

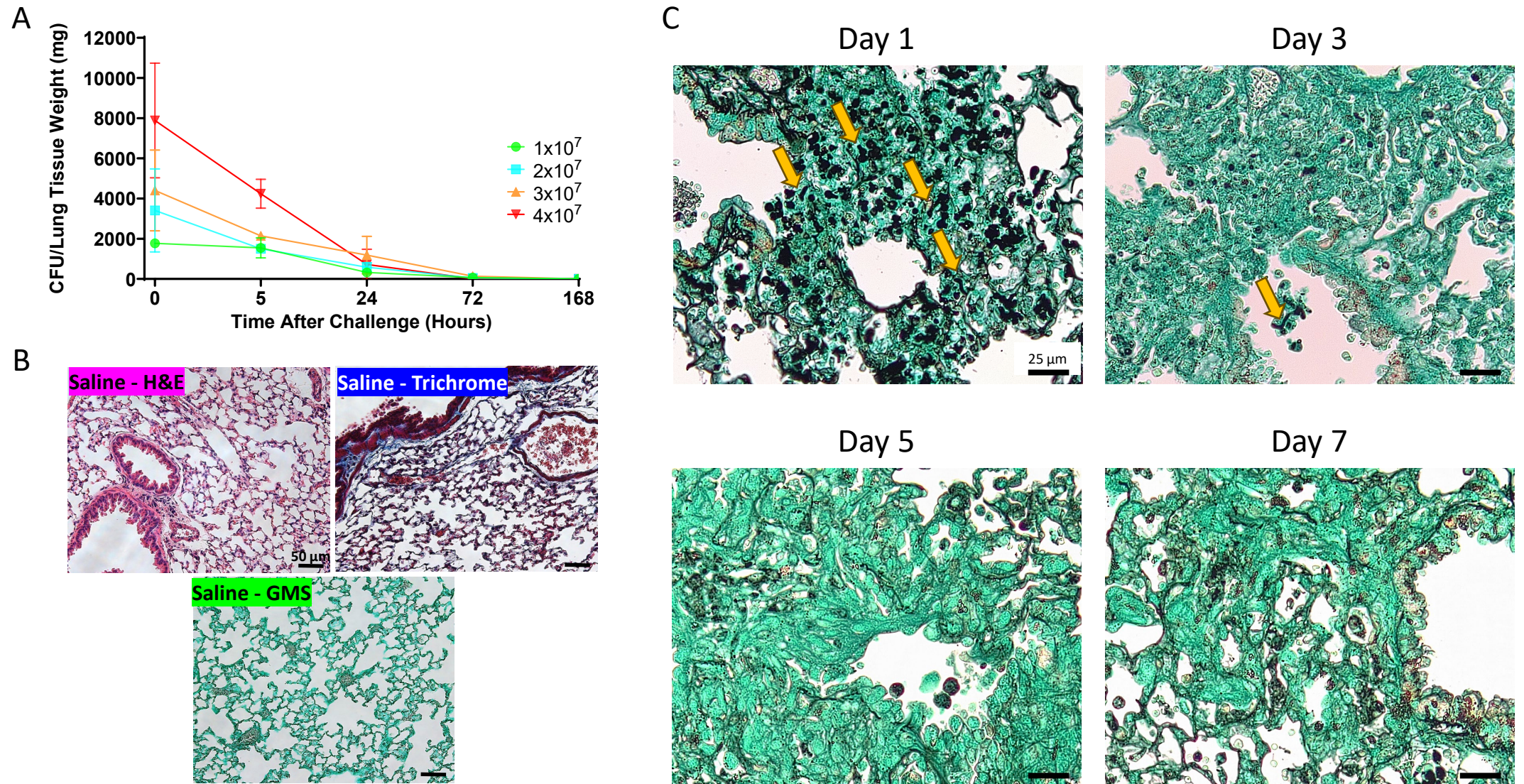
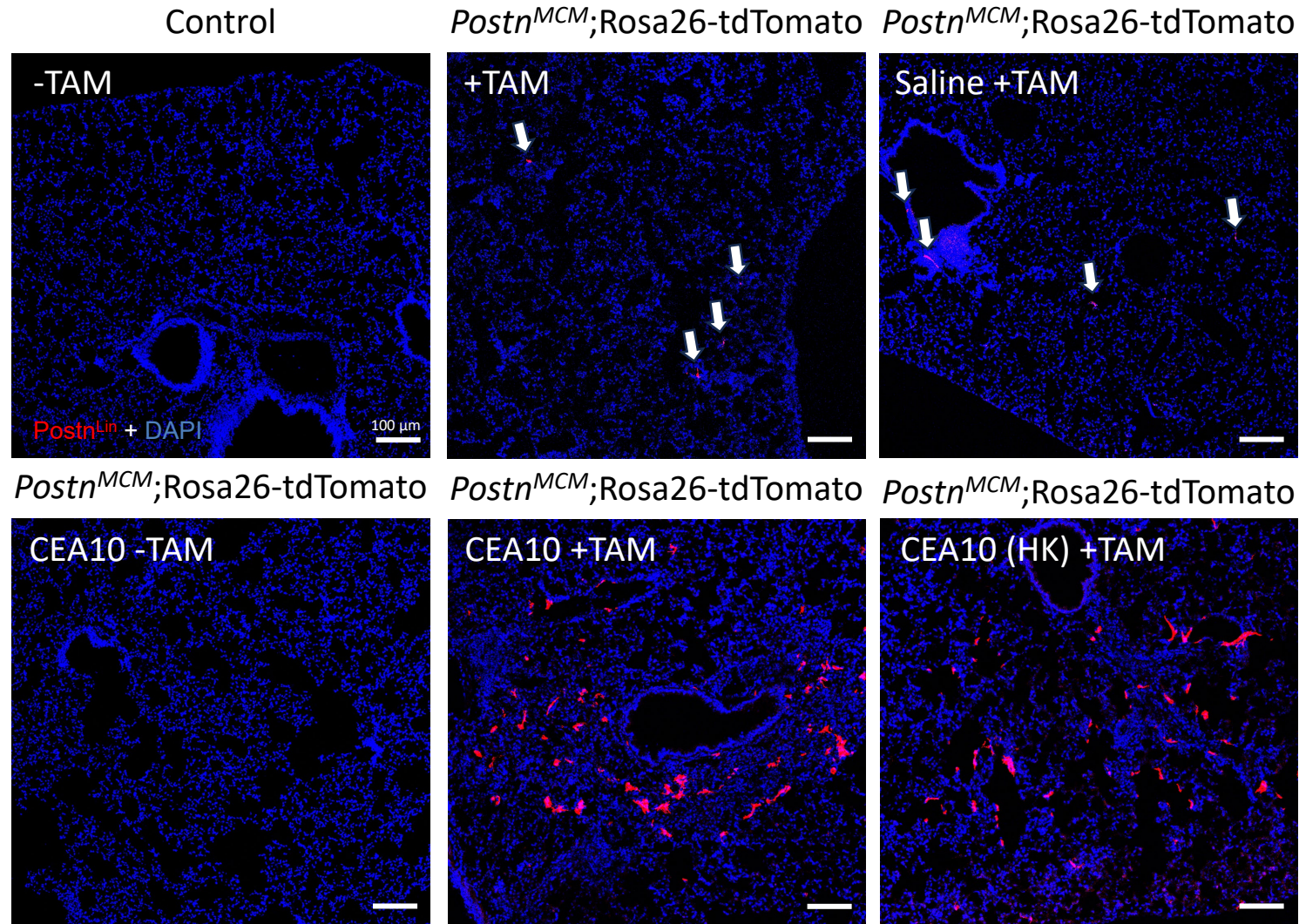


