

The Impact of Systemic Inflammation on Post-Hypoxic Recovery

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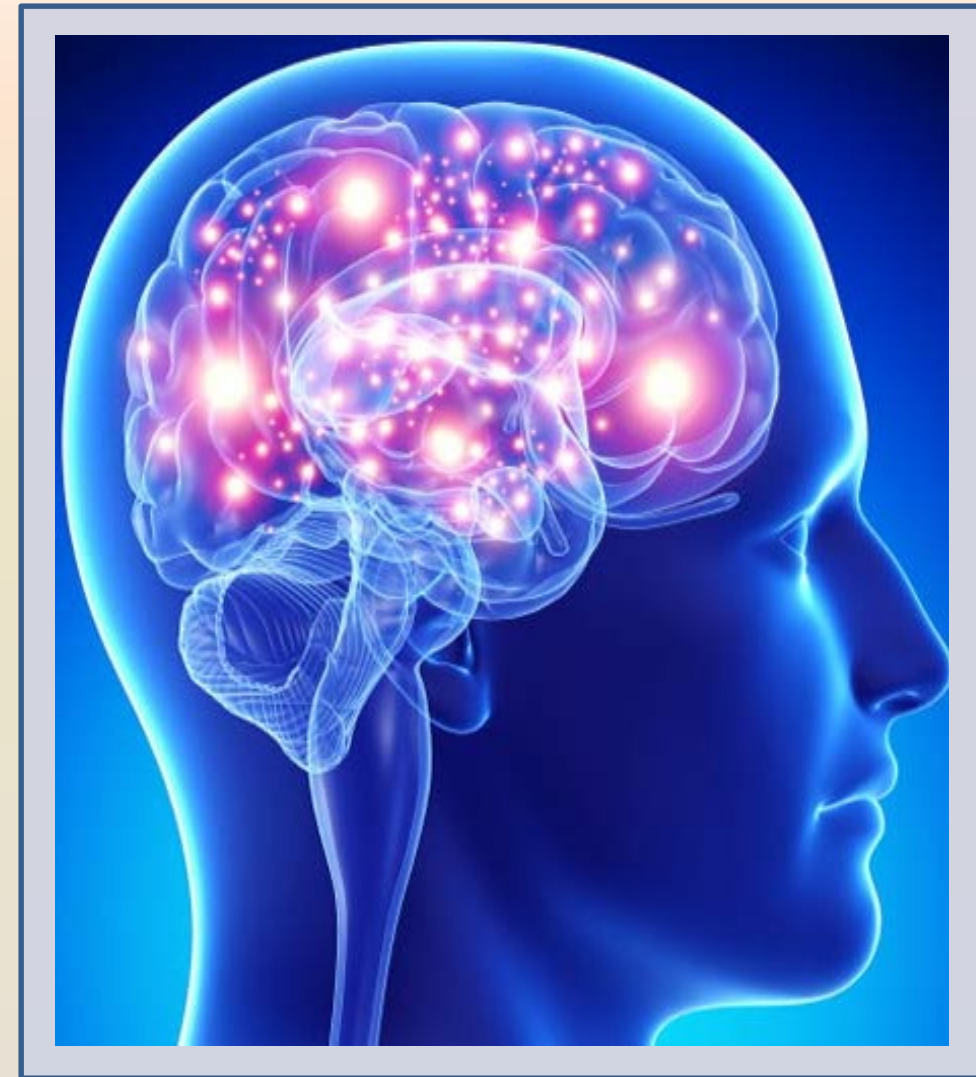
UW Neurological Surgery Summer Student Program

