    | F      | 11  | Abortion         |                      | Intact tissue  | Scalp                     |

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### Supplementary Table 2. Expression level of COVID-19 receptors.

| Organ               | Cluster No. | Annotation                                      | Annotation                  |
|---------------------|-------------|-------------------------------------------------|-----------------------------|
| Intestine           | 1           | B cell (Plasmocyte)_IGLV3-1 high                | Enterocyte_RPS2P46 high     |
|                     | 2           | T cell                                          | Enterocyte progenitor_APOA4 high |
|                     | 3           | Dendritic cell                                  | Enterocyte_GSTA1 high       |
|                     | 4           | Enterocyte progenitor                           | Proliferating cell          |
|                     | 5           | Fibroblast                                      | Stromal cell                |
|                     | 6           | Macrophage                                      | Goblet cell                 |
|                     | 7           | B cell (Plasmocyte)_IGHG3 high                  | Myofibroblast               |
|                     | 8           | Smooth muscle cell                              | Endothelial cell            |
|                     | 9           | Mast cell                                       | Smooth muscle cell          |
|                     | 10          | Schwann cell                                    | Neuron                      |
|                     | 11          | Enterocyte_CA7 high                             | Macrophage                  |
|                     | 12          | Mucous neck cell                                | Enteroendocrine cell        |
|                     |             |                                                  |                             |
|                     |             |                                                  |                             |
| Adult_Duodenum      | 1           | B cell (Plasmocyte)_IGHM/H_A_IGK high           | Enterocyte                  |
|                     | 2           | Mucous neck cell                                | Myofibroblast               |
|                     | 3           | Enterocyte_GSTA1 high                           | Proliferating cell          |
|                     | 4           | B cell (Plasmocyte)_IGH/HA_IGL high             | Neuron                      |
|                     | 5           | Goblet cell_LCN2 high                           | Neutrophil                  |
|                     | 6           | Enterocyte progenitor                           | Endothelial cell            |
|                     | 7           | Enterocyte_APOA1 high                           | Erythroid cell              |
|                     | 8           | B cell (Plasmocyte)_IGH/HA_IGK high             |                              |
|                     | 9           | Macrophage                                      | Erythroid cell_HBA2 high    |
|                     | 10          | B cell_Contamination                            | Enterocyte_APOA4 high       |
|                     | 11          | Endothelial cell                                | Enterocyte_AGR2 high        |

DCD, Donation after Cardiac Death
Enterocyte_BEST4 high
B cell (Plasmocyte)_IGHA_1
GK high
T cell
Enterocyte_MT gene high
Fibroblast
Mast cell
B cell (Plasmocyte)_IGHM/H_A_HIGK high
Goblet cell_CLCA1 high
Adult_Epityphlon
1 B cell (Plasmocyte)_JCHAIN high
2 Lymphocyte
3 T cell
4 CD8 T cell
5 Proliferating B cell
6 B cell (Plasmocyte)_IGHG3 high
Enterocyte
7 Myeloid cell
8 B cell (Plasmocyte)_IGK1-9 high
9 Mast cell
Stromal cell
10 Goblet cell
Fetal_Intestine 5
1 Enterocyte_APOA4 high
2 Epithelial cell
3 Stromal cell_CXCL1 14 high
4 Enterocyte_GSTA1 high
5 Macrophage
6 Proliferating cell
7 Endothelial cell
Enterocyte
8 Enterocyte_PROG1 high
9 Endothelial cell
10 Fibroblast
11 Enterocyte progenitor
12 Conventional dendritic cell
13 Stromal cell_PTGDS high
14 B cell (Plasmocyte)_IGHG/H_A high
15 T cell
16 Mast cell
17 Goblet cell
18 Endothelial progenitor cell
Adult_Ileum
1 Enterocyte
2 Enterocyte progenitor_REGIA high
3 Endothelial cell
4 Fibroblast
5 Enterocyte progenitor
6 Conventional dendritic cell
7 Stromal cell_PTGDS high
8 B cell (Plasmocyte)_IGHG/H_A high
9 T cell
10 Mast cell
11 Goblet cell
12 Endothelial progenitor cell
13 B cell (Plasmocyte)_IGHM/H_A_HIGL high
14 Neutrophil
15 Paneth cell
16 Fibroblast_FNDC1 high
17 Fibroblast_HMGB2 high
18 Stromal cell
19 Myofibroblast
20 Dendritic cell
21 T cell
22 Neuron
23 Endothelial cell
24 Goblet
25 Smooth muscle cell_ACTA2 high
26 Smooth muscle cell_ACTG2 high
27 Neutrophil
28 T cell_CCL4 high
29 Erythroid cell_HBA1 high
30 Smooth muscle cell_MGP high
31 Endothelial cell
32 Goblet cell
33 Stromal cell_MGP high
34 T cell
35 Neuron
36 Enterocutaneous cell_CFL1 high
37 Enterocutaneous cell_MLN high
38 Proliferating cell
39 Enterocyte_GUCA2A high
40 Smooth muscle cell_MT-RNR2 high
41 Smooth muscle_ACT2 high
42 Paneth cell
| Adult_Jejunum | Adult Rectum | Adult_Sigmoid Colon |
|--------------|--------------|--------------------|
| Macrophage | B cell (Plasmocyte) | Goblet cell |
| Smooth muscle cell | Paneth cell | Goblet progenitor_MT gene |
| Neuron | Paneth cell | Smooth muscle cell |
| Enterocyte | Paneth cell | Enterocyte |
## SUPPLEMENTARY DATA