Figure S1. Dynamics of conidial clearance from the lung. (A) Kinetics of viable CFU clearance from the lungs of immunocompetent mice following inoculation with the specified amount of *A. fumigatus* conidia. Values represent the means $\pm$ SD from 3 biological replicates. (B) Histologic sections of mock-infected control lungs stained with H&E, Masson's trichrome and GMS. (C) Histologic sections of lungs from mice inoculated with 3×10^7 *A. fumigatus* conidia. Lungs were harvested at the indicated times, and tissue sections were stained with GMS to highlight fungal elements. Arrows highlight areas containing *A. fumigatus* germlings.

A



B

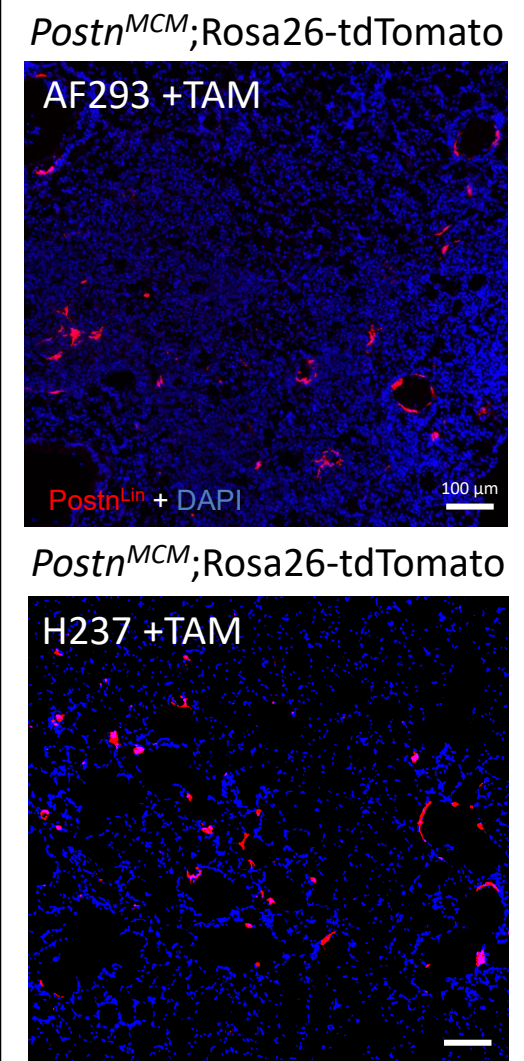


Figure S2. The appearance of *A. fumigatus*-induced *Postn*^{Lin} cells is tightly regulated by the TAM-inducible system and is independent of the fungal strain. Representative fluorescent images show tdTomato⁺ cells in red and DAPI-stained nuclei in blue. (A) Top 3 panels represent control mice, whereas the lower 3 panels represent *A. fumigatus*-inoculated mice. Top left panel: untreated reference control (mice lacking the *Postn*^{MCM} and Rosa26-tdTomato insertions); Top middle panel: *Postn*^{Lin}-tracing mice with TAM treatment in the absence of saline mock inoculation; Top right panel: *Postn*^{Lin}-tracing mice mock-inoculated with saline and treated with TAM. Lower left panel: Mice inoculated with 3 x 10⁷ CEA10 conidia without TAM treatment; Lower middle panel: mice inoculated with CEA10 conidia with TAM treatment; Lower right panel: mice inoculated with the same number of heat-killed (HK) CEA10 conidia with TAM treatment. (B) Mice inoculated with the same number of live conidia from the AF293 or H237 clinical isolates of *A. fumigatus*.