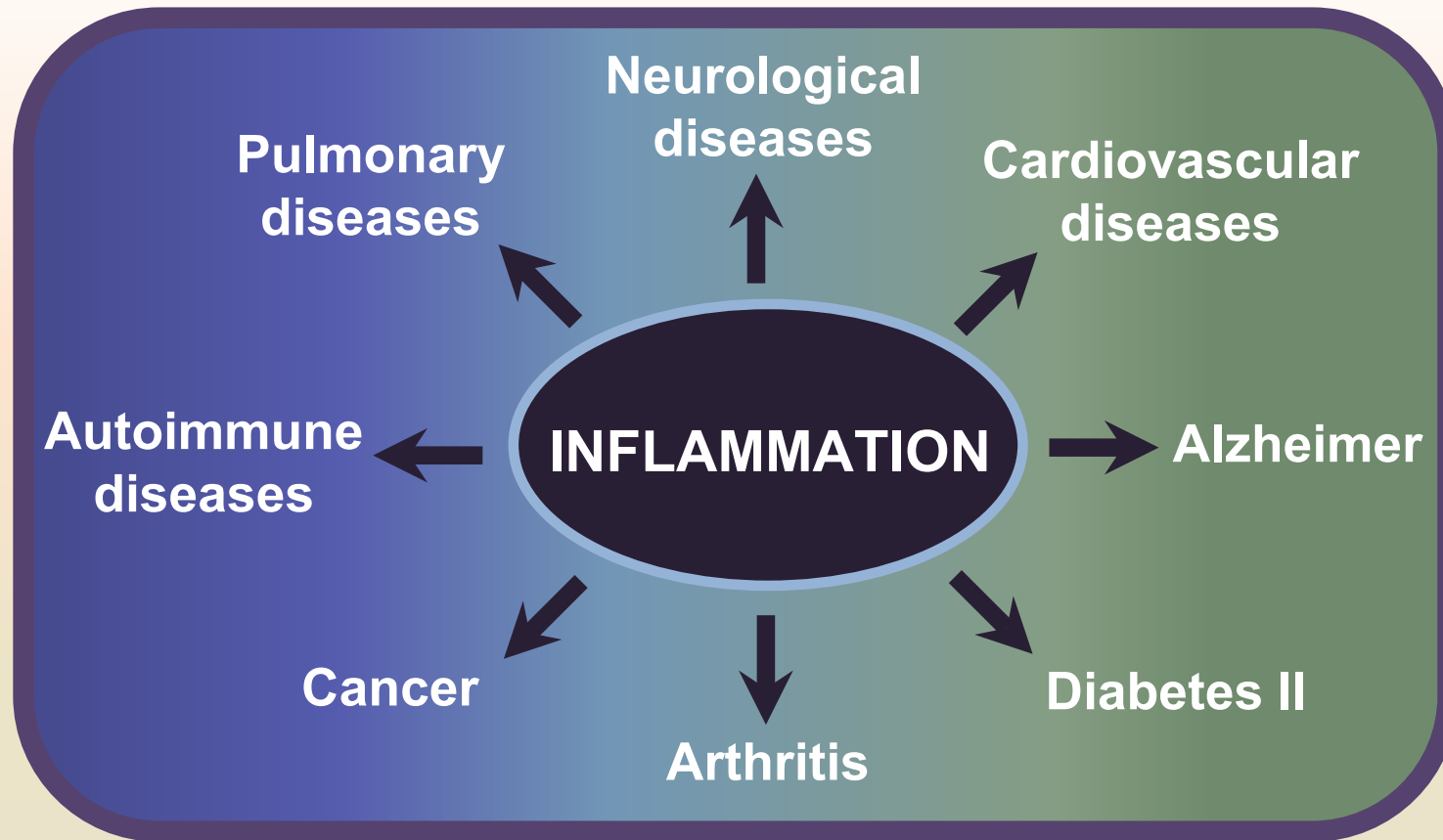
Drs. Ibis Agosto, Nino Ramirez



Background: Hypoxia

- What do Sudden Infant Death Syndrome (SIDS), sleep apnea, and traumatic brain injury (TBI) have in common?
 - **Hypoxic insult** to the central nervous system (CNS) followed by reoxygenation
- Reoxygenation = Post-hypoxic recovery
 - Period after the hypoxic episode (10% O₂) has ended and *normoxic* levels of gases are restored (21% O₂)





