Farm Exposure Is Associated With Reduced Rates of Viral Respiratory Illnesses In Early Life

AAAAAI 2016 Oral Abstract Presentation
Jamee R Castillo, MD

JR Castillo¹, CM Seroogy¹, M Keifer², I Reyes², J Van Wormer², J Meece², M Evans¹, JE Gern¹
¹University of Wisconsin School of Medicine and Public Health, Madison, WI
²National Farm Medicine Center, Marshfield Clinic Research Foundation, Marshfield, WI
Background

- Viral respiratory illnesses (VRIs):
  - Most common illnesses of infants and young children
  - VRIs represent a significant public health burden
  - Risk factor for the development of childhood asthma

- Environmental factors:
  - Important in shaping respiratory health in childhood
  - Exposure to farm animals in early life reduces the risk for childhood allergic diseases and asthma

Little is known about the relationship between farm exposure and VRIs in early childhood.
• Farm exposure promotes immune development\(^2\)

• Overarching Hypothesis:

Aim
To determine effects of farm exposure on rates of viral infections and illnesses through age 2 years

Hypothesis
Farm children will have decreased rates of viral illnesses compared to non-farm children.
Study Design

**Wisconsin Infant Study Cohort** (The “WISC” Study)

Pre-natal Enrollment

**Non-Farm**: 100

*Farm*: 100

*Farm Inclusion Criteria:*
- Pregnant women who work or reside on farms with cattle, cows, or goats

*Farm Exclusion Criteria:*
- Resides or works on farm with horses, sheep, or poultry, i.e. sheep-only farms
- Resides or works in household with pet farm animals
- Resides in nonfarm household < 1/8 mile from animal farm
Study Design

**Wisconsin Infant Study Cohort (The “WISC” Study)**

**Inclusion:**
- Healthy full-term (>37 weeks gestation) neonates

**Exclusion:**
- Preterm delivery
- Perinatal infections
- Maternal use of antibiotics (except GBS prophylaxis) or corticosteroids in last trimester
- Maternal chronic medical conditions (ex. HIV, autoimmune disease)

Viral Infection & Illness Assessment

Birth

24 mo.
Respiratory Viral Infection & Illness Assessment

Mid-turbinate nasal swabs were collected:
• At scheduled intervals (viral infection surveillance nasal swabs):
  2 mo.  9 mo.  12 mo.  18 mo.  24 mo.
  Birth

• At any respiratory illness (viral illness nasal swabs):
  ≥2 days of cold symptoms, cough, or wheeze
Respiratory Viral Infection & Illness Assessment

- Viruses were detected by multiplex PCR:
  - Adenovirus
  - Bocavirus
  - Coronavirus
    - CoV 229E
    - CoV NL63
    - CoV OC43
  - Enterovirus / Rhinovirus
  - Influenza A
  - Metapneumovirus
  - Parainfluenza
    - PIV 2
    - PIV 3
    - PIV 4
  - Respiratory Syncytial Virus
    - RSV A
    - RSV B

Terminology:
- **Infection** = virus detection, (-) symptoms
- **Illness** = virus detection, (+) symptoms: ≥2 days of cold symptoms, cough, or wheeze
WISC Enrollment

Current Enrollment:
• Farm: 72
• Non-farm: 92

Two Interim Analyses:
Analysis 1: August 2015
• Farm: 28
• Non-farm: 24

Analysis 2: February 2016
• Farm: 44
• Non-farm: 44

Sites as of Oct. 2015
Rate of Infections & Illnesses

**Infections**

No significant difference

<table>
<thead>
<tr>
<th>Age</th>
<th>Farm</th>
<th>Non-Farm</th>
<th>p-value</th>
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<tr>
<td>2 mo.</td>
<td>8/28</td>
<td>9/24</td>
<td>0.49</td>
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<tr>
<td>9 mo</td>
<td>7/15</td>
<td>8/15</td>
<td>0.72</td>
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<td>12 mo.</td>
<td>3/11</td>
<td>4/6</td>
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<tr>
<td>18 mo.</td>
<td>1/3</td>
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<tr>
<td>Total</td>
<td>19/57</td>
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Rate of Viral Infection Farm vs Non-farm in Surveillance Nasal Swabs
(Rate = # of swabs with virus detected / total swabs)

**Illnesses**

1.85-fold increase in Non-farm
95% CI 1.02-3.35
p=0.04

August 2015
- 210 nasal specimens from 28 farm children and 24 non-farm children were analyzed
- Mean length of time for follow-up: 10.1 months for farm children and 10.3 months for non-farm children
Rate of Infections & Illnesses

**Infections**

No significant difference

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<th>Non-Farm</th>
<th>p-value</th>
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<tbody>
<tr>
<td>2 mo.</td>
<td>9/35</td>
<td>13/33</td>
<td>0.23</td>
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<tr>
<td>9 mo</td>
<td>9/18</td>
<td>10/18</td>
<td>0.74</td>
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<tr>
<td>12 mo.</td>
<td>4/15</td>
<td>4/8</td>
<td>0.26</td>
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<td>18 mo.</td>
<td>1/5</td>
<td>2/4</td>
<td>0.53</td>
</tr>
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<td>24 mo.</td>
<td>1/2</td>
<td>1/1</td>
<td>1.00</td>
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<tr>
<td>Total</td>
<td>24/75</td>
<td>30/64</td>
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</tbody>
</table>

Rate of Viral Infection Farm vs Non-farm in Surveillance Nasal Swabs
(Rate = # of swabs with virus detected / total swabs)

**Illnesses**

1.44-fold increase in Non-farm
95% CI 0.92-2.28
p=0.11

February 2016

- 296 nasal specimens from 44 farm children and 44 non-farm children
- Mean length of time for follow-up: 12.7 months for farm children and 11.7 months for non-farm
Conclusions

• Despite similar rates of viral infection, farm children have decreased rates of respiratory viral illnesses compared to non-farm children.
  • Final analysis will adjust for confounders, i.e. daycare, # of siblings

• Early-life farming exposures may impact anti-viral immune maturation and the development of asthma and allergy.
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