

**Supplementary Table 1 Primer sequence used for quantitative RT-PCR**

| <b>Gene</b>            | <b>Forward primer</b>        | <b>Reverse primer</b>         |
|------------------------|------------------------------|-------------------------------|
| <i>human ALP</i>       | 5'-TAAGGACATCGCCTACCAGCTC-3' | 5'-TCTTCCAGGTGTCAACGAGGT-3'   |
| <i>human OPN</i>       | 5'-CAGTTGTCCCCACAGTAGACAC-3' | 5'-GTGATGTCCTCGTCTGTAGCATC-3' |
| <i>human OCN</i>       | 5'-CTCACACTCCTCGCCCTATT-3'   | 5'-CCTCCTGCTTGGACACAAA-3'     |
| <i>human RUNX-2</i>    | 5'-CTTTACTTACACCCCGCCAGTC-3' | 5'-AGAGATATGGAGTGCTGCTGGTC-3' |
| <i>human CAP</i>       | 5'-GGTGGGCATTGTGGAGATAA-3'   | 5'-CGGAAGATTTGGCACTGACT-3'    |
| <i>human P16</i>       | 5'-CATCTATGCGGGCATGGTTA-3'   | 5'-GCTTCCTGGACACGCTGGT-3'     |
| <i>human P21</i>       | 5'-CGGCGTTTGGAGTGGTAGAA-3'   | 5'-GGGAGCAGGCTGAAGGGT-3'      |
| <i>human COL-1</i>     | 5'-AACATGGAGACTGGTGAGACCT-3' | 5'-CGCCATACTCGAACTGGAATC -3'  |
| <i>human PERIOSTIN</i> | 5'-CACTCTTTGCTCCCACCAATA-3'  | 5'-ATTTTCCTTCCAGCGTCTCAA-3'   |
| <i>human GAPDH</i>     | 5'-CTTTGGTATCGTGGAAGGACTC-3' | 5'-GTAGAGGCAGGGATGATGTTCT-3'  |

**Supplementary Table 2 The antibodies used in the study**

| Abbreviation | Antibody full name |                                               | Manufacture  | Product No. | Concentration | Application    |
|--------------|--------------------|-----------------------------------------------|--------------|-------------|---------------|----------------|
| CD3          | CD3-PC5.5          |                                               | beckman      | B49203      | 5µl/ test     | Flow Cytometry |
| CD4          | CD4-FITC           |                                               | beckman      | C41134      | 5µl/ test     | Flow Cytometry |
| CD8          | CD8-FITC           |                                               | beckman      | A07756      | 10µl/ test    | Flow Cytometry |
| CD25         | CD25-PE            |                                               | beckman      | C41200      | 10µl/ test    | Flow Cytometry |
| CD127        | CD127-APC          |                                               | beckman      | B42026      | 5µl/ test     | Flow Cytometry |
| IFN-γ        | IFN-γ-PE           |                                               | beckman      | IM2717U     | 10µl/ test    | Flow Cytometry |
| IL-17A       | IL-17A             | Monoclonal Antibody                           | thermofisher | 12-7179-42  | 5 µL/ test    | Flow Cytometry |
| CD86         | BD                 | Pharmlngen™<br>FITC Mouse Anti-<br>Human CD86 | BD           | 557343      | 20µl/ test    | Flow Cytometry |
| CD206        | BD                 | Pharmlngen™<br>APC Mouse Anti-<br>Human CD206 | BD           | 550889      | 20µl/ test    | Flow Cytometry |

**Supplementary Table 3 The inclusion and exclusion criteria in the animal experiment.**

| Inclusion criteria                                         | Exclusion criteria                              |
|------------------------------------------------------------|-------------------------------------------------|
| 1. Male                                                    | 1. Animals die before the end of the experiment |
| 2. Body initial weight 230-300g                            | 2. Post-operative infection                     |
| 3. General healthy                                         | 3. Other systemic disease (whether related to   |
| 4. Without any oral disease or developmental abnormalities | surgery) after surgery                          |