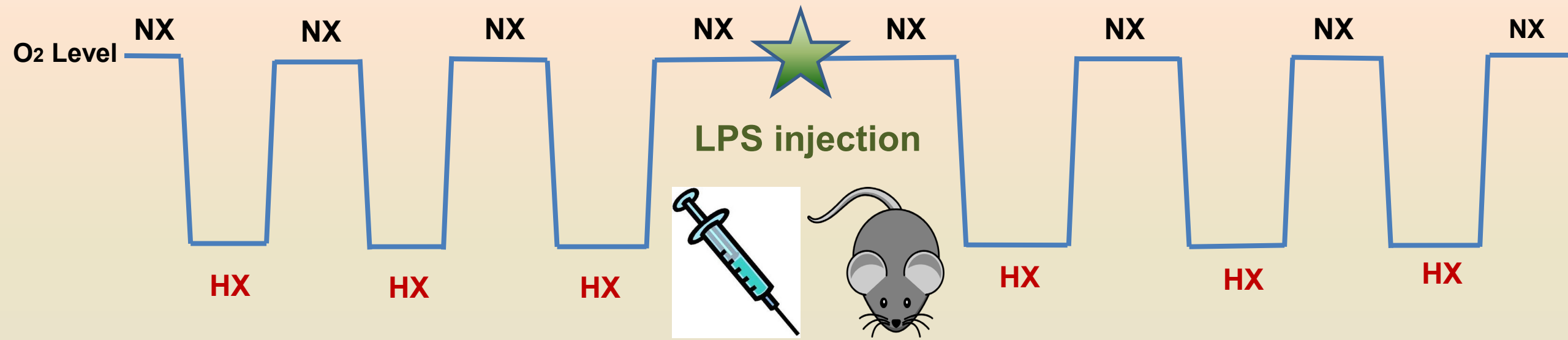
- CNS inflammation has been linked to **sleep apneas** and **SIDS** (Lorea-Hernández et al., 2016).
- Little is known on how inflammation affects the *post-hypoxic reoxygenation period*

Methodology

- CD1 mice at p6-p8
- **Intraperitoneal injection of LPS (3 hr)**
 - 15 μ l lipopolysaccharide (LPS) (2 μ g/ μ l) + 15 μ l saline
 - 30 μ l saline
- **Baseline whole-body plethysmography**
 - Measured tidal volume and respiratory rate
- **Intermittent Hypoxia (10% O₂, 5 min x 3)**
 - Reoxygenation 10 min
- **Whole-body pleth**



Intermittent Hypoxia Protocol

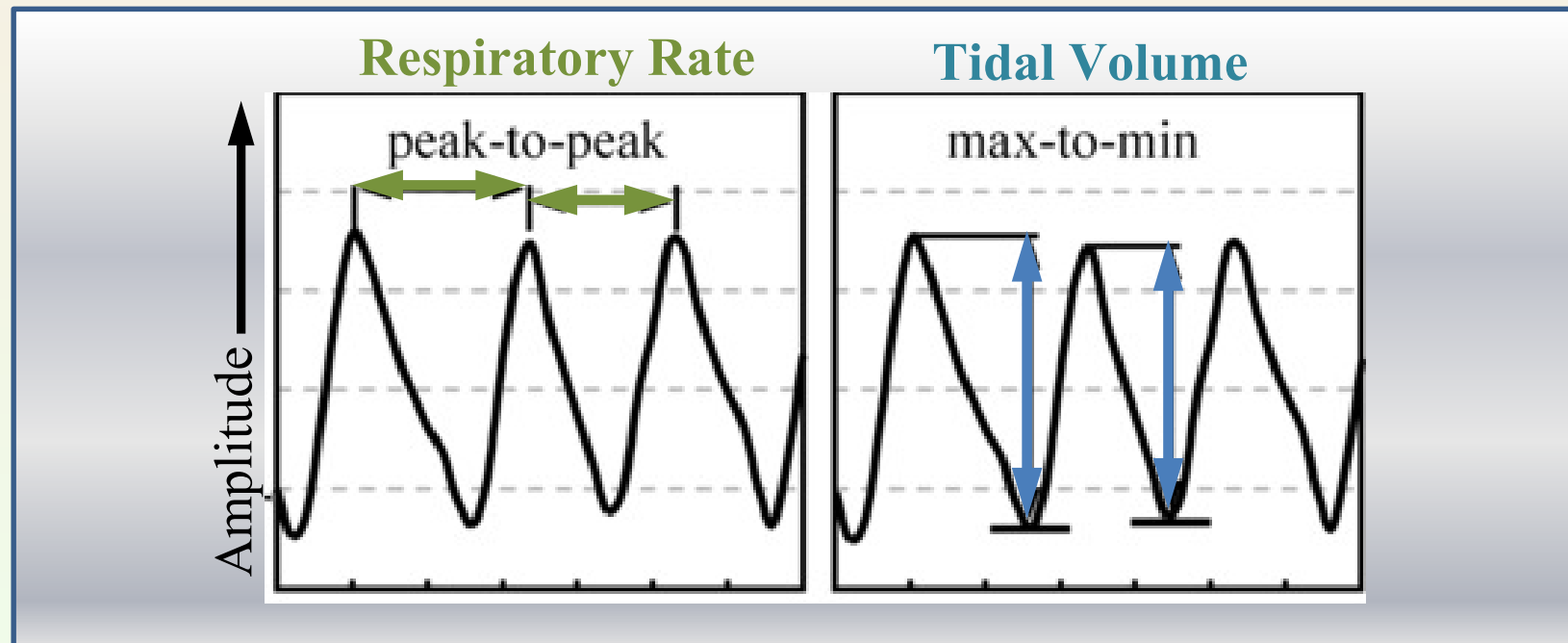


NX = Normoxia
(Reoxygenation, 21% O₂)

