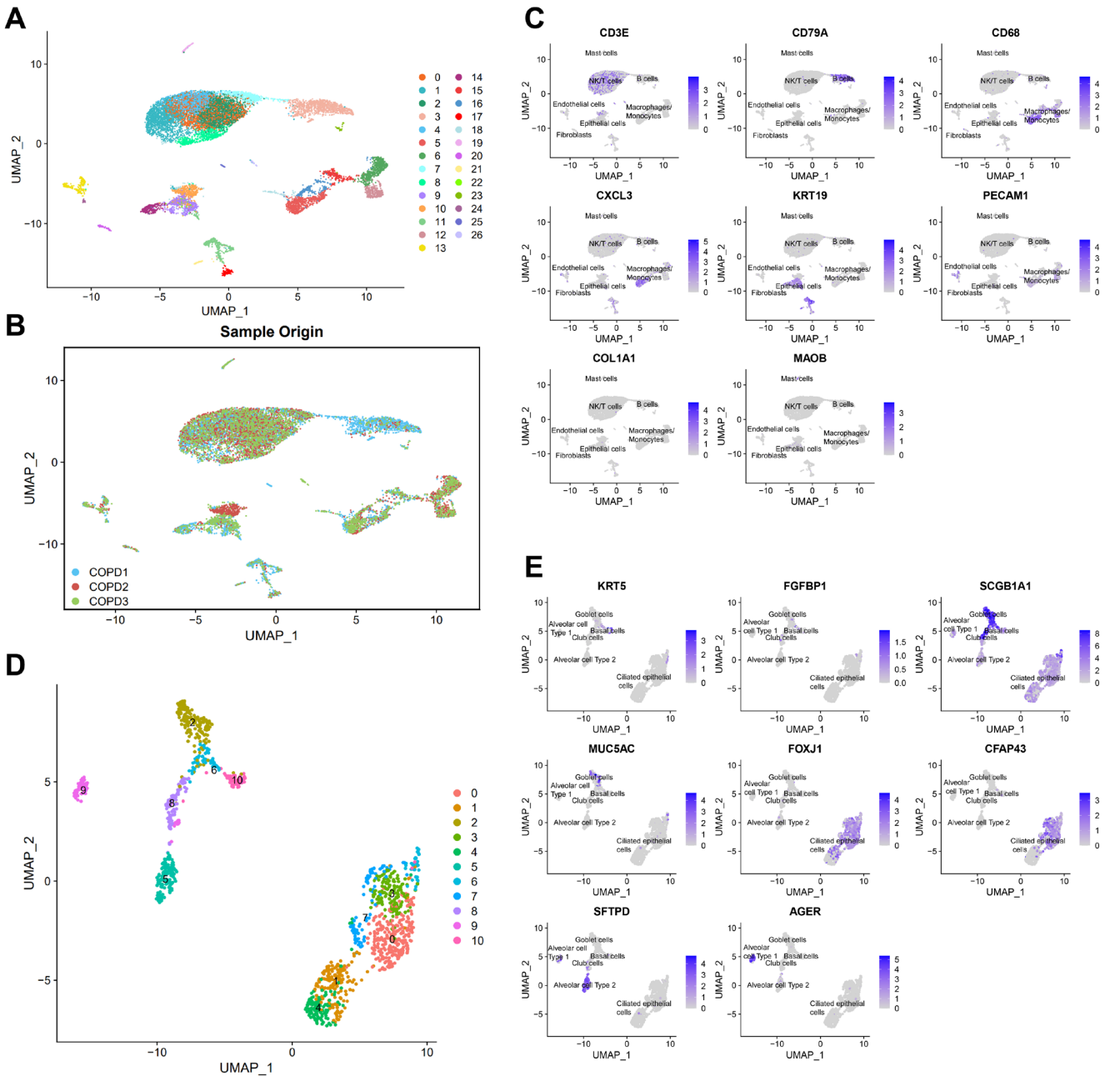

Figure S1 Cell annotations. (A) Visualization of UMAP clustering results displaying the aggregation and distribution of cells, with each color representing a cluster; (B) two-dimensional visualization of UMAP clustering results showing the aggregation and distribution of cells from three samples; (C) UMAP distribution plots of eight marker genes; (D) visualization of UMAP clustering results after extraction of epithelial cell population, illustrating the aggregation and distribution of cells, with each color representing a cluster; (E) UMAP distribution plots of eight marker genes after extraction of epithelial cell population. COPD, chronic obstructive pulmonary disease; UMAP, uniform manifold approximation and projection.