|   | Cell Type                                      |
|---|------------------------------------------------|
| 1 | T cell                                         |
| 2 | Stromal cell_DCN high                          |
| 3 | B cell (Plasmocye)                             |
| 4 | Enterocyte progenitor                          |
| 5 | Enterocyte_GUCA2A high                         |
| 6 | Unknown                                        |
| 7 | Schwann cell                                   |
| 8 | Enterocyte_CA7 high                            |
| 9 | Macrophage                                     |
| 10| Mast cell                                      |
| 11| Stromal cell_CXCL14 high                       |
| 12| Goblet cell                                    |
| 13| Smooth muscle cell                             |
| 14| Enterocyte progenitor                          |
| 15| Goblet cell                                    |
| 16| Enterocyte_SLC26A3 high                        |
| 17| Goblet cell (Plasmocye)_IGHA1                  |
| 18| Goblet cell (Plasmocye)_IGHA1                  |
| 19| B cell (Plasmocye)_IGHA1                       |
| 20| T cell                                         |
| 21| B cell (Plasmocye)_IGHA1                       |
| 22| B cell (Plasmocye)_IGHA1                       |
| 23| Goblet cell                                    |
| 24| Smooth muscle cell                             |
| 25| Enterocyte progenitor                          |
| 26| Enterocyte_SLC26A3 high                        |
| 27| Goblet cell (Plasmocye)_IGHA1                  |
| 28| Goblet cell (Plasmocye)_IGHA1                  |
| 29| B cell (Plasmocye)_IGHA1                       |
| 30| Goblet cell (Plasmocye)_IGHA1                  |
| 31| B cell (Plasmocye)_IGHA1                       |
| 32| Enterocyte progenitor                          |
| 33| Enterocyte_progenitor                          |
| 34| Goblet cell                                    |
| 35| Smooth muscle cell                             |
| 36| Enterocyte progenitor                          |
| 37| Enterocyte_SLC26A3 high                        |
| 38| Goblet cell (Plasmocye)_IGHA1                  |
| 39| Goblet cell (Plasmocye)_IGHA1                  |
| 40| B cell (Plasmocye)_IGHA1                       |
| 41| Goblet cell (Plasmocye)_IGHA1                  |
| 42| B cell (Plasmocye)_IGHA1                       |
| 43| Enterocyte progenitor                          |
| 44| Enterocyte_progenitor                          |
| 45| Goblet cell                                    |
| 46| Smooth muscle cell                             |
| 47| Enterocyte progenitor                          |
| 48| Enterocyte_SLC26A3 high                        |
| 49| Goblet cell (Plasmocye)_IGHA1                  |
| 50| Goblet cell (Plasmocye)_IGHA1                  |
| 51| B cell (Plasmocye)_IGHA1                       |
| 52| Goblet cell (Plasmocye)_IGHA1                  |
| 53| B cell (Plasmocye)_IGHA1                       |
| 54| Enterocyte progenitor                          |
| 55| Enterocyte_SLC26A3 high                        |
| 56| Goblet cell (Plasmocye)_IGHA1                  |
| 57| Goblet cell (Plasmocye)_IGHA1                  |
| 58| B cell (Plasmocye)_IGHA1                       |
| 59| Goblet cell (Plasmocye)_IGHA1                  |
| 60| B cell (Plasmocye)_IGHA1                       |
| 61| Enterocyte progenitor                          |
| 62| Enterocyte_SLC26A3 high                        |
| 63| Goblet cell (Plasmocye)_IGHA1                  |
| 64| Goblet cell (Plasmocye)_IGHA1                  |
| 65| B cell (Plasmocye)_IGHA1                       |
| 66| Goblet cell (Plasmocye)_IGHA1                  |
| 67| B cell (Plasmocye)_IGHA1                       |
| 68| Enterocyte progenitor                          |
| 69| Enterocyte_SLC26A3 high                        |
| 70| Goblet cell (Plasmocye)_IGHA1                  |
| 71| Goblet cell (Plasmocye)_IGHA1                  |
| 72| B cell (Plasmocye)_IGHA1                       |
| 73| Goblet cell (Plasmocye)_IGHA1                  |
| 74| B cell (Plasmocye)_IGHA1                       |
| 75| Enterocyte progenitor                          |
| 76| Enterocyte_SLC26A3 high                        |
| 77| Goblet cell (Plasmocye)_IGHA1                  |
| 78| Goblet cell (Plasmocye)_IGHA1                  |
| 79| B cell (Plasmocye)_IGHA1                       |
| 80| Goblet cell (Plasmocye)_IGHA1                  |
| 81| B cell (Plasmocye)_IGHA1                       |
| 82| Enterocyte progenitor                          |
| 83| Enterocyte_SLC26A3 high                        |
| 84| Goblet cell (Plasmocye)_IGHA1                  |
| 85| Goblet cell (Plasmocye)_IGHA1                  |
| 86| B cell (Plasmocye)_IGHA1                       |
| 87| Goblet cell (Plasmocye)_IGHA1                  |
| 88| B cell (Plasmocye)_IGHA1                       |
| 89| Enterocyte progenitor                          |
| 90| Enterocyte_SLC26A3 high                        |
| 91| Goblet cell (Plasmocye)_IGHA1                  |
| 92| Goblet cell (Plasmocye)_IGHA1                  |
| 93| B cell (Plasmocye)_IGHA1                       |
| 94| Goblet cell (Plasmocye)_IGHA1                  |
| 95| B cell (Plasmocye)_IGHA1                       |
| 96| Enterocyte progenitor                          |
| 97| Enterocyte_SLC26A3 high                        |
| 98| Goblet cell (Plasmocye)_IGHA1                  |
| 99| Goblet cell (Plasmocye)_IGHA1                  |
|100| B cell (Plasmocye)_IGHA1                       |
|101| Goblet cell (Plasmocye)_IGHA1                  |
|102| B cell (Plasmocye)_IGHA1                       |
|103| Enterocyte progenitor                          |
|104| Enterocyte_SLC26A3 high                        |
|105| Goblet cell (Plasmocye)_IGHA1                  |
|106| Goblet cell (Plasmocye)_IGHA1                  |
|107| B cell (Plasmocye)_IGHA1                       |
|108| Goblet cell (Plasmocye)_IGHA1                  |
|109| B cell (Plasmocye)_IGHA1                       |
|110| Enterocyte progenitor                          |
|111| Enterocyte_SLC26A3 high                        |
|112| Goblet cell (Plasmocye)_IGHA1                  |
|113| Goblet cell (Plasmocye)_IGHA1                  |
|114| B cell (Plasmocye)_IGHA1                       |
|115| Goblet cell (Plasmocye)_IGHA1                  |
|116| B cell (Plasmocye)_IGHA1                       |