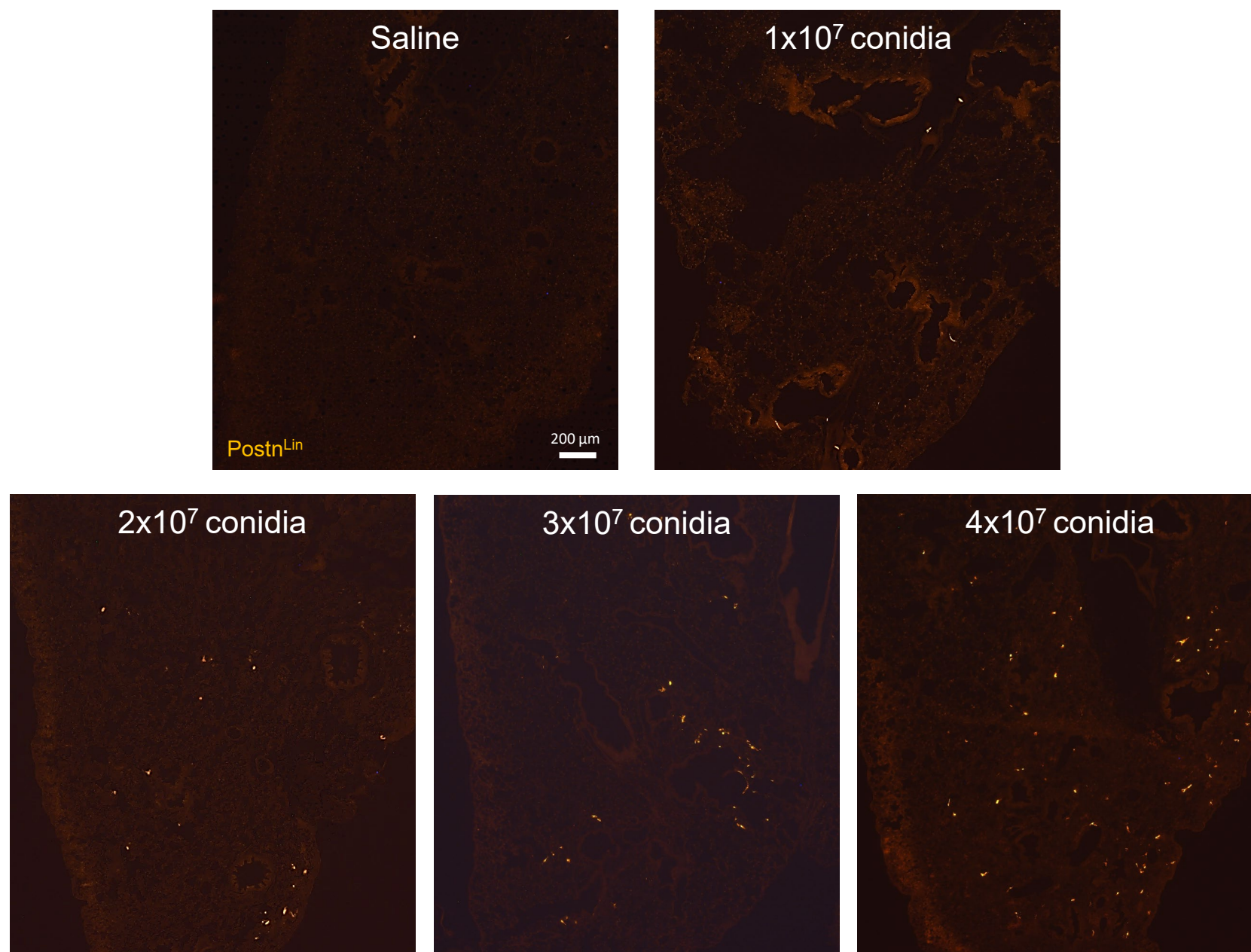
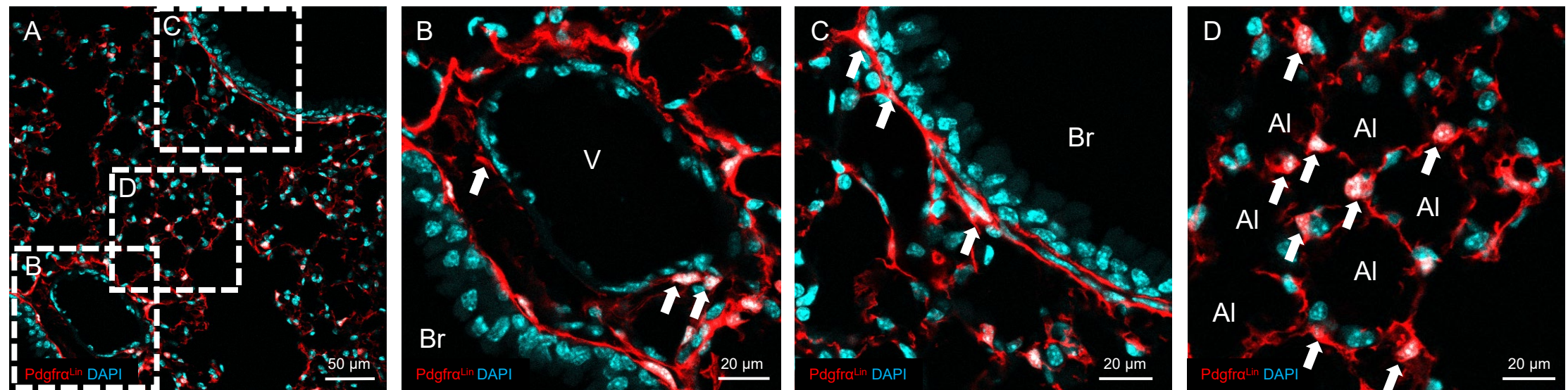


Figure S3. Dose-response analysis to determine the optimal dose of conidia required to elicit fibroblast activation. Representative histological sections show *tdTomato⁺* cells in the lungs of *Postn^{Lin}* mice harvested 7 days after OP inoculation with the indicated amounts of *A. fumigatus* conidia. Tissue autofluorescence was enhanced to provide background tissue visualization.