HX = Hypoxia (10% O₂)

Hypothesis

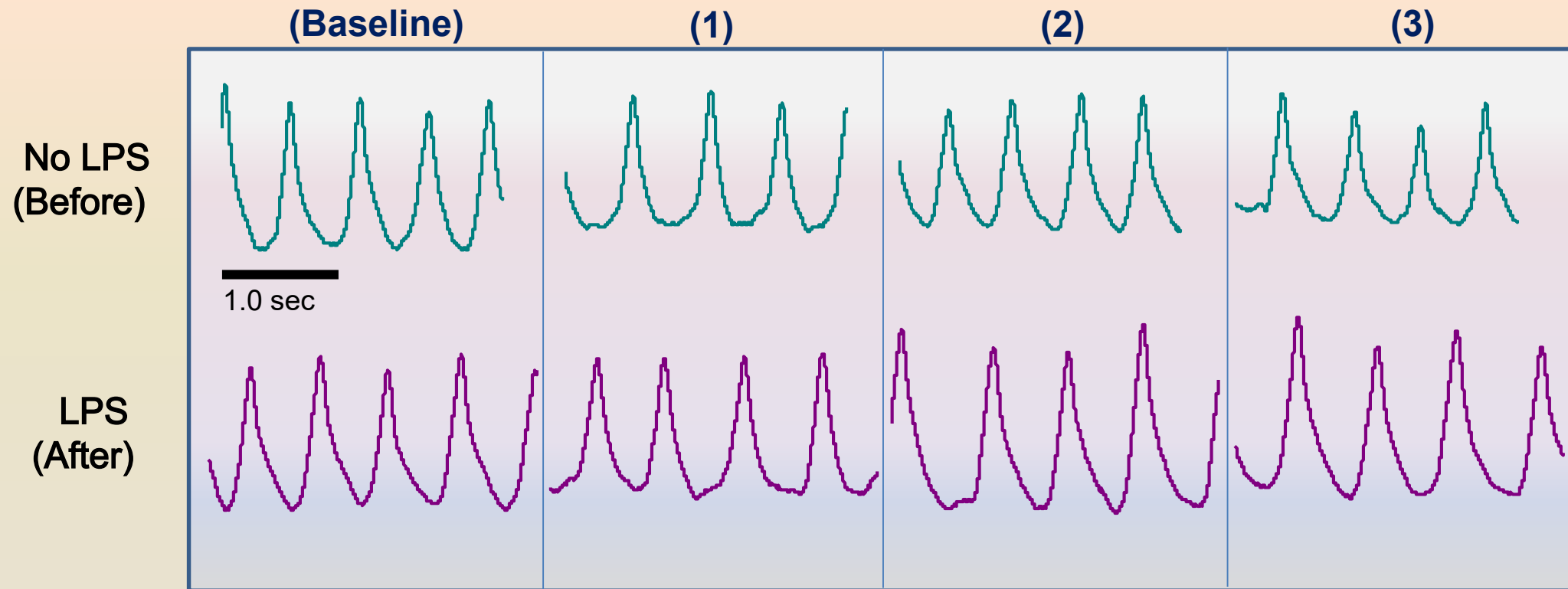
- Systemic inflammation induced by LPS will *reduce* an animal's ability to recover after intermittent hypoxia
 - The average respiratory rate of animals during post-hypoxic recovery will *decrease* after LPS injection in comparison to no LPS
 - The average tidal volume during recovery from hypoxia will *decrease* after LPS injection in comparison to no LPS