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SUPPLEMENTARY DATA

| Kidney | Adult_Kidney2 | Fetal_Kidney | Fetal_Kidney |
|--------|---------------|--------------|--------------|
|        | Intercalated cell |               | Lympathic endothelial cell |
|        | _SPINK1 high |               | 1 |
| 1      | Principle cell | Proximal tubule | Neutrophil |
| 2      | Proximal tubule cell | MT1G high | Proximal tubule progenitor cell |
| 3      | Fensreted endothelial cell | SELE high | S-shaped body cell | PSMA2 high |
| 4      | Loop of Henle (Thick ascending limb) | Loop of Henle_SFP1 high | Nephrogenic mesenchyme cell | DAP11 high |
| 5      | Loop of Henle | Fibroblast | Proliferating cell |
| 6      | | | |
| 7      | Macrophage | | |
| 8      | Ureteric epithelial cell | | |
| 9      | Proximal tubule cell | | |
| 10     | T cell | | |
| 11     | Conventional dendritic cell | | |
| 12     | Proximal tubule cell | ALDOB high | |
| 13     | Fensreted endothelial cell | | |
| 14     | Glomertular endothelial cell | AQP1 high | |
| 15     | Intercalated cell | SLC26A4 high | |
| 16     | Myocyte | | |
| 17     | Myofibroblast | | |
| 18     | B cell | | |
| 19     | Mast cell | | |
| 20     | Proximal tubule cell | | |
| 21     | Proximal tubule cell | | |
| 22     | Intercalated cell | | |