Quiescent resident $\text{Pdgfra}^{\text{Lin}}$ fibroblasts



Af-activated $\text{Postn}^{\text{Lin}}$ fibroblasts

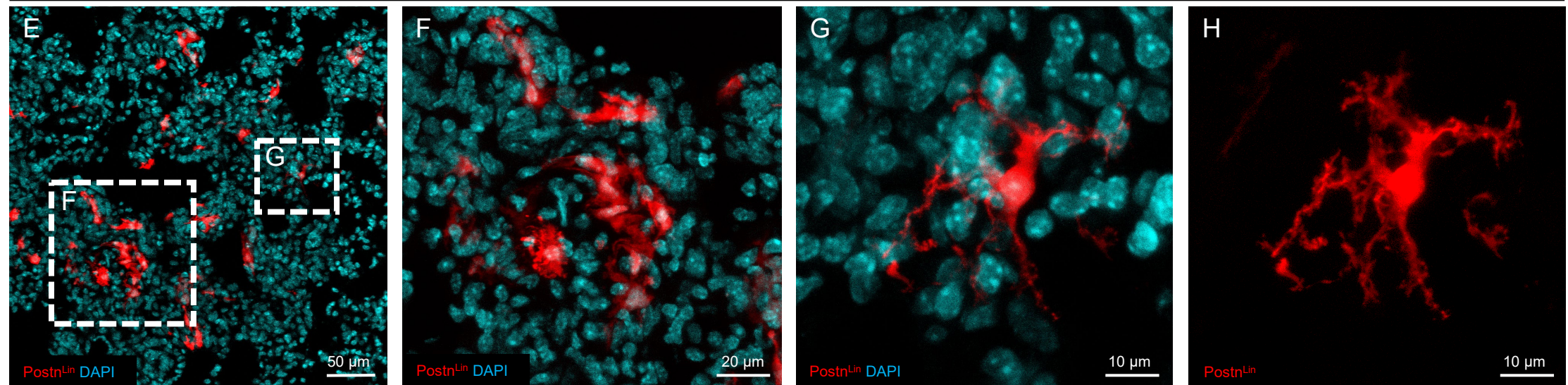


Figure S4. $\text{Postn}^{\text{Lin}}$ activated fibroblasts exhibit distinct morphological features. Representative fluorescent micrographs showing: (A) low-power and (B-D) high-power images of non-activated resident $\text{Pdgfra}^{\text{Lin}}$ pulmonary fibroblasts. Arrows on panels B, C, and D highlight $\text{Pdgfra}^{\text{Lin}}$ cells (red) surrounding a vessel (V), bronchiole (Br), and alveoli (Al), respectively; (E) low-power and (F-H) high-power images of alveolar regions containing $\text{Postn}^{\text{Lin}}$ cells embedded within inflammatory foci 7 days after *A. fumigatus* inoculation.