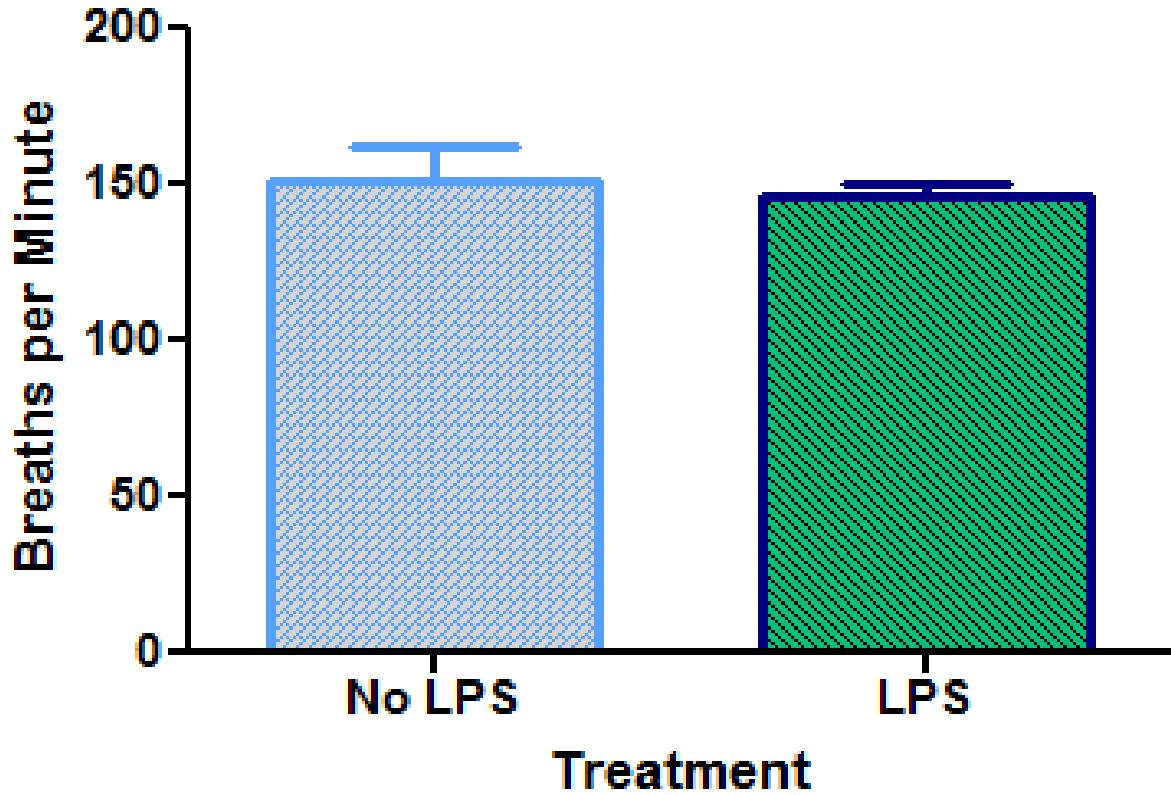
Reoxygenation Before and After LPS

(Animal 1)