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## SUPPLEMENTARY DATA

| Adult_Kidney4 | Fetal_Kidney y 5 |
|--------------|-----------------|
| Loop of Henle_UMOD high | Collecting duct cell_CALB1 high |
| Proximal tubule | Interstitial progenitor cell |
| cell_MT1G high | S-shaped body medial cell |
| Neutrophil | Collecting duct cell_CRABP1 high |
| T cell | Podocyte |
| Kidney epithelial | Nephrogenic mesenchyme |
| Unknown | cell_DAPL1 high |
| Macrophage_APOC1 high | Distal tubule progenitor cell |
| Endothelial | Ureteric epithelial cell |
| cell_EMCN high | S-shaped body cell_CFAP126 high |
| Loop of Henle_KNG1 high | Mesangial cell |
| Glomerular endothelial | Interstitial cell_POSTN high |
| cell_AQP1 high | Proliferating cell |
| high | Dendritic cell |
| Intercalated cell_CALB1 high | Endothelial cell_GJA5 high |
| Principle cell | Endothelial cell_PLVAP high |
| Intercalated cell_SLC26A high | Nephrogenic mesenchyme |
| Smooth muscle cell | cell_DAPL1 high |
| B cell (Plasmocyte) | S-shaped body cell |
| Mast cell | cell_DAPL1 high |
| Fibroblast | S-shaped body medial cell |
| Endothelial | Collecting duct cell |
| cell_COL4A1 high | Loop of Henle progenitor |
| Neutrophil | Podocyte |
| Loop of Henle (Thick ascending limb) | Distal tubule progenitor cell |
| 1 | Collecting duct cell |
| Principle cell | Proximal tubule progenitor cell |
| cell_SPINK1 high | Intercalated cell_POSTN high |
| Distal tubule | Intercalated cell_POSTN high |
| cell_SLC12A3 high | Ureteric epithelial cell |
| Proximal tubule | Dendritic cell |
| cell_ALDOB high | Neuron |
| Proximal tubule | Endothelial cell_CCL21 high |
| cell_MT1G high | Intercalated cell |
| Dendritic cell | Erythroid cell |
| Loop of Henle_SOD3 high | Nephrogenic mesenchyme |
| high | cell_DAPL1 high |
| Endothelial | S-shaped body cell |
| cell_IGFBP5 high | cell_DAPL1 high |
| Smooth muscle cell | Fetal_Kidney y 6 |
| Proximal tubule | Collecting duct cell |
| cell_SOX4 high | Proximal tubule tissue |
| Endothelial | Loop of Henle_SLP |
| cell_SLC2A3 high | Distal tubule |
| Loop of Henle_SLP high | cell_KLK1 high |
| high | Intercalated cell |
| Distal tubule | S-shaped body cell |
| cell_KLK1 high | Thick ascending limb |
| Intercalated cell | Loop of Henle_UMOD high |
| cell_SLC26A4 high | Collecting duct cell_CALB1 high |
| B cell | Interstitial progenitor cell |
| Glomerular endothelial | S-shaped body medial cell |
| cell_AQP1 high | Collecting duct cell_CRABP1 high |

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Lung    Adult_Lung1
1       AT2 cell
2       Endothelial cell_TMEM100 high
3       AT1 cell
4       Fibroblast
5       M2 Macrophage
6       Neutrophil
7       Endothelial cell_VWF high
8       Conventional dendritic cell
9       Smooth muscle cell
10      Basal/epithelial cell
11      T cell
12      Endothelial cell_SELE high
13      B cell (Plasmocyte)_IGHA/H M high
14      Alveolar bipotent/intermediate cell
15      Fibroblast
16      Clara cell
17      Mast cell
18      Fibroblast_SFRP high
19      Arterial endothelial cell_Clara cell_BPIFB1 high
20      Chondrocyte
21      Ciliated cell
22      Megakaryocyte
23      Macrophage
24      B cell (Plasmocyte)_IGHG high
25      Proliferating smooth muscle cell