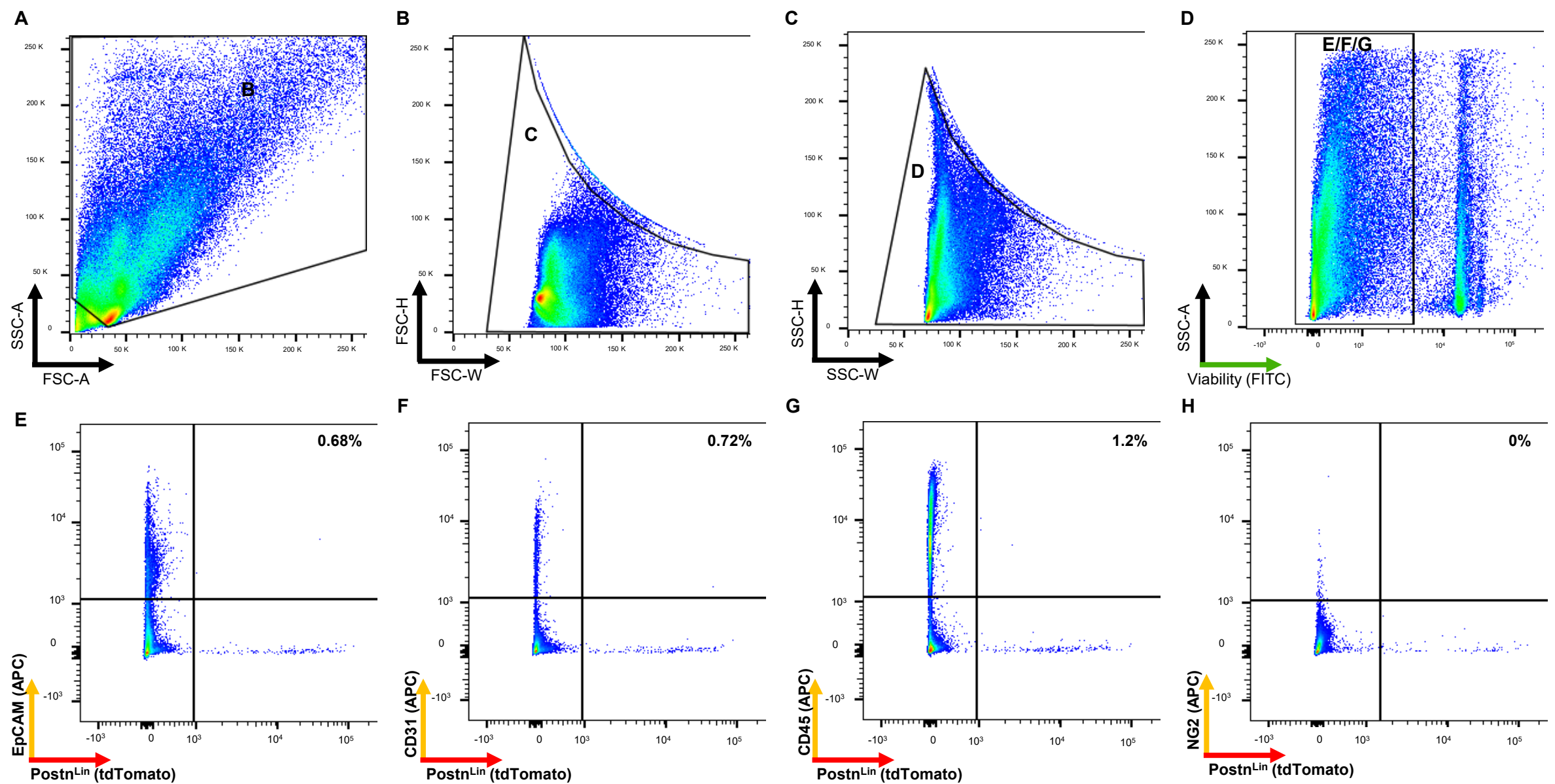


Figure S5. Cell sorting strategy used for quantification of coexpression markers. (A-D) Representative flow cytometry gating strategy to differentiate Postn^{Lin} cells (tdTomato⁺) from non-stromal cells (APC⁺): (A) Cell gating, (B & C) singlet identification, and (D) selection of live cells. The resulting tdTomato⁺ population (rightward scatter) was analyzed for expression of (E) EpCAM, (F) CD31, (G) CD45 and (H) NG2, (upward scatter), labeled with allophycocyanin (APC). The percentage of tdTomato⁺ cells that are positive for these markers are indicated in the upper right quadrant. FSC: Forward-scatter, SSC: Side-scatter, A: Area, H: Height, W: Width.

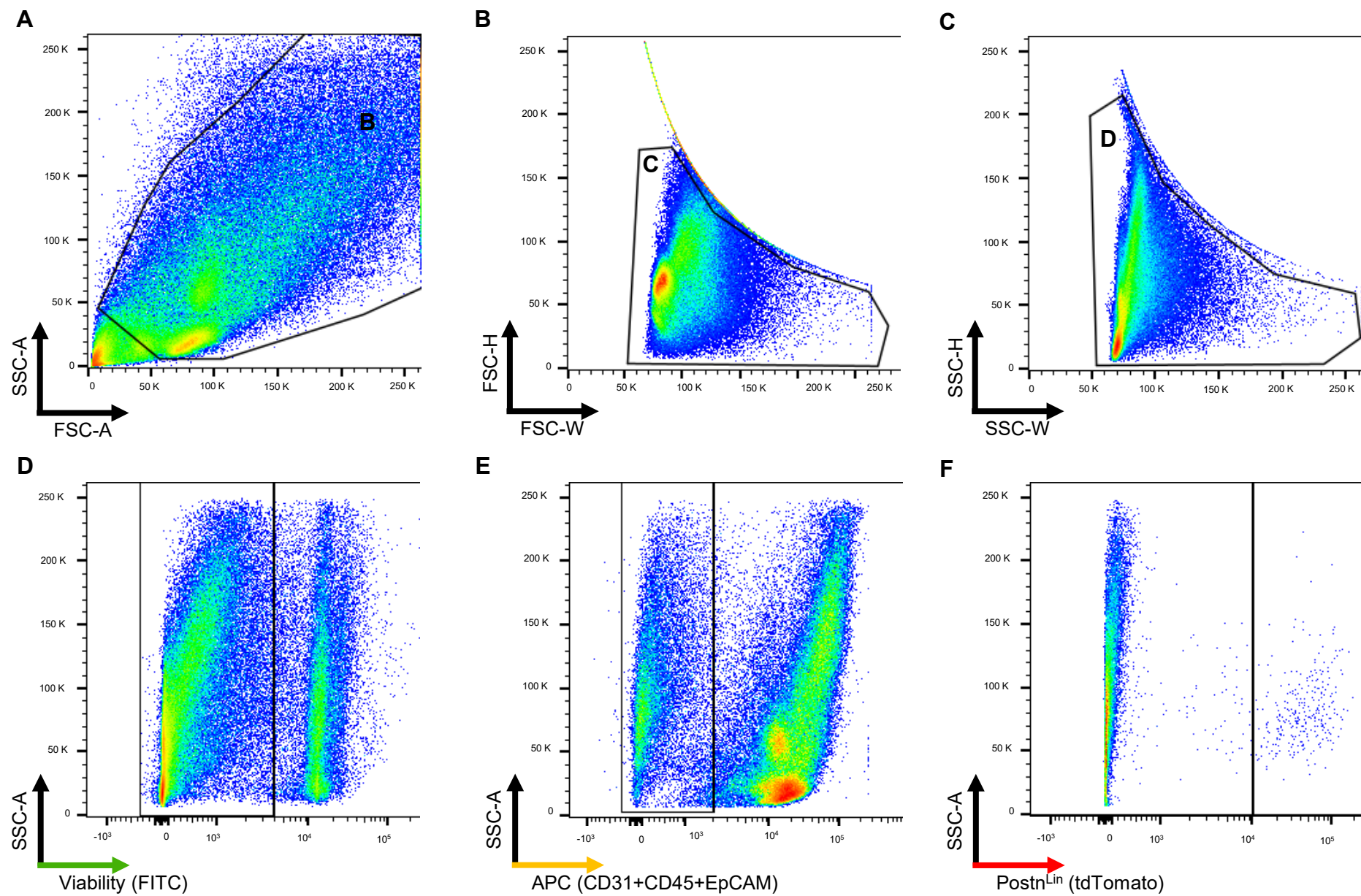
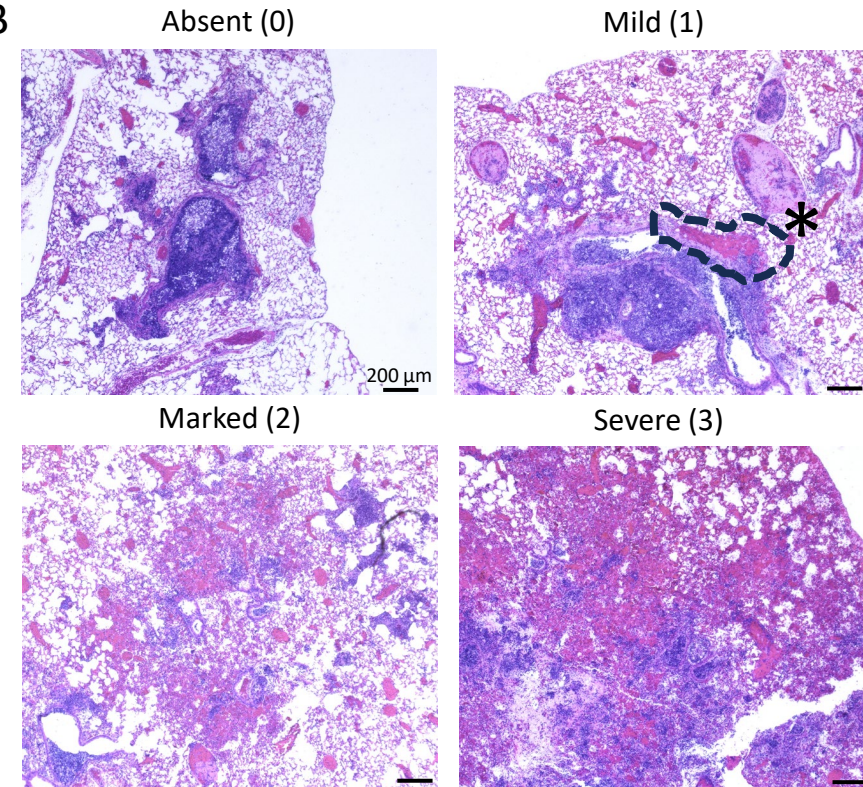


