

## 040: Infant rhinorrhea and watery eyes in the absence of a cold associated with increased heart rate variability among girls.



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### BACKGROUND

We propose a novel connection between dysregulation of the autonomic nervous system in infancy and subsequent airway hyperreactivity at school age that leads to more emergency department visits for asthma (Figure 1) based on the following:

- Parasympathetic nervous system (PNS) signaling can cause rhinorrhea and watery eyes through airway cooling (vasomotor rhinitis) and increased PNS response (rhinorrhea and watery eyes).<sup>1,2</sup>
- Infant rhinorrhea and/or watery eyes in the absence of a cold (RWWC) predicted school age exercise-induced wheeze (EIW), emergency department (ED) visits, and hospitalizations for asthma or other breathing problems, independent of infant wheeze and allergic sensitization.<sup>3</sup>
- Infant RWWC was predicted by prenatal exposure to pesticides and maternal stress, both of which can increase PNS signaling in infants.<sup>4,7</sup>
- We observed increased HRV, an indicator of PNS activity, measured in infancy predicted wheeze at age 2-3 years in children enrolled in the large Prenatal Alcohol in SIDS and Still Birth (PASS) Safe Passage birth cohort study.<sup>8</sup>

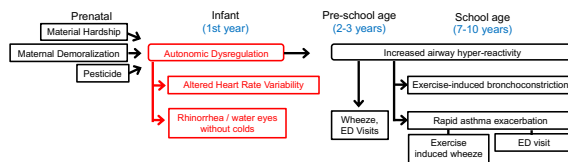


Figure 1. Proposed connection between prenatal exposures, infant RWWC and school age exercise-induced wheeze. Components tested in this analysis in red.

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### HYPOTHESIS

Infants with RWWC would have a greater decrease in heart rate variability associated with a standardized physiological challenge, infant-mother still-face paradigm, indicating increased parasympathetic tone.

### METHODS

- RWWC symptoms since birth were queried for 3-month old Fair Start Birth Cohort Study participants, an Environmental Influences on Child Health Outcomes (ECHO) study in NYC.
- Within 2 months of reporting about RWWC, HF-HRV was assessed [Root Mean Square of Successive Differences (RMSSD)] during periods of relative inactivity and during a standardized physiological challenge, infant-mother still-face paradigm.<sup>9,10</sup>
- The still-face paradigm included 2-minutes of mother/child play immediately followed by 2-minutes of the mother maintaining a still-face.
- Relative risks (RR) for RWWC estimated with multivariable models adjusting for potential cofounders and covariates

### RESULTS

- RWWC was frequent for girls (32%) and boys (21%).
- The children with the greatest decrease in RMSSD between play and still-face challenge had a higher prevalence of RWWC (Fig. 1).
- The association between decrease in RMSSD between play and still-face challenge and RWWC appeared to be somewhat greater among girls than boys, but this difference was not statistically significant.
- In a model controlling for sex, HRV assessment age and time between HRV and RWWC assessment, RWWC at 3 months was significantly associated with having the greatest decrease in HF-HRV between play and still-face (lowest tertile, OR=6.6 [1.01-43] P=0.049).

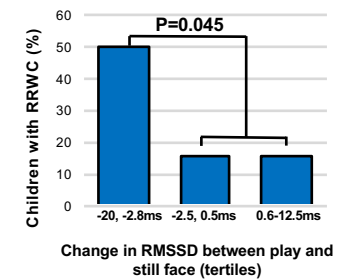


Figure 1. Prevalence of RWWC at 3 months by tertile of change in HRV between play and still-face challenge (n=38). Children with the greatest decrease in HRV were the most likely to have had a report of RWWC.

### CONCLUSIONS

This relatively small study demonstrated greater decreases in HF-HRV in response to a stressor among children with reported RWWC, suggesting that these children could have increased parasympathetic tone and/or overall greater vagal reactivity.)

### FUTURE DIRECTIONS

Demonstrating a novel connection between dysregulation of the autonomic nervous system in infancy and subsequent airway hyperreactivity at school age that correlates with more emergency department visits for asthma could provide a foundation for developing a minimally invasive way to identify at-risk children before asthma symptoms emerge.

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