Fetal_Lung 1
1       Lung mesenchyme cell
2       Lung mesenchyme cell
3       CD8 T cell
4       Distal progenitor cell
5       Proliferating lung mesenchyme cell_UBE2C high
6       Endothelial cell_IGFBP3 high
7       Airway smooth muscle cell
8       Proliferating T cell
9       Proximal progenitor cell
10      Pericyte I
11      Fibroblast
12      Erythroid cell
13      Myofibroblast_ELN high
14      Macrophage
15      Smooth muscle cell_ACTG2 high
16      Endothelial cell_Col4A1 high
17      NK cell
18      Chondrocyte
19      Neuron
20      Myofibroblast
21      Basal/epithelial cell
22      Proliferating smooth muscle cell

Fetal_Lung 2
1       Lung mesenchyme cell
2       Proliferating cell_KIAA010 high
3       Proliferating cell_UBE2C high
4       Distal progenitor cell

Adult_Lung2
1       AT2 cell
### Adult- Lung 3

| Number | Cell Type                          | Gene Expression |
|--------|------------------------------------|-----------------|
| 2      | Fibroblast                         | Endothelial cell_SELE high |
| 3      | Macrophage                         | Endothelial cell_VWF high |
| 4      | Macrophage                         | CCL20 high      |
| 5      | Smooth muscle cell                 | Proximal progenitor cell_SCGB3A2 high |
| 6      | Proximal progenitor cell            | GRP high        |
| 7      | Fibroblast                         | VEGF high       |
| 8      | Endothelial cell                   | ACTA2 high      |
| 9      | Pericyte                           | TMEM100 high    |
| 10     | Conventional dendritic cell        | COX4I2 high     |
| 11     | Proliferating alveolar cell        | BPIFB1 high     |
| 12     | Dendritic Cell                     | PLA2G2A high    |
| 13     | T cell                             | S100A2 high     |
| 14     | Lymphatic endothelial cell         | BPIFB1 high     |
| 15     | Proliferating alveolar cell        | ACKR1 high      |
| 16     | Proliferating alveolar cell        | BPIFB1 high     |
| 17     | Monocyte                           | PLA2G2A high    |
| 18     | Endothelial cell                   | BPIFB1 high     |
| 19     | Arterial endothelial cell          | CCL20 high      |
| 20     | Activated T cell                   | BPIFB1 high     |
| 21     | NK cell                            | BPIFB1 high     |
| 22     | T cell                             | S100A2 high     |
| 23     | Endothelial cell                   | PLA2G2A high    |
| 24     | Neutrophil                         | PLA2G2A high    |
| 25     | Mast cell                          | PLA2G2A high    |
| 26     | Myeloid cell                       | PLA2G2A high    |
| 27     | Activated T cell                   | PLA2G2A high    |
| 28     | NK cell                            | PLA2G2A high    |
| 29     | Endothelial cell                   | PLA2G2A high    |
| 30     | Proliferating cell                 | PLA2G2A high    |
### SUPPLEMENTARY DATA

| Liver | Adult_Liver1 | Liver | Fetal_Liver | Adult_Liver4 |
|-------|--------------|-------|-------------|--------------|
| 19    | Fibroblast   | 1     | Erythroid cell_HBM high | 1 |  |
| 20    | Proliferating T cell | 2 | Erythroid progenitor cell_REXO2 high | 2 |  |
| 21    | Ciliated cell | 3     | Erythroid progenitor cell_NPM1 high | 3 |  |
| 22    | Smooth muscle cell | 4 | Erythroid cell_HBB high | 4 |  |
|       |              | 5     | Conventional dendritic cell | 5 |  |
|       |              | 6     | Neutrophil_ELANE high | 6 |  |
|       |              | 7     | Mast progenitor cell | 7 |  |
|       |              | 8     | HSPC | 8 |  |
|       |              | 9     | Effector T cell | 9 |  |
|       |              | 10    | B cell (Centrocyte) | 10 |  |
|       |              | 11    | Neutrophil_PRTN3 high | 11 |  |
|       |              | 12    | Neutrophil_CAMP high | 12 |  |
|       |              | 13    | Neutrophil_DEF high | 13 |  |
|       |              | 14    | Monocyte | 14 |  |
|       |              | 15    | Pre B cell | 15 |  |
|       |              | 16    | Unknown | 16 |  |
|       |              | 17    | T cell | 17 |  |
|       |              | 18    | Kupffer cell | 18 |  |
|       |              | 19    | Multipotential progenitor cell | 19 |  |
|       |              | 20    | Megakaryocyte/Erythroid progenitor cell | 20 |  |
|       |              | 21    | Dendritic cell | 21 |  |
|       |              |       |              |              |  |