Figure S6. Cell sorting strategy for isolating tdTomato^+ stromal cells for bulk RNA-seq. (A) Cell gating, (B-C) singlet identification, and (D) live cell selection. (E) The resulting non-stromal population was excluded by removing CD31^+ (endothelial), EpCAM^+ (epithelial), and CD45^+ (hematopoietic) cells labeled with allophycocyanin (APC). (F) The remaining tdTomato^+ stromal population (rightward scatter) was sorted for RNA isolation and bulk RNA-seq. FSC: Forward-scatter, SSC: Side-scatter, A: Area, H: Height, W: Width.

A

ID	Hemorrhage Score	Total Vessels $\geq 100 \mu\text{m}$	Vessels with Af	% Angioinvasion
Control + <i>A. fumigatus</i>				
354	0	66	12	18.18
418	2	45	5	11.11
497	3	51	12	23.53
520	1	45	6	13.33
521	0	56	2	3.57
522	0	66	17	25.76
1376	2	34	17	50.00
1377	0	37	8	21.62
1400	0	32	4	12.50
1406	0	27	4	14.81
DTA + <i>A. fumigatus</i>				
352	1	34	26	76.47
353	2	51	38	74.51
416	1	51	25	49.02
417	2	30	5	16.67
439	3	56	19	33.93
495	3	31	20	64.52
496	2	58	34	58.62
29661b	3	42	26	61.90

B



C

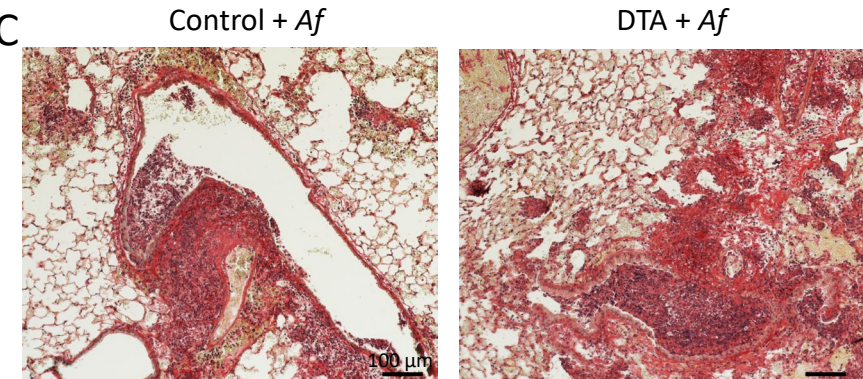


Figure S7. Alveolar hemorrhage, angioinvasion, and collagen deposition in lungs from mice with IPA. (A) Table summarizing alveolar hemorrhage scores and percent angioinvasion as described in Methods. Alveolar hemorrhage was evaluated using a semiquantitative scoring system with the following criteria: 0 (Absent), no red blood cells detected in alveolar spaces; 1 (Mild), rare, focal presence of red blood cells within the alveolar lumen; 2 (Marked), multifocal accumulation of red blood cells in alveoli; and 3 (Severe), widespread alveolar regions with substantial red blood cell presence (n = 10 for control group and n = 8 for DTA group). (B) Representative H&E-stained lung sections corresponding to each hemorrhage score are shown in the right panel. (C) Representative images of control and DTA lungs from the IPA model stained with Picrosirius Red.