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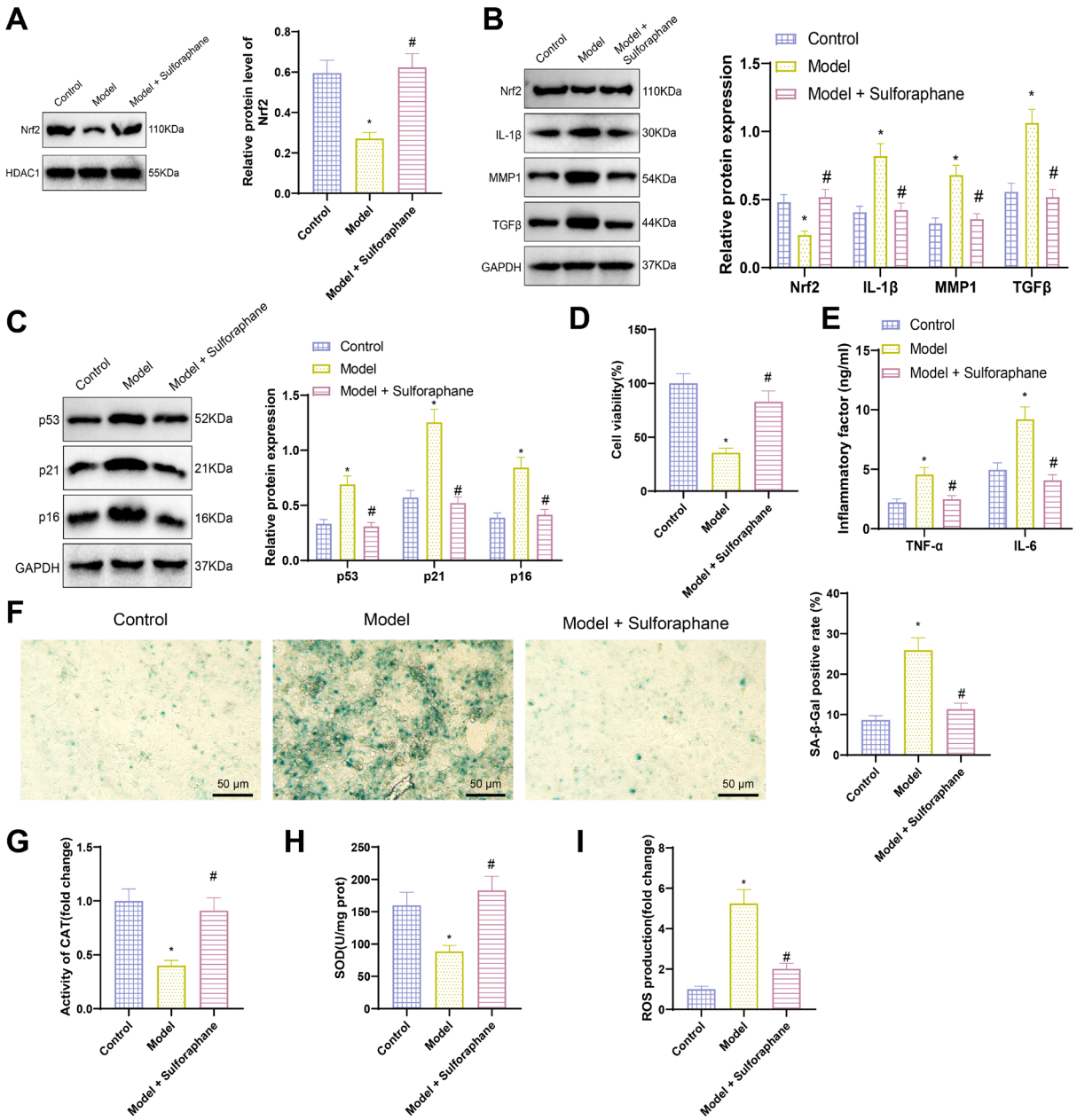

Figure S2 Impact of Nrf2 activator on the SASP of COPD primary cells. (A) Western blot experiment assessing the protein expression of nuclear Nrf2 in each group of cells; (B) Western blot experiment examining the expression of Nrf2, IL-1β, MMP1, and TGF-β proteins in primary cells of each group; (C) Western blot experiment analyzing the expression levels of p53, p21, and p16 proteins in primary cells of each group; (D) CCK-8 assay evaluating the proliferative capacity of primary cells in each group; (E) ELISA experiment measuring the levels of TNF-α and IL-6 in the supernatant of primary cell cultures in each group; (F) SA-β-Gal staining experiment determining the proportion of SA-β-Gal-positive cells in primary cells of each group; (G-I) measurement of enzyme activities of CAT (G), SOD (H) and ROS (I) levels in primary cells of each group. ANOVA was used to compare differences between groups: *, P<0.05 compared to the control group; #, P<0.05 compared to the model group. Cell experiments were repeated three times. COPD, chronic obstructive pulmonary disease; Nrf2, nuclear factor erythroid 2-related factor 2; SASP, senescence-associated secretory phenotype; IL-1β, interleukin-1 beta; MMP1, matrix metalloproteinase 1; TGF-β, transforming growth factor beta; CCK-8, cell counting kit-8; TNF-α, tumor necrosis factor-alpha; IL-6, interleukin-6.

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