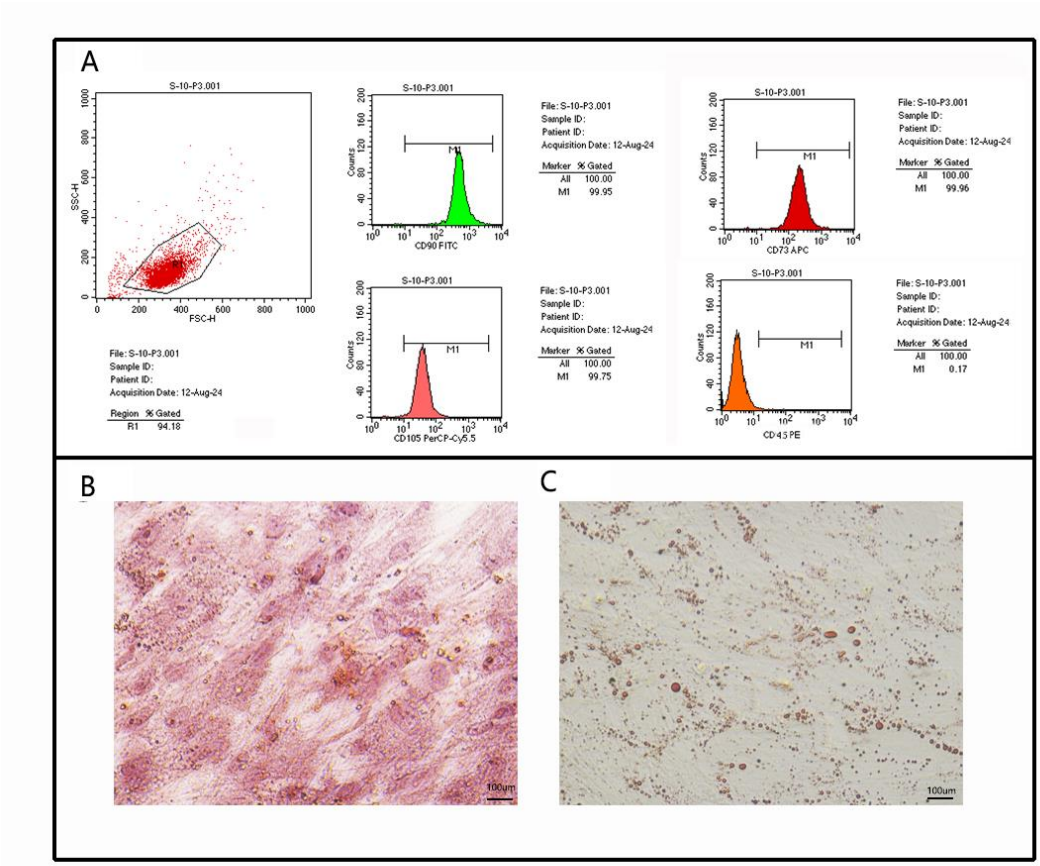
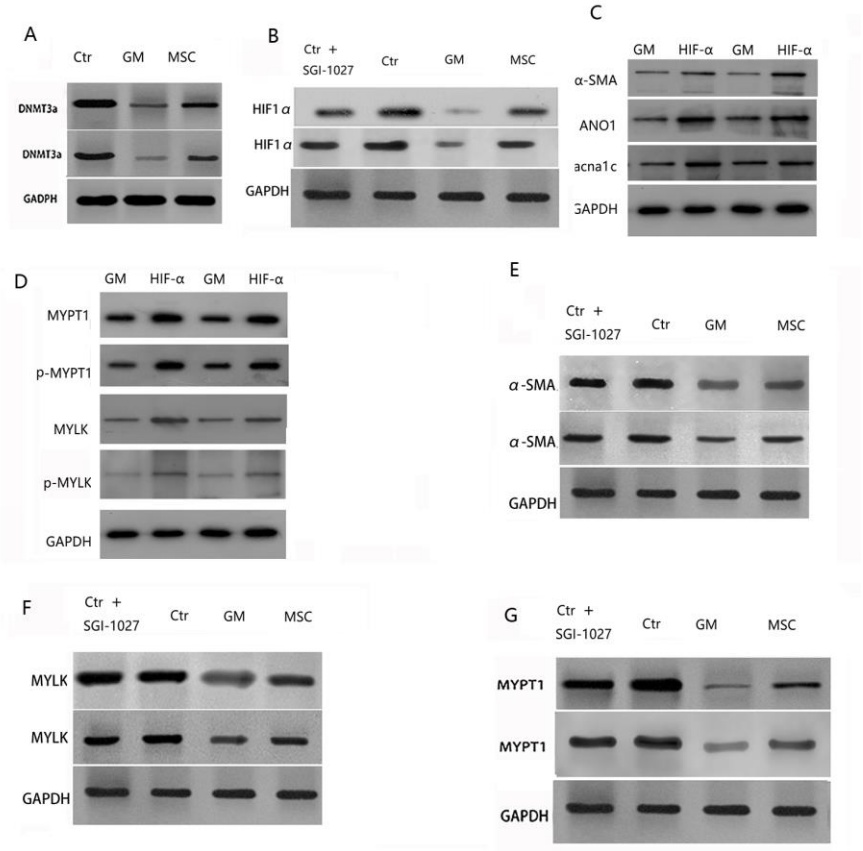


Supplementary Figure 1 Characterization of human umbilical cord-derived mesenchymal stem cells. A: Flow cytometry analysis of human umbilical cord-derived mesenchymal stem cells (hUC-MSCs) surface markers. Primary hUC-MSCs (batch number HF-P6-20220327-01, P3) were harvested and characterized by flow cytometry for the expression of specific surface markers. Histograms illustrate high positive expression (> 95%) of MSC markers CD90 (top left), CD73 (top right), and CD105 (bottom left), along with negative expression (< 2%) of the hematopoietic lineage marker CD45 (bottom right); B: *In vitro* osteogenic differentiation of hUC-MSCs. hUC-MSCs cultured in osteogenic differentiation medium for 21 days demonstrated successful osteogenesis. Alizarin Red S staining (left) shows strong positive aggregation of calcium deposits (red), indicative of mineralized extracellular matrix formation; C: *In vitro* adipogenic differentiation of hUC-MSCs. hUC-MSCs cultured in adipogenic differentiation medium for 14 days exhibited

successful adipogenesis. Oil Red O staining (right) reveals abundant intracellular lipid droplets (red), characteristic of mature adipocytes.



Supplementary Figure 2 MSCs modulate contraction-related proteins through DNMT3a and HIF1α pathway. This figure explores the molecular pathways by which MSCs modulate contraction-related proteins. A: Western blot images and quantification for DNMT3a protein levels in HESMCs; B and C: Western blot images and quantification for HIF1α protein levels in HESMCs; D: Western blot images and quantification for MYLK, p-MYLK, ratio analysis, $MYPT_1$, p-$MYPT_1$, ratio analysis in HESMCs with HIF1α overexpression; E-G: Western blot images and quantification for MYLK, $MYPT_1$, and α-SMA in HESMCs treated with a DNMT3a inhibitor. Data are mean ± SD. *$P < 0.05$, **$P < 0.01$; ***$P < 0.001$.