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Alveolar flows of the developing lungs:from embryonic to early childhood airways JANNA TENENBAUM-KATAN, PHILIPP HOFEMEIER, RAMI FISHLER, Technion - Israel Institute of Technology, BARBARA ROTHEN-RUTISHAUSER, Adolphe Merkle Institute, University of Fribourg, JOSUE SZNITMAN, Technion - Israel Institute of Technology — At the onset of life in utero the respiratory system is simply a liquid-filled duct. With our first breath, alveoli are filled with air and become a significant port of entry for airborne particles. As such, alveolar lining is nearly fully functional at birth, though lung development continues during childhood as structural changes increase alveolar surface area to optimize ventilation. We hypothesize that such fluid dynamical changes potentially affect two phenomena occurring within alveoli: (i) flow patterns in airspaces at distinct stages of both in- and ex-utero life and (ii) fate of inhaled particles ex-utero. To investigate these phenomena, we combine experimental and numerical approaches where (i) microfluidic in vitro devices mimic liquid flows across the epithelium of fetal airspaces, and (ii) computational simulations are employed to examine particle transport and deposition in the deep alveolated regions of infants' lungs. Our approaches capture anatomically-inspired geometries based on morphometrical data, as well as physiological flows, including the convective-diffusive nature of submicron particle transport in alveolar regions.Overall, we investigate respiratory flows in alveolar regions of developing lungs, from early embryonic stages to late childhood

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