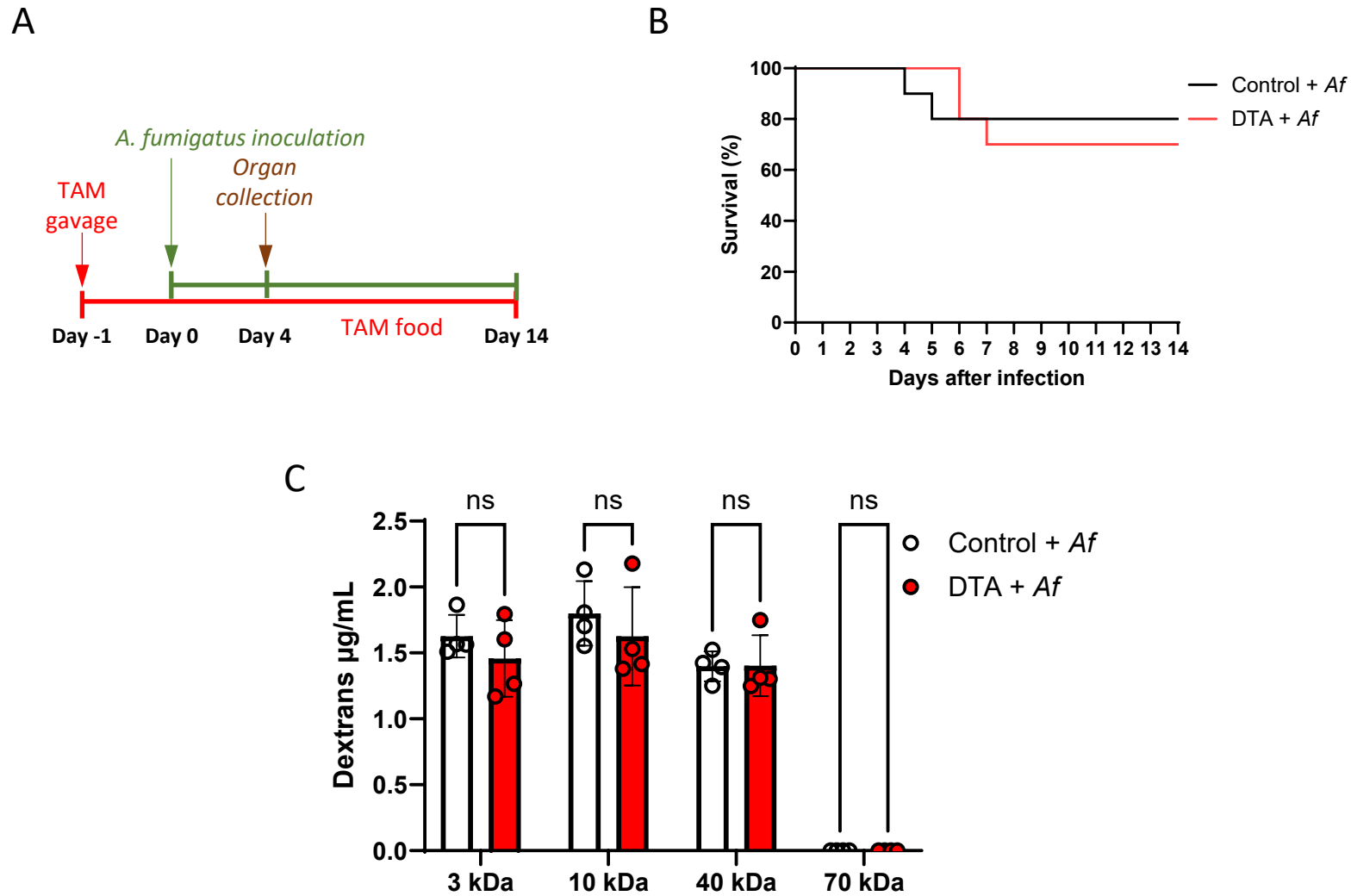


Figure S8. Analysis of vascular permeability following targeted ablation of *Postn*^{Lin} cells in an immunocompetent background. (A) Schematic representation of the experimental approach: Mice were inoculated OP with 3×10^7 conidia. TAM was administered via gavage one day before fungal inoculation and subsequently maintained through a TAM-infused chow diet until 4 days post-inoculation, at which point dextrans were administered by OP instillation and peripheral blood was collected. (B) Percent survival of immunocompetent mice challenged with *A. fumigatus* (n=10). (C) quantification of pulmonary vascular permeability using the appearance of fluorescent dextrans in the circulation following pulmonary instillation of dextrans of the indicated molecular sizes. Unpaired two-tailed t-test revealed no significant differences (ns). Bars represent the mean $\pm$ SD except when indicated. Dots indicate individual biological replicates (n = 4 for control group and n = 4 for DTA group).

