

**Supplementary Table 1.** Summary of the single-cell RNA-seq protocols

| Methods       | Feature                                                                         | Library construction                                         | Gene coverage | Reference (s) |
|---------------|---------------------------------------------------------------------------------|--------------------------------------------------------------|---------------|---------------|
| SMART-seq     | FACS                                                                            | oligo-dT; TSO; PCR                                           | Full-length   | [92]          |
| SMART-seq2    | FACS, microfluidics                                                             | oligo-dT; TSO+LNA; PCR                                       | 3'            | [20]          |
| SMART-seq3    | FACS                                                                            | oligo-dT; TSO+UMI; PCR;tagmentation                          | 3'            | [93]          |
| STRT-seq      | FACS                                                                            | oligo-dT; TSO+(UMI)+barcode; PCR                             | 5'            | [94, 95]      |
| STRT-seq-2i   | STRT-seq introduced with multiplexing                                           | upgraded STRT-seq with introducing multiplexing (scaling up) | 5'            | [96]          |
| STRT-seq-C1   | STRT-seq coupled with C1                                                        | oligo-dT; TSO+UMI+barcode; PCR                               | 5'            | [97]          |
| CEL-seq       | FACS, microfluidics                                                             | oligo-dT+barcode+T7; IVT                                     | 3'            | [98]          |
| CEL-seq2      | C1                                                                              | modifying length of UMI and barcode                          | 3'            | [99]          |
| QUARTZ-seq    | FACS                                                                            | oligo-dT; poly-A-tailing; PCR                                | 3'            | [19]          |
| QUARTZ-seq2   | FACS                                                                            | oligo-dT + UMI+barcode; poly-A-tailing; PCR                  | 3'            | [100]         |
| MARS-seq      | FACS sort to 384-well plate                                                     | oligo-dT+barcode+T7; IVT                                     | 3'            | [21]          |
| Drop-seq      | Microfluidics                                                                   | oligo-dT+UMI+barcode; TSO; PCR                               | 3'            | [15]          |
| DroNC-seq     | Upgraded Drop-seq, sequence nuclei                                              | oligo-dT+UMI+barcode; TSO; PCR                               | 3'            | [101]         |
| InDrop        | Microfluidics                                                                   | oligo-dT+barcode+T7; IVT                                     | 3'            | [16]          |
| Cyto-seq      | picoliter well                                                                  | oligo-dT+UMI+barcode; PCR                                    | 3'            | [14]          |
| 10X Chromium  | Microfluidics                                                                   | oligo-dT+UMI+barcode; TSO; PCR                               | 3'            | [17]          |
| Seq-well      | Nano-well plate                                                                 | oligo-dT+barcode; TSO; PCR                                   | 3'            | [13]          |
| Microwell-seq | agarose-constructed microwell array                                             | oligo-dT+UMI+barcode; TSO; PCR                               | 3'            | [102]         |
| SPLiT-seq     | Split-pool, combinatorial barcoding                                             | oligo-dT+barcode;ligation+barcode;PCR                        | 3'            | [23]          |
| sciRNA-seq    | Combinatorial barcoding                                                         | oligo-dT+UMI+barcode; Tn5+barcode; PCR                       | 3'            | [22]          |
| NASC-seq      | Identifying newly synthesized transcript by adding 4sU; bead capture Alkylation | oligo-dT;TSO;PCR                                             | 3'            | [103]         |
| MATQ-seq      | FACS                                                                            | oligo-dT+random primers; polyC-tailing; PCR                  | 3'            | [104]         |
| SeNaUmi-seq   | Microfluidics, Nanopore sequencing                                              | oligo-dT; poly-A-tailing; PCR                                | 3'            | [105]         |

**Supplementary Table 2.** Digestion protocols for endometrial cells

| Sample       | Digestion                               |                                                     | Filtration (μm) | Removal of red blood cells           | Major target cells              | Reference |
|--------------|-----------------------------------------|-----------------------------------------------------|-----------------|--------------------------------------|---------------------------------|-----------|
| Endometrium  | Enzyme (s)                              | Incubation                                          |                 |                                      |                                 |           |
|              | Collagenase A1                          | Overnight at 4°C                                    | 50              |                                      | Stromal cells                   | [49]      |
|              | Collagenase A1 + TrypLE Select + DNaseI | Overnight at 4°C + 20 min at 37 °C                  |                 |                                      | Epithelial-enriched cells       |           |
|              | Collagenase IV                          | 37 °C for 1 h                                       | 40              | Red blood cell lysis buffer          | Mixture                         | [48]      |
|              | Collagenase Type IA + DNase I           | 37 °C for 1 h                                       | 40              |                                      | Mixture                         | [47]      |
|              | Dispase II + Collagenase III + DNase I  | Overnight at 4°C + 45min at 37°C                    |                 | Red blood cell lysis buffer          | Mixture                         | [50]      |
| Whole uterus | Collagenase III + DNase I               | 37°C for 1 h                                        | 40              | Ficoll                               | Mixture                         | [36]      |
|              | Collagenase V                           | Every 20-30 min at 37°C for 2hours                  | 70              |                                      | Stromal and smooth muscle cells | [46]      |
|              | CollagenaseV + TrypLE                   | Every 20-30 min at 37°C for 2hours + 37°C for 10min |                 |                                      | Epithelial cell                 |           |
| Decidua      | Tumor dissociation kit                  | GentleMACS Dissociator 30 minutes at 37°C twice     | 40              | Red blood cell lysis buffer          | Mixture                         | [52]      |
|              | Collagenase IV                          | 37°C for 1 h                                        | 70              | Ficoll                               | Stromal and immune cells        | [53]      |
|              | Collagenase IV and DNase I              | GentleMACS Dissociator 30 minutes at 37°C twice     | 200 and 60      | Ficoll                               | Mixture                         | [54]      |
| Organoids    | 0.02% EDTA + collagenase V              | 37 °C for 9 min + 37 °C for 10 min                  | 100             | Red blood cell lysis buffer + Ficoll | Mixture                         | [55]      |
|              | 0.05%EDTA + DNase I                     | 40 min at 37 °C + 5 min at 37 °C                    | 40              |                                      | Mixture                         | [56]      |