

Supplementary Figure legends

Supplementary Fig. 1: MRAP does not mediate osteogenesis in tMSCs

Osteoblastic related genes *Alp* were detected in siMRAP-transfected tMSCs by RT-qPCR.

Supplementary Fig. 2: Phenotype identification and histopathological examination of *Mrap*^{-/-} mice

(A) Representative images of a homozygous (*Mrap*^{-/-}, n=3) and heterozygous (*Mrap*^{+/-}, n=12) *Mrap* mutant mouse at the age of 7 months compared to a wild type (*Mrap*^{+/+}, n=8).

(B) Photograph of liver, kidney and spleen isolated from the *Mrap*^{-/-} mice and *Mrap*^{+/+} mice.

(C) Weights of the body and organs (liver, spleen, kidney, and lung) isolated from *Mrap*^{-/-}, *Mrap*^{+/-} and *Mrap*^{+/+} mice.

(D) Representative histology with H&E (hematoxylin and eosin staining) of the organs (fat, kidney, liver, lung, and spleen) at 100× magnification from *Mrap*^{-/-}, *Mrap*^{+/-} and wild-type mice.

Supplementary Fig. 3: Effect of *Mrap* deficiency to the development of thymus in mice

(A) Gating strategy of thymocyte development in mice was shown.

(B) The ratios of the major populations of DN, DP, CD4 SP, and CD8 SP cells in thymocytes of *Mrap*^{-/-}, *Mrap*^{+/-} and *Mrap*^{+/+} mice (7 weeks and 7 months old). Thymocytes were phenotyped by flow cytometry with live/dead-eF780 and mAbs against mouse CD4, CD5, CD8, CD25, CD44, CD45R, and CD69. Only singlets and live/dead-eF780 negative cells were included in the analysis. DN, double negative; DP, double positive; SP, single positive.

(C) The percentage of DN T in early T-cell development. DN1-4 populations are defined by CD44 and CD25 expression, as indicated.

Supplementary Table: Primers for real-time polymerase chain reaction

Primers specifically designed and oligo synthesized by Genscript (Nanjing, China).