**Supplementary Table 4 Routine blood tests and biochemical blood analyses  
of SD rats**

| Detection items              | Control (mean ± SD) | Cell sheet (mean ± SD) |
|------------------------------|---------------------|------------------------|
| d0                           |                     |                        |
| Routine blood tests          |                     |                        |
| WBC# ( $\times 10^9/L$ )     | 7.967 ± 3.053       | 6.167 ± 2.532          |
| Lymph# ( $\times 10^9/L$ )   | 5.933 ± 2.248       | 4.4 ± 1.952            |
| Mon# ( $\times 10^9/L$ )     | 0.2 ± 0.1           | 0.1667 ± 0.05774       |
| Gran# ( $\times 10^9/L$ )    | 1.833 ± 0.8327      | 1.6 ± 0.6083           |
| Lymph%                       | 74.87 ± 5.437       | 70.83 ± 5.382          |
| Mon%                         | 2.9 ± 0.6557        | 2.833 ± 0.2887         |
| Gran%                        | 22.23 ± 5.15        | 26.33 ± 5.326          |
| RBC ( $\times 10^{12}/L$ )   | 7.657 ± 0.1834      | 7.377 ± 0.2676         |
| HGB (g/L)                    | 147.3 ± 10.79       | 149 ± 8.718            |
| HCT (%)                      | 38 ± 2.914          | 37.80 ± 1.908          |
| MCV                          | 49.77 ± 4.6         | 51.3 ± 1.054           |
| MCH (pg)                     | 19.2 ± 1.709        | 20.17 ± 0.5132         |
| MCHC (g/L)                   | 387 ± 5             | 393.7 ± 3.512          |
| RDW (%)                      | 10.7 ± 0.1732       | 10.73 ± 0.3055         |
| PLT ( $\times 10^9/L$ )      | 917.7 ± 259.2       | 1026 ± 137.9           |
| MPV (fL)                     | 5.433 ± 0.2517      | 5.4 ± 0.2              |
| PDW                          | 15.97 ± 0.2517      | 16 ± 0.3               |
| PCT (%)                      | 0.4943 ± 0.118      | 0.552 ± 0.05575        |
| Biochemical blood analyses   |                     |                        |
| ALT (U/L)                    | 58.933 ± 3.765      | 103.3 ± 77.46          |
| AST (U/L)                    | 114.967 ± 6.580     | 173.8 ± 104.5          |
| Ca (mmol/L)                  | 2.403 ± 0.114       | 2.513 ± 0.1531         |
| CREA-S ( $\mu\text{mol}/L$ ) | 42.667 ± 6.397      | 50.07 ± 10.64          |
| Mg II (mmol/L)               | 0.867 ± 0.0822      | 1.103 ± 0.255          |

