Supplementary Materials and Methods

Clinical measurements and calculations

Body mass index (BMI) was calculated as the weight in kilograms divided by the square of the height in meters. Waist circumference was measured at the midpoint between the inferior costal margin and the superior border of the iliac crest on the midaxillary line. Hip circumference was measured at the widest point over the buttocks. Body fat percentage was quantified with the InBody-720 body composition analyzer (Biospace, Seoul, Korea). All subjects underwent a standard 75-g OGTT after an overnight fasting for at least 10h. Glucose was measured by enzymatic method. Serum insulin was measured using a double antibody radioimmunoassay. Serum hepatic enzymes were measured by Beckman Synchron clinical system CX5 PRO. Triglycerides (TG) and total cholesterol (TC) were measured by enzymatic methods. High-density lipoprotein-cholesterol (HDL-c) and low-density lipoprotein-cholesterol (LDL-c) were determined by immunoinhibition methods, as previously described (Shi, et al. 2012). Homeostasis model of assessment-insulin resistance (HOMA-IR) was calculated as \[\text{HOMA-IR} = \frac{\text{FINS} (\text{IU/ml}) \times \text{FPG} (\text{mmol/l})}{22.5}\].

Stromal vascular fractions isolation and brown adipocyte differentiation

Isolation of preadipocyte-containing stromal vascular fraction (SVF) was performed as previously described (Wang, et al. 2013). In brief, male C57BL/6 mice, aged 3 weeks, were used in the experiments (n = 5-6). Brown adipose tissue was minced and digested with 1 g/l collagenase type I (Sigma, Ronkonkoma, NY, USA) in DMEM supplemented with 1% bovine serum albumin for 25 min at 37°C, followed by quenching with complete medium. Cell suspensions were centrifuged washed and filtered through a 70 µm strainer (BD Biosciences, San Jose, CA, USA) and were plated onto 10 cm dishes. Cells were cultured in DMEM supplemented with 10% FBS, 100U/ml penicillin-streptomycin and 10ng/ml murine basic fibroblast growth factor (R&D company, Minneapolis, MN, USA). SVFs were then plated onto 48 well plates to reach confluence. Brown adipocyte differentiation of confluent SVFs cells was carried out in growth medium supplemented with 0.5 mM IBMX, 5 µg/ml insulin, 1µM dexamethasone, 1 nM T3 and 1 µM rosiglitazone (Sigma, Ronkonkoma, NY, USA) for 96 h, and further in growth medium supplemented with 5 µg/ml insulin, 50 nM T3 and 1 µM rosiglitazone for another 4 days.