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### SUPPLEMENTARY DATA

| Heart      | Adult_Heart1                                      | Fetal_Heart 1                                                                 |
|------------|--------------------------------------------------|-------------------------------------------------------------------------------|
| Hepatocyte | Smooth muscle cell in Ventricle cardiomyocyte    | 1 Ventricle cardiomyocyte_MT gene high                                        |
|            | 2 Smooth muscle cell                              | 2 Fibroblast_DCN high                                                        |
|            | 3 M2 Macrophage Macrophage_CCL3L3 high            | 3 Endothelial cell_FABP4 high                                                |
|            | 4 Fibroblast                                      | 4 Ventricle Cardiomyocyte_MYL2 high                                           |
|            | 5 M1 Macrophage Macrophage_SPP1 high              | 5 Proliferating cell                                                          |
|            | 6 Endothelial cell                                | 6 Erythroid cell                                                              |
|            | 7 T cell                                          | 7 Endocardial cell                                                            |
|            | 8 Endothelial cell                                | 8 Vascular smooth muscle cell                                                 |
|            | 9 Neutrophil                                      | 9 Fibroblast_PENK high                                                       |
|            | 10 M2 Macrophage                                  | 10 Atrial cardiomyocyte_MT high                                              |
|            | 11 Neutrophil                                     | 11 Proliferating fibroblast                                                   |
|            | 12 Mast cell                                      | 12 Arterial endothelial cell                                                  |
|            | 13 Fibroblast                                     | 13 Atrial cardiomyocyte_NPPA high                                            |
|            | 14 Smooth muscle cell in Ventricle cardiomyocyte  | 14 Antigen-presenting cell                                                    |
|            | 15 Neutrophil                                     | 15 Macrophage                                                                 |
|            | 16 Smooth muscle cell in Ventricle cardiomyocyte  | 16 Proliferating endothelial cell                                             |
|            | 17 Fibroblast                                     | 17 Stromal cell                                                               |
|            | 18 Neutrophil                                     | 18 Neuron                                                                     |
|            | 19 Cardiomyocyte                                  | 19 Atrial cardiomyocyte_MyH6 high                                            |
|            | 20 Erythroid cell                                 | 20 Epithelial cell                                                            |
|            | 21 Megakaryocyte                                  | 21 Megakaryocyte                                                             |
| Fetal_Heart2| 1 Smooth muscle cell in Ventricle cardiomyocyte  | 1 Fibroblast_DCN high                                                        |
|            | 2 Smooth muscle cell                              | 2 Ventricle cardiomyocyte_CSRP3 high                                          |
|            | 3 Neutrophil                                      | 3 Fibroblast_PENK high                                                       |
|            | 4 Smooth muscle cell cell_CYCS high               | 4 Endocardial cell                                                            |
|            | 5 Neutrophil                                      | 5 Ventricle cardiomyocyte_MB high                                            |
|            | 6 Smooth muscle cell in Ventricle cardiomyocyte   | 6 Endothelial cell_FABP4 high                                                |
|            | 7 Neutrophil                                      | 7 Proliferating cell_TOP2A high                                              |
|            | 8 Smooth muscle cell in Ventricle cardiomyocyte   | 8 Proliferating cell_PTTG12 high                                             |
|            | 9 Neutrophil                                      | 9 Macrophage                                                                  |
|            | 10 Smooth muscle cell in Ventricle cardiomyocyte  | 10 Vascular smooth muscle cell                                                |
|            | 11 Neutrophil                                     | 11 Atrial cardiomyocyte_NPPA high                                            |
|            | 12 Smooth muscle cell in Ventricle cardiomyocyte  | 12 Smooth muscle cell                                                         |
|            | 13 Erythroid cell                                 | 13 Erythroid cell                                                             |
|            | 14 Neutrophil                                     | 14 Neutrophil                                                                 |
|            | 15 Arterial endothelial cell_GJA5 high            | 15 Atrial cardiomyocyte_NPPA high                                            |
|            | 16 Neuron                                         | 16 Atrial cardiomyocyte_NPPA high                                            |
|            | 17 Antigen-presenting cell                        | 17 Epithelial cell                                                            |
|            | 18 Epithelial cell                                | 18 Epithelial cell                                                            |

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