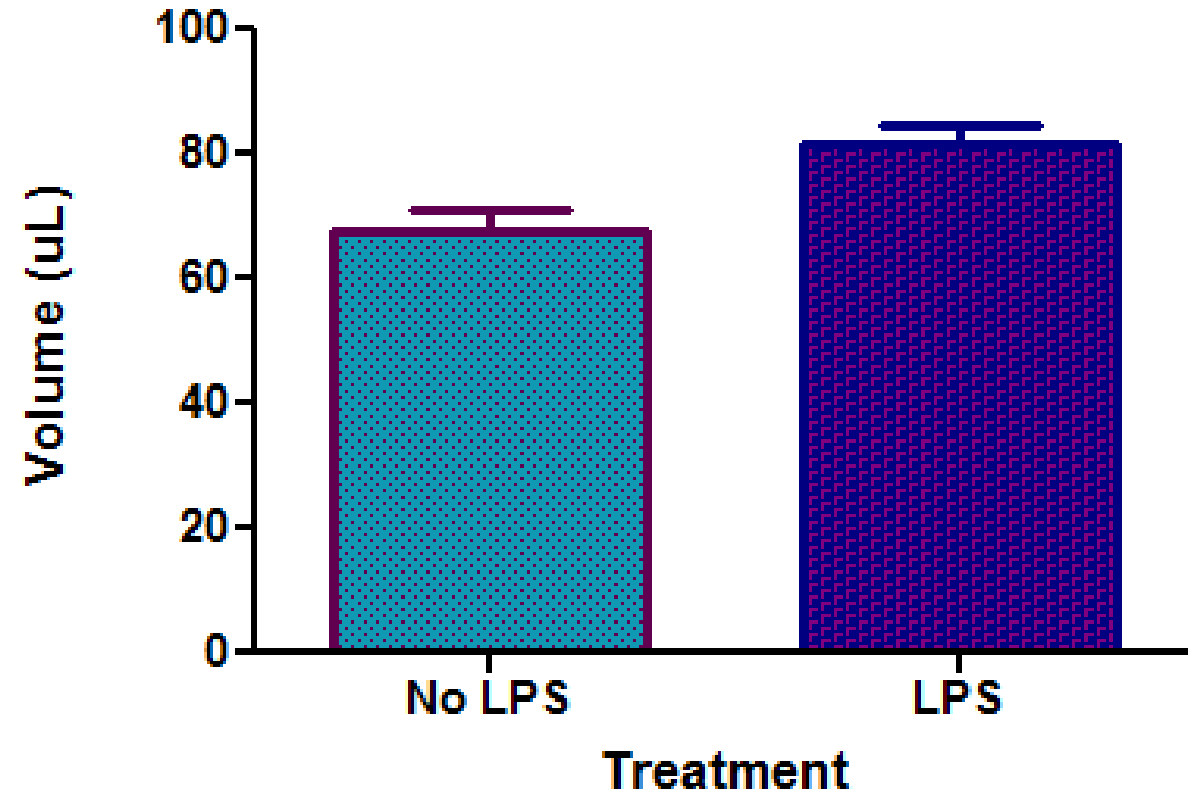
Reoxygenation



Respiration Rate: Animal 1



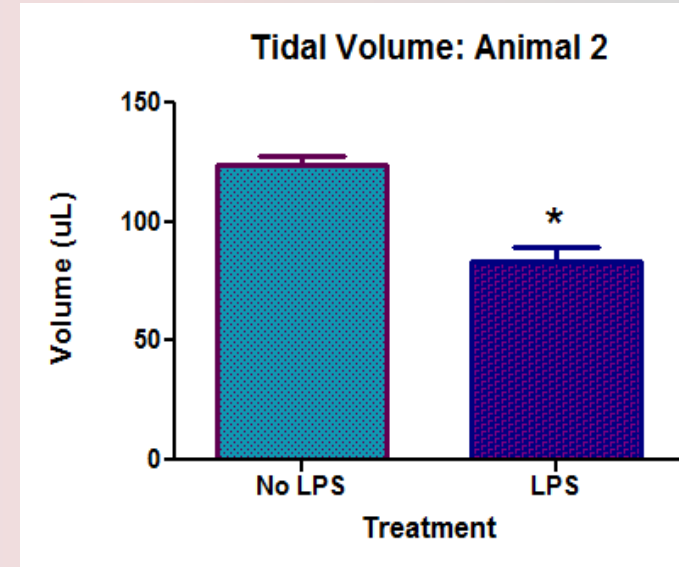
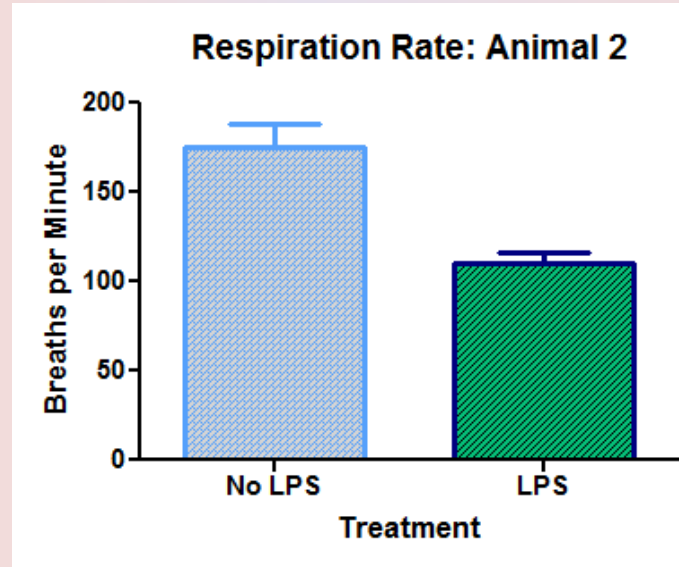
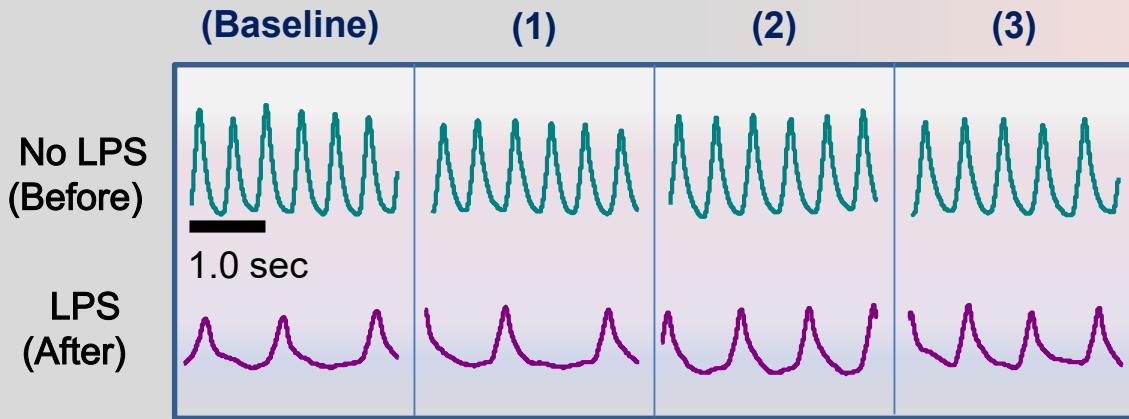
Tidal Volume: Animal 1



