D31

Chellapriya Vythinathan Advisor(s): Kay Beharry

Inflammatory responses in varying intermittent hypoxia/hyperoxia paradigms in the neonatal rat lungs

Background: Extremely low gestational age neonates (ELGANs) frequently experience brief intermittent hypoxia (IH) with resolution in room air (RA) or hyperoxia (Hx) between episodes. Balancing the harm of hypoxia vs. that of hyperoxia remain a challenge in the neonatal intensive care unit. We tested the hypothesis that oxygen fluctuations, regardless of resolution in RA or Hx between episodes are equally damaging to the immature lungs.
Methods: Newborn rats at birth (P0) were exposed to two IH paradigms: 1) hyperoxia (50% O2) with brief hypoxia (12% O2); or 2) normoxia (21% O2) with hypoxia (12% O2); intermittent hyperoxia (IHx) consisting of (21% O2 with recovery in 50% O2); hyperoxia only (50% O2); or RA (21% O2). Pup were studied on P14 or placed in RA until P21 (recovery/reoxygenation).
Results: All paradigms of oxygen fluctuations resulted in significantly impaired lung growth and abnormalities in lung architecture, including persistent hemorrhage, decreased alveolarization and alveolar simplification, compared to RA controls. In addition, elevated arterial wall thickness and arterial lumen occlusion, suggesting pulmonary hypertension, were seen in all exposed groups. These characteristics were associated with lower radial alveolar counts, and elevated pro-inflammatory cytokines during recovery/re-oxygenation. IL-6 was elevated during exposure, and IL-10 was deficient in all exposed groups.
Conclusion: Oxygen fluctuations during the first few weeks of postnatal life is detrimental to the immature lungs with potential long-term adverse consequences. Strict monitoring of ELGANs to curtail oxygen fluctuations during early postnatal life is necessary to preserve alveolar integrity and prevent lung inflammation and injury.