|                               |                  |                  |
|-------------------------------|------------------|------------------|
| UREA (mmol/L)                 | 6.213 ± 0.784    | 7.787 ± 1.132    |
| γ-GT (U/L)                    | 0.367 ± 0.125    | 0.5333 ± 0.3512  |
| d3                            |                  |                  |
| Routine blood tests           |                  |                  |
| WBC# (× 10 <sup>9</sup> /L)   | 17.867 ± 8.857   | 24.767 ± 5.313   |
| Lymph# (× 10 <sup>9</sup> /L) | 14.167 ± 8.391   | 16.70 ± 1.323    |
| Mon# (× 10 <sup>9</sup> /L)   | 0.367 ± 0.058    | 1.567 ± 1.848    |
| Gran# (× 10 <sup>9</sup> /L)  | 3.333 ± 0.551    | 6.500 ± 2.193    |
| Lymph%                        | 76.93 ± 8.312    | 68.40 ± 8.466    |
| Mon%                          | 2.433 ± 1.168    | 5.633 ± 5.514    |
| Gran%                         | 20.63 ± 7.146    | 25.97 ± 3.201    |
| RBC (× 10 <sup>12</sup> /L)   | 3.373 ± 0.762    | 5.017 ± 0.257    |
| HGB (g/L)                     | 85.00 ± 20.881   | 122.3 ± 4.041    |
| HCT                           | 20.50 ± 4.957    | 29.90 ± 0.60     |
| MCV                           | 60.70 ± 1.769    | 59.83 ± 4.257    |
| MCH                           | 25.07 ± 0.802    | 24.40 ± 1.970    |
| MCHC                          | 413.7 ± 1.528    | 408.7 ± 5.895    |
| RDW                           | 10.07 ± 0.231    | 11.70 ± 2.066    |
| PLT                           | 75.00 ± 52.849   | 382.3 ± 279.178  |
| MPV                           | 6.667 ± 0.643    | 6.067 ± 0.321    |
| PDW                           | 28.27 ± 17.358   | 17.33 ± 0.635    |
| PCT                           | 0.05167 ± 0.042  | 0.2260 ± 0.153   |
| Biochemical blood analyses    |                  |                  |
| ALT (U/L)                     | 51.767 ± 2.660   | 66.6 ± 8.955     |
| AST (U/L)                     | 107.533 ± 11.813 | 123.067 ± 21.175 |
| Ca (mmol/L)                   | 2.3 ± 0.073      | 2.42 ± 0.107     |
| CREA-S (μmol/L)               | 27.033 ± 0.946   | 29.433 ± 2.207   |
| Mg II (mmol/L)                | 0.893 ± 0.025    | 0.923 ± 0.025    |
| UREA (mmol/L)                 | 5.643 ± 0.532    | 5.58 ± 0.562     |

|                               |                  |                  |
|-------------------------------|------------------|------------------|
| γ-GT (U/L)                    | 0.333 ± 0.047    | 0.733 ± 0.125    |
| d30                           |                  |                  |
| Routine blood tests           |                  |                  |
| WBC# (× 10 <sup>9</sup> /L)   | 10.77 ± 3.872    | 16.33 ± 2.572    |
| Lymph# (× 10 <sup>9</sup> /L) | 6.967 ± 2.957    | 9.633 ± 2.627    |
| Mon# (× 10 <sup>9</sup> /L)   | 0.3333 ± 0.1528  | 0.4333 ± 0.1528  |
| Gran# (× 10 <sup>9</sup> /L)  | 3.467 ± 0.7095   | 6.267 ± 0.3215   |
| Lymph%                        | 63.43 ± 4.864    | 58.00 ± 7.950    |
| Mon%                          | 3.267 ± 0.3786   | 2.867 ± 0.5033   |
| Gran%                         | 33.30 ± 4.782    | 39.13 ± 7.958    |
| RBC (× 10 <sup>12</sup> /L)   | 7.857 ± 0.8731   | 7.343 ± 0.5101   |
| HGB (g/L)                     | 163.3 ± 10.41    | 153.0 ± 8.888    |
| HCT                           | 40.30 ± 4.244    | 37.70 ± 1.997    |
| MCV                           | 51.40 ± 0.6083   | 51.43 ± 1.097    |
| MCH                           | 20.83 ± 0.9866   | 20.80 ± 0.4583   |
| MCHC                          | 406.3 ± 17.79    | 405.3 ± 2.517    |
| RDW                           | 10.67 ± 0.6110   | 11.10 ± 0.5196   |
| PLT                           | 1086 ± 263.8     | 1125 ± 264.6     |
| MPV                           | 5.533 ± 0.3512   | 5.233 ± 0.1528   |
| PDW                           | 15.93 ± 0.05774  | 15.83 ± 0.1528   |
| PCT                           | 0.5070 ± 0.09617 | 0.5190 ± 0.05798 |
| Biochemical blood analyses    |                  |                  |
| ALT (U/L)                     | 58.433 ± 1.470   | 59.733 ± 4.061   |
| AST (U/L)                     | 116.733 ± 7.985  | 119.9 ± 6.182    |
| Ca (mmol/L)                   | 2.573 ± 0.253    | 2.297 ± 0.045    |
| CREA-S (μmol/L)               | 53.633 ± 6.133   | 51.1 ± 3.827     |
| Mg II (mmol/L)                | 1.15 ± 0.220     | 0.96 ± 0.016     |
| UREA (mmol/L)                 | 5.873 ± 0.470    | 6.697 ± 1.039    |
| γ-GT (U/L)                    | 0.6 ± 0.082      | 0.7 ± 0.163      |

