Neonatal Respiratory Rhythms and Prematurity

The link between preterm birth and respiration issues in infants
Why Study Prematurity?

15 million babies born prematurely per year

90% of premature babies die within days of birth in low-income countries

Issues surrounding ventilation of premature infants
  ◦ Costly and lack of availability
  ◦ Leads to future respiration issues
The Ramirez Lab

Hypothesis involving the central nervous system—pre-Bötzinger Complex

Mouse models of prematurity
- Lipopolysaccharide (LPS)
- Control
- C-Section
In vivo vs. In vitro

Translating breathing into neural firing from respiratory centers
- Slicing and electrophysiology

Analyzing different types of breathing with plethysmography
- Eupneas, sighs, and gasps

Neuronal activities in the preBötC resemble respiratory activities in vivo

Ramirez Lab
Types of Respiration in a Mouse Model

1. Eupneas
2. Large breaths
3. Saw Breaths
4. Gasps
Control Breathing (Term Birth)
LPS Breathing (Preterm Birth)
Control vs. LPS Transitions (10 vs 60 m)

Large Saw Gasp Eupnea

Ramirez Lab
in vitro preBötC Rhythm: Control (include area)

Burst area: 0.788836642

Ramirez Lab
in vitro preBötC Rhythm: LPS

Burst area: 38.0366854
The Next Step

A newer hypothesis introducing the post-inspiratory complex (PIC)

New slicing and recording approaches

Drug manipulation and responses from each center
  ◦ Ex. morphine
Thank you!

Dr. Ellenbogen
Mrs. Ellenbogen
Dr. Nino Ramirez
Sanja Ramirez
Christina Buckman
Jim Pridgeon