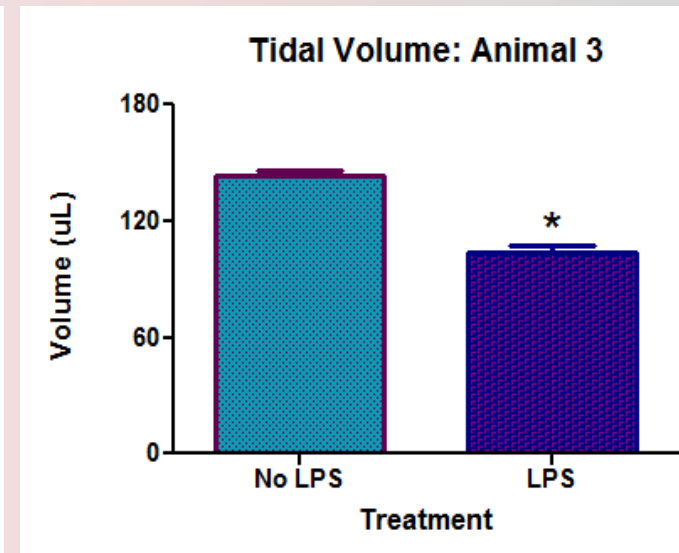
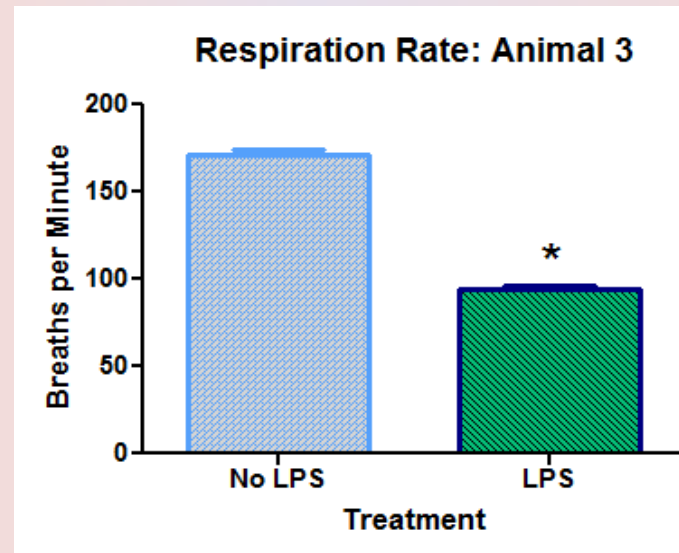
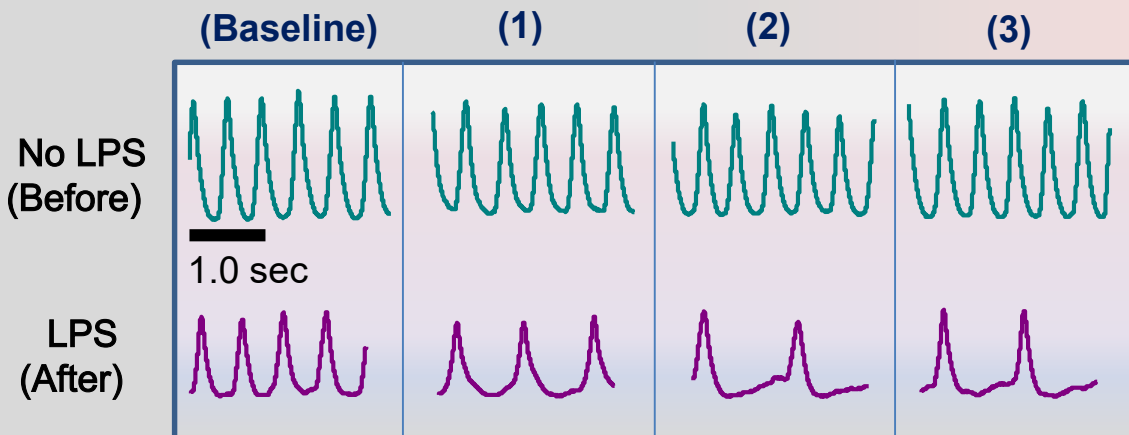
Reoxygenation Before and After LPS

