

**Table S1.** Components of cell osteogenic differentiation medium.

| Components                 | Volume      |
|----------------------------|-------------|
| Basal Medium(DMEM/F12=1:1) | 43.395mL    |
| Fetal Bovine Serum         | 5mL         |
| Penicillin-Streptomycin    | 0.5mL       |
| Glutamine                  | 0.5mL       |
| Ascorbate                  | 0.1mL       |
| $\beta$ -Glycerophosphate  | 0.5mL       |
| Dexamethasone              | 5 $\mu$ L   |
| <b>Total</b>               | <b>50mL</b> |

**Table S2.** Components of cell adipogenic differentiation medium. (A: induction medium; B: maintenance medium.)

| Components (A)             | Volume      |
|----------------------------|-------------|
| Basal Medium(DMEM/F12=1:1) | 43.75mL     |
| Fetal Bovine Serum         | 5mL         |
| Penicillin-Streptomycin    | 0.5mL       |
| Glutamine                  | 0.5mL       |
| Insulin                    | 0.1mL       |
| IBMX                       | 50 $\mu$ L  |
| Rosiglitazone              | 50 $\mu$ L  |
| Dexamethasone              | 50 $\mu$ L  |
| <b>Total</b>               | <b>50mL</b> |
| Components (B)             | Volume      |
| Basal Medium(DMEM/F12=1:1) | 43.9mL      |
| Fetal Bovine Serum         | 5mL         |
| Penicillin-Streptomycin    | 0.5mL       |
| Glutamine                  | 0.5mL       |
| Insulin                    | 0.1mL       |
| <b>Total</b>               | <b>50mL</b> |

**Table S3.** Components of cell chondrogenic differentiation medium.

| Components                 | Volume      |
|----------------------------|-------------|
| Basal Medium(DMEM/F12=1:1) | 48.745ml    |
| Dexamethasone              | 5 $\mu$ L   |
| Ascorbate                  | 0.15mL      |
| ITS+Supplement             | 0.5ml       |
| Sodium Pyruvate            | 50 $\mu$ L  |
| Proline                    | 50 $\mu$ L  |
| TGF- $\beta$ 3             | 0.5ml       |
| <b>Total</b>               | <b>50mL</b> |

**Table S4.** PDT (h) data of UCMSCs P3 ,P10, TERT-UCMSCs P20 and P30.

| Days     | MSCs P3 | MSCs P10 | TERT-UCMSCs P20 | TERT-UCMSCs P30 |
|----------|---------|----------|-----------------|-----------------|
| <b>1</b> | 49.37   | 57.00    | 62.50           | 41.83           |

|   |       |       |       |       |
|---|-------|-------|-------|-------|
| 2 | 22.51 | 28.68 | 23.49 | 24.79 |
| 3 | 21.67 | 26.30 | 21.66 | 28.31 |
| 4 | 26.93 | 29.28 | 18.49 | 25.61 |
| 5 | 17.97 | 18.33 | 16.87 | 20.04 |
| 6 | 20.07 | 20.66 | 19.12 | 21.22 |
| 7 | 23.17 | 23.48 | 21.87 | 24.46 |
| 8 | 26.37 | 26.71 | 24.99 | 27.57 |
| 9 | 29.62 | 29.60 | 27.87 | 30.65 |