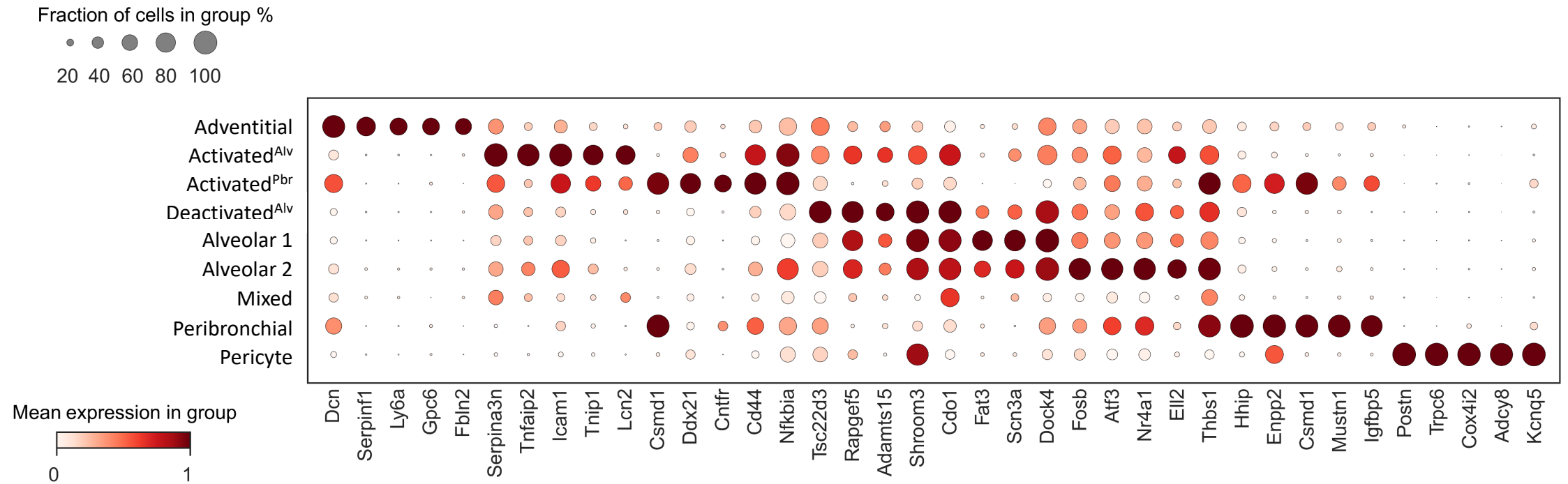


Fig. S9. Dot plot showing representative genes for each cluster identified by scRNA-seq. Dot size denotes the proportion of cells within each fibroblast subset expressing the indicated gene, whereas dot color reflects the mean expression level among expressing cells (scaled from low to high). The analysis resolves transcriptionally the indicated stromal populations.

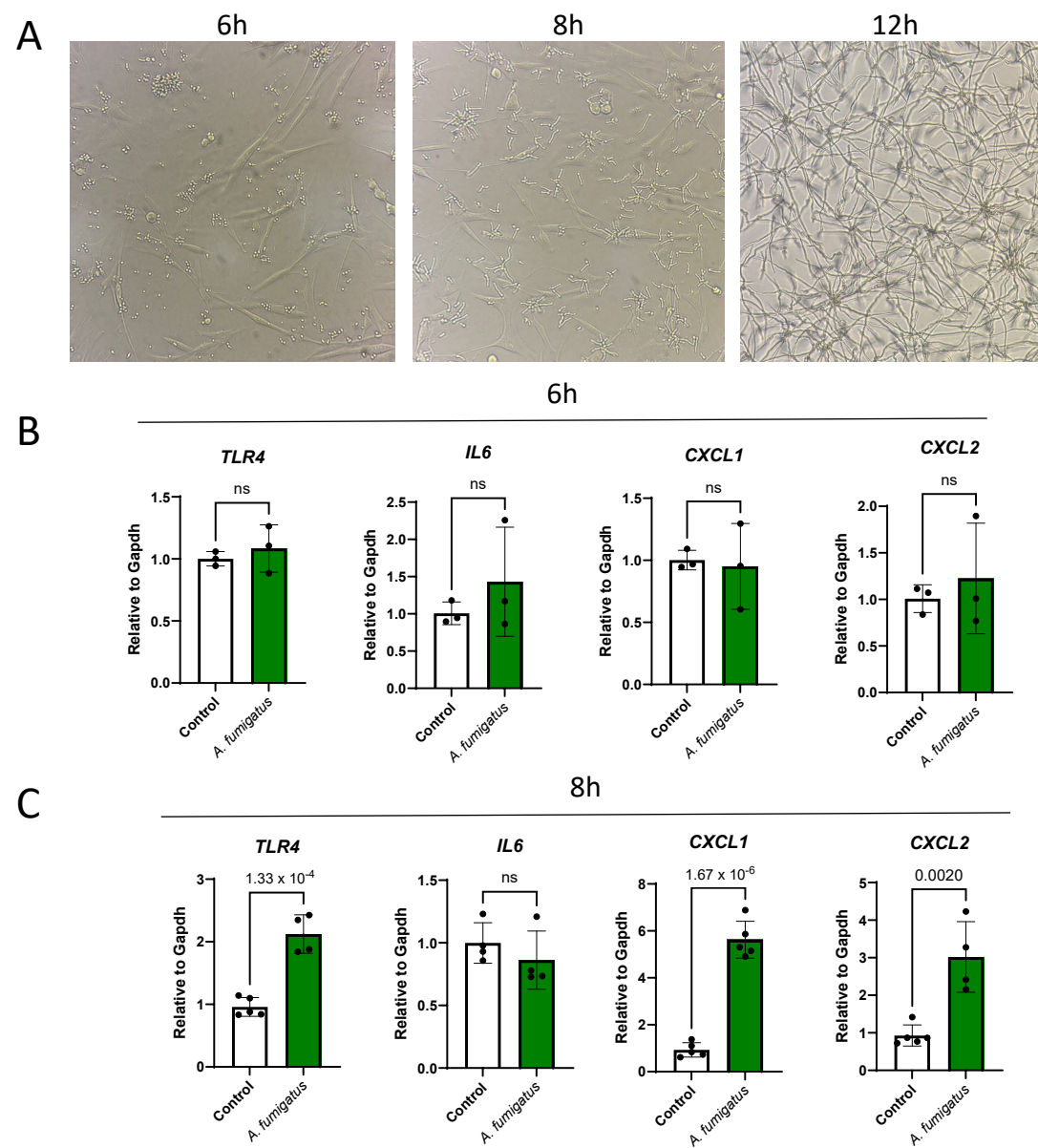


Figure S10. Analysis of inflammatory markers induced by stimulation of primary human pulmonary fibroblasts with *A. fumigatus* *in vitro*. (A) Representative images depicting the dynamic appearance of *A. fumigatus* growth forms following incubation in fibroblast culture medium at the indicated time points. (B–C) RT-qPCR analysis of the indicated genes in primary human pulmonary fibroblast cultures stimulated with viable *A. fumigatus* for (B) 6 h and (C) 8 h. (ns: no significant, **P < 0.01, ***P < 0.001, ****P < 0.0001; unpaired two-tailed t-test versus control). Bars represent the mean $\pm$ SD except when indicated. Dots indicate individual biological replicates (n = 3 and 5 for control groups in B and C, respectively, and n = 3 for *A. fumigatus*-treated group).