(Animals 2 & 3)

Reoxygenation (Animal 2)



Reoxygenation (Animal 3)



* = Significance from no LPS

Conclusions

- Our preliminary data supports the hypothesis that LPS-induced systemic **inflammation reduces respiratory rate and tidal volume during post-hypoxic reoxygenation** in comparison to animals that lack LPS.
 - This suggests that mild inflammation has a negative impact on the respiratory system of neonatal mice.
- Inflammation in neurological diseases and disorders which are tied to hypoxic episodes could impact respiratory recovery.



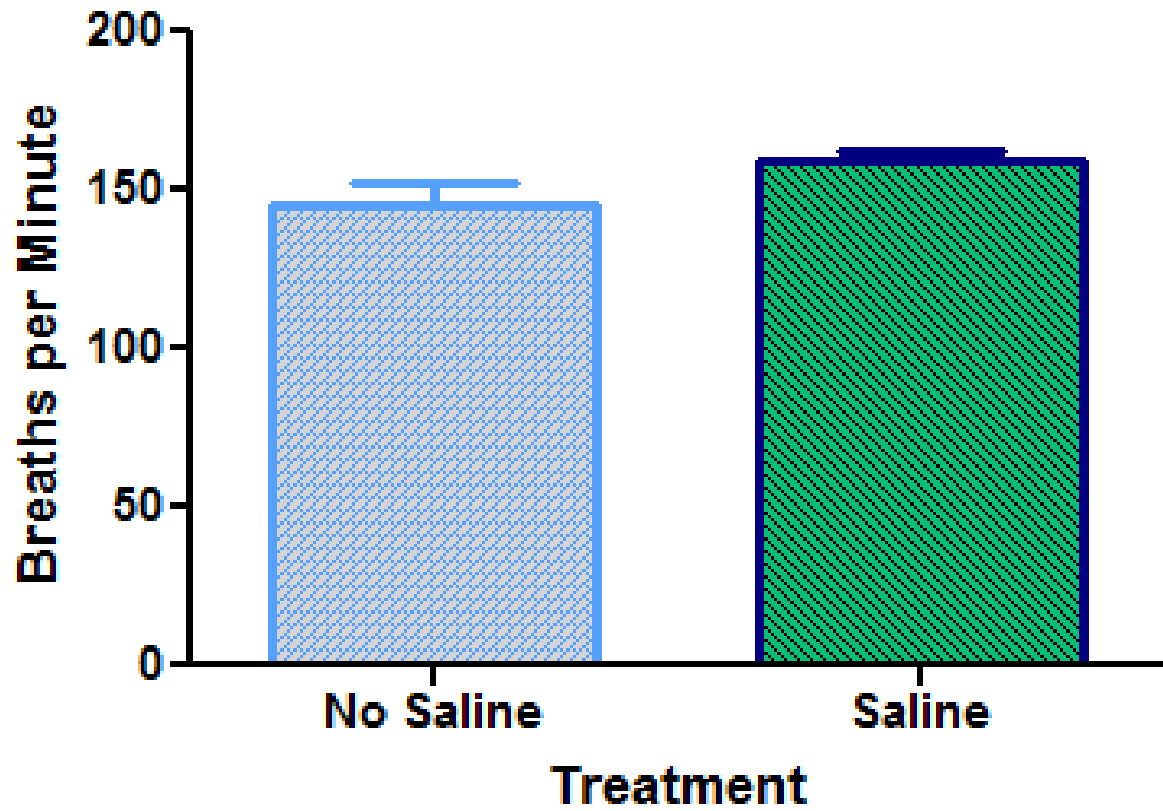
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Respiration Rate: Control Animal



Tidal Volume: Control Animal

