Table S1. Primers used for quantitative real-time PCR (qPCR)

Gene name	Gene Symbol	Forward Primer 5'-3'	Reverse Primer 3'-5'
Beta (β)-Actin	ACTB	CTGGGACGACATGCAGAAAA	AAGGAAGGCTGGAAGAGTGC
Nuclear factor kappa-light-chain-enhancer of activated B cells	NFKB	AAGAGGAGGTTTCGCCACCG	TTGCAGATTTTGACCTGAGGGT
Tumor necrosis factor alpha	TNFα	AGCCCATGTTGTAGCAAACC	ACATTGGGTCCCCCAGGATA
C-X-C Motif Chemokine Ligand 8	CXCL8	GCTCTGTGTGAAGGTGCAGTT	GGCACAGTGGAACAAGGACT
Interleukin 6	IL6	ACCCCCAGGAGAAGATTCCA	CACCAGGCAAGTCTCCTCATT
Superoxide Dismutase 3	SOD3	ACGCTGGCGAGGACGACCTG	GCTTCTTGCGCTCTGAGTGCTC
Glutathione S Transferase alpha 1	GSTA1	TGCAGCTGGAGTAGAGTTTG	ATGGGCACTTGCTGGAACAT
Glutathione Peroxidase1	GPX1	GTGCTCGGCTTCCCGTGCAAC	CTCGAAGAGCATGAAGTTGGGC
Heme oxygenase 1	HMOX1	TTCAAGCAGCTCTACCGCTC	GGGGGCAGAATCTTGCACTTT

Table S2. The checklist descriptors of the comparison between primary cells and 16HBE under airlifted culture conditions

	3D cell culture parameter	Primary cells [7-9]	Cell line (16HBE)[10, 11]
Cells	Cell types	Ciliated cells, goblet cells, Clara cells, basal cells	Ciliated cells, goblet cells, basal cells
	Cell availability	Limited	Unlimited
	Cell identity	Variance between different donors; donor's health affects model characteristics	Immortalized; standardized characterization
	Ethics	Ethical permission may be required	Not required
Cell culture manipulation	Handling	Require more experience; cells sensitive to mistreatment	Easier to work with
	Culture medium	Serum-free medium; specific growth factors; may need optimization	Standardized medium
	Growth time	4 weeks before exposure	4 weeks (with extension possibility) before exposure
	Cost	High	Low
Biological functions/features of culture	Quality standards	Differ between labs; usually depends on experiment's purpose	Standardized quality control
	Culture morphology	Pseudostratified structure; 3-5 layers of cells	Cobblestone morphology; 3-5 cell layers

	Culture functionality	Polarized mucociliary differentiated airway epithelial cell layer	Epithelial layer expresses mucins and some cilia; barrier function
	Relevance to human tissue	High; maintains morphology, gene expression, key metabolic enzymes	Low
Assay validation for toxicity/efficacy testing	Reproducibility of the results	Low (due to donor-to-donor variations)	High
	Throughput	Low	High

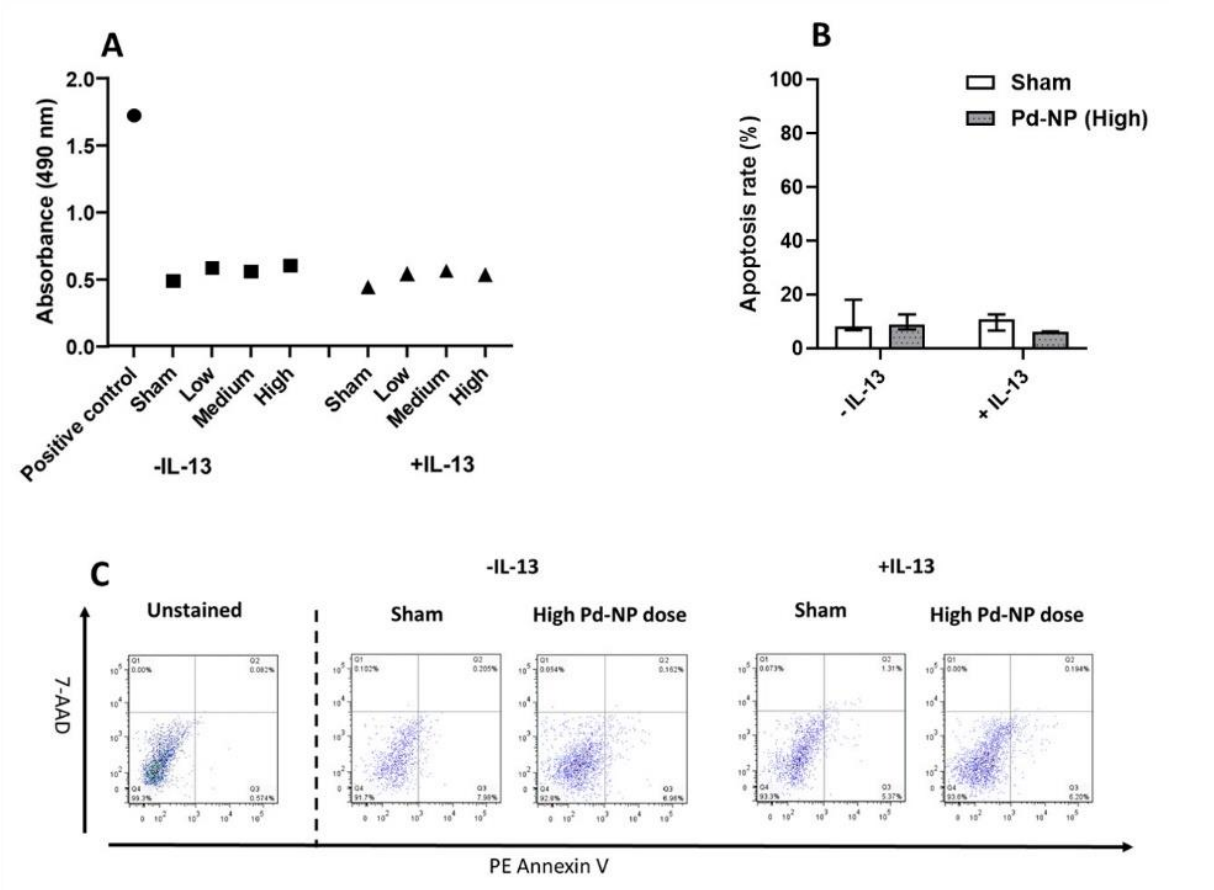

Figure S1. Palladium nanoparticle (Pd-NP) induced cytotoxicity and apoptosis rate in Non-CB and CB mucosa models after 24h incubation following exposure to Pd-NP.

The cytotoxic effect was measured by colorimetric Lactate Dehydrogenase assay after 24 h of exposure to the clean air (sham) and all Pd-NP doses, positive Control (N=2) (A). The apoptosis rate was detected by FACS after 24 h of exposure to the clean air (sham) and high Pd-NP dose. Data presented as median and 25th -75th percentiles (N=3) (B). The gating strategy used to identify apoptotic cells (C).

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