Prenatal Farm-Derived Exposures are Associated with Atopic Dermatitis Risk in Infancy

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Abstract

Atopic Dermatitis Outcomes

Rationale: Atopic dermatitis (AD) during infancy is significantly less prevalent in Wisconsin children from farm families compared to non-farm children. We hypothesized that specific farm-derived exposures, including prenatal contact with farm animals and animal feed, are inversely associated with AD development in infants.

Methods: Mothers completed questionnaires about environmental exposures starting at 13-weeks gestation. AD was defined as parental report of a healthcare provider’s diagnosis of AD. Fisher’s exact test was used to analyze effects of individual animal and feed exposures. Chi-square test for trend was used to analyze effects of animal exposures by number of species.

Results: Among children (ages 2 to 48 months) in the farm group (n=104), prenatal exposures to poultry (AD rate: 3% vs 28%, P=0.003), pig (4% vs 25%, P=0.04) and feed grain (13% vs 34%, P=0.02) were associated with reduced rates of AD. The risk of AD was further influenced by diversity of animal species exposure. Prenatal exposure to greater numbers of animal species was associated with reduced rates of AD (0 animals 43%, 1-2 animals 31%, 3-4 animals 16%, 5-6 animals 6%, P=0.01).

Conclusions: Maternal contact with farm animals (poultry, pig, and diversity of exposure) and feed grain during pregnancy was inversely associated with development of AD in Wisconsin farm children. These findings are consistent with studies in Western Europe and suggest that prenatal contacts with farm-derived exposures additively reduce the risk of developing AD in early life.

Study Objective and Hypothesis

To determine the associations of farm exposure with the incidence of AD in early childhood

#W-hypothesized that patterns of farm exposure are inversely associated with AD development in infants

Study Design and Participants

Subjects were enrolled in the Wisconsin Infant Study Cohort (WISC) -Prospective birth cohort with prenatal enrollment (2013 - )

#Farm Group Entry Criteria: Healthy neonates ≥34 weeks born to mothers who work on farms with cattle, goats, or pigs

#Maternal contact with specific farm exposures (poultry, pig, feed grain, and diversity of species) during pregnancy was inversely associated with development of AD in Wisconsin farm children. These findings are consistent with studies in Western Europe and suggest that prenatal contacts with farm-derived exposures additively reduce the risk of developing AD in early life.

Statistical Methods

#Fisher’s exact test was used to analyze effects of individual animal and feed exposures

#Chi-square test for trend was used to analyze effects of animal exposures by number of species

#Latent class analysis (LCA) was used as a data reduction strategy to identify 3 distinct farm exposure groups

#Covariates (specific farm-derived exposures) were selected and incorporated into a log-linear multinomial regression model

WISC Baseline Demographics

<table>
<thead>
<tr>
<th></th>
<th>Farm (n=111)</th>
<th>Non-Farm (n=129)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex</td>
<td>57%</td>
<td>42%</td>
<td>0.03</td>
</tr>
<tr>
<td>Caucasian</td>
<td>99%</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>Vaginal delivery</td>
<td>63%</td>
<td>79%</td>
<td></td>
</tr>
<tr>
<td>Daycare attendance</td>
<td>14%</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>Maternal smoking</td>
<td>9%</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>Dog ownership</td>
<td>73%</td>
<td>52%</td>
<td>0.0009</td>
</tr>
<tr>
<td>Cat ownership</td>
<td>78%</td>
<td>32%</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

No group differences observed in maternal age, household income, marital status, education, household size, and histories for AD, asthma, and allergic rhinitis.

LCA Identified 3 Distinct Farm Cohort Exposure Groups

#Group A (n=22)

- High and diverse environmental and animal exposure
- Largest household size

#Group B (n=54)

- High environmental and moderate/less complex animal exposure
- High crop (excluding forage) and cattle exposure

#Group C (n=28)

- Moderate to low and less complex environmental and animal exposure
- Smallest household size and largest farm acreage

Conclusions

- Farm children were half as likely to develop AD during infancy compared to non-farm children
- Maternal contact with specific farm exposures (poultry, pig, feed grain, and diversity of species) during pregnancy was inversely associated with AD development in offspring
- Grouped farm exposure (Farm Group A > B > C) was inversely associated with AD development in offspring

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