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**Supplementary Table 5 Proposed standards of biological characteristics for DFSCs sheet**

| Categories                       | Items                              |       | Methods                              | Quality standards                     |
|----------------------------------|------------------------------------|-------|--------------------------------------|---------------------------------------|
| Physical and chemical properties | Cell amount per cell sheet         |       | CCK-8                                | $3.15 \times 10^6 - 4.05 \times 10^5$ |
|                                  | Cell viability                     |       | AOPI staining                        | $\geq 85\%$                           |
|                                  | Cell senescence rate               |       | $\beta$ - galactosidase staining     | $\leq 10\%$                           |
|                                  | Maximum tensile force              |       | Electronic universal testing machine | $\geq 0.01$ N                         |
|                                  | Uniformity                         |       | HE staining, DAPI staining           | Uniform double-layer structure        |
|                                  | Collagen I content                 |       | HYP content detection kit            | $\geq 0.02$ $\mu\text{g}/\text{mg}$   |
|                                  | GAG content                        |       | GAG content detection kit            | $\geq 0.02$ $\mu\text{g}/\text{mg}$   |
| Biological characteristics       | Osteogenic expression              | gene  | q-PCR                                | Positive                              |
|                                  | Induced osteoblast differentiation |       | Alizarin red staining                | Positive for alizarin red staining    |
|                                  | Chondroblast expression            | gene  | q-PCR                                | Positive                              |
|                                  | Odontoblast expression             | gene  | q-PCR                                | Positive                              |
|                                  | Telomere relative length           |       | q-PCR                                | Positive                              |
|                                  | Cell proliferation capacity        |       | Colony-forming units                 | $\geq 10\%$                           |
|                                  | Secretory factor. detection        | VEGF  | ELISA                                | $\geq 1500$ $\text{pg}/\text{mL}$     |
| Biological functions             | Secretory factor. detection        | ANG-1 | ELISA                                | $\geq 2500$ $\text{pg}/\text{mL}$     |
|                                  | Periodontal regeneration ability   |       | Micro-CT                             | New bone formation                    |

|                             |                                          |                                                                                   |                                                                    |      |
|-----------------------------|------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------|------|
| Safety and biocompatibility | Lymphocyte proliferation inhibition test | Co-culture with PBMC and CCK8 staining                                            | Inhibit proliferation                                              | PBMC |
|                             | Th1 lymphocyte inhibition test           | Co-culture with PBMC, fluorescent antibody staining, and flow cytometry detection | Inhibit Th1 lymphocyte proportion                                  |      |
|                             | Th17 lymphocyte inhibition test          | Co-culture with PBMC, fluorescent antibody staining, and flow cytometry detection | Inhibit Th17 lymphocyte proportion                                 |      |
|                             | Treg lymphocyte stimulation test         | Co-culture with PBMC, fluorescent antibody staining, and flow cytometry detection | Increased lymphocyte proportion                                    | Treg |
|                             | Bacteria test                            | Culture method                                                                    | Negative                                                           |      |
|                             | Mycoplasma detection                     | One-step method (RD-RCA)                                                          | $\leq 0.5$ EU/mL                                                   |      |
|                             | Bacterial endotoxin test                 | Gel clot method                                                                   | Negative                                                           |      |
|                             | Extraction fluid cytotoxicity testing    | CCK8                                                                              | Cell viability $\geq 70\%$ .<br>Inhibition rate $\leq 30\%$        |      |
|                             | Tumorigenicity                           | Paraffin Section of heart, liver, spleen, lungs, and kidneys                      | No abnormal inflammatory responses, no abnormal cell proliferation |      |