



Figure S1 Green fluorescent protein (GFP) expression and cell viability in C28/I2 chondrocytes transduced with wild-type or mutant *COL2A1* construct. (A) Representative bright-field and fluorescence microscopy images showing GFP expression in C28/I2 cells transduced with vehicle control, wild-type (WT), or mutant *COL2A1* construct. No observable differences in GFP signal intensity or cell density were noted among the groups (40× magnification). (B) Quantification of relative GFP fluorescence intensity revealed no significant differences between vehicle, WT, or mutant *COL2A1* construct, indicating comparable transduction efficiency (n=3). (C) Cell viability assessed by CCK-8 assay showed no significant difference among the three groups, suggesting that overexpression of WT or mutant *COL2A1* did not impair cell proliferation or viability (n=3).