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The Amish have Decreased Asthma and Allergic Diseases Compared to Old Order Mennonites

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Capsule summary:

Wisconsin Amish have a lower prevalence of allergic disease compared to Old Order Mennonite.

Keywords

Amish; Old Order Mennonite; Farm; Allergies

The prevalence of allergic diseases is increasing worldwide, particularly in Westernized regions. Epidemiologic studies from several continents have shown an association between infants born into farming environments and significantly decreased frequency of asthma and allergic diseases. The protective factors in farming environments remain poorly understood but may include animal exposure and farm (unprocessed) milk ingestion (1, 2). The Amish, Old Order Mennonites (OOM), and Hutterites are distinct Anabaptist traditional agrarian cultures. Studies of Amish and OOM have separately reported a decreased prevalence of allergic respiratory diseases compared to existing databases of non-Anabaptist populations (3, 4). While the contrast in allergic respiratory disease prevalence between Anabaptist and non-Anabaptist populations may be due to lifestyle or genetic differences, significant differences in the risk for respiratory allergic diseases have also been observed between the mutually traditional and genetically similar Amish and Hutterite groups (5). These observations suggest that within traditional and genetically similar agrarian communities, the risk for respiratory allergic disease can vary greatly. Identifying which farming communities have increased protection against allergic diseases and understanding what factors are relevant in promoting protection is critical for understanding the mechanisms of allergic sensitization and development of rational and safe primary prevention strategies for the general public.

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We sought to determine the prevalence of a broad range of allergic diseases in the Amish and the OOM in Wisconsin. The Amish and OOM are of Swiss German ancestry with origins in the Anabaptist movement during the 16th century in Europe. These distinct groups had similar immigration patterns to North America starting in the 18th century. Both groups seek to live separately from society and practice a traditional agrarian lifestyle in overlapping geographical regions of Wisconsin. A cross-sectional paper survey was developed and distributed to Amish and OOM families in Wisconsin, as previously described (6). The allergic disease and farm-related survey questions were modified from the National Health and Nutrition Examination Survey (NHANES) and GABRIELA questionnaires, respectively (7, 8). Analyses were conducted using SAS software (SAS Institute Inc., Cary NC) version 9.4. All p-values were two-sided and $p<0.05$ was used to define statistical significance.

A total of 1,741 surveys were distributed from August 2014 until March 2016, of which 518 surveys were received (29.9% response rate) representing over 4200 individuals. The majority of households consisted of married couples with children with the mean number of children per household was significantly higher for Amish compared to OOM (6.56±4.14 versus 5.23±3.39 respectively p=0.0025). The OOM group had a lower frequency of raw milk ingestion and farm residence compared to Amish. However, the majority of both Amish and OOM respondent families live on a farm and reported consumption of raw unprocessed farm milk, including during pregnancy. Amish families reported significantly smaller farm size with fewer animals compared to OOM (supplementary Table 1).

At the household level, Amish families reported an overall allergic disease prevalence of 26.4% (n=92 households, data available from 348 households) while OOM reported a significantly higher prevalence of 46.7% (n=35 households, data available from 75 households, p=0.0008). There was more than one affected family member in 33.6% of Amish families compared to 48.6% of OOM families with allergic disease. At the individual level, Amish reported significantly less self-reported and health care professional diagnosed asthma, eczema, hay fever, and food allergies compared to OOM (Figure 1). There was no significant difference in the age range of reported allergic disease affected individuals between the Amish and OOM (Amish: mean age 33 years±18.2; OOM: mean age 27 years ±14.5).

This is the first Amish and OOM direct comparative study aimed at determining the prevalence of allergic diseases. Our findings demonstrate a lower prevalence of a broad range of self-reported and health care professional diagnosed allergic diseases in the Amish compared to OOM and provide another example of prevalence differences within farming populations despite sharing many similarities in lifestyle, diet, and genetic background. The reported allergic disease prevalence from our surveyed Amish families is similar to previous studies and was extended to include food and skin allergies (3, 5). In our survey, while the allergic disease prevalence in OOM was higher than Amish, it is considerably lower when compared to the reported general population and is consistent with the notion that early life farming exposures are protective against the development of allergic sensitization (4). The reasons for the differences between Amish and OOM in our survey remain unknown and is the focus of ongoing investigations, including formal allergic sensitization data to support

the allergic disease diagnoses and improved understanding of health care seeking behaviors between the groups. The household microbial environment from farming families has been strongly implicated as the driving exposure in preventing allergic disease. The recent study comparing Hutterites with the Amish suggested communal living and large industrialized farming practices were contributors to increased asthma in the Hutterites and attributed to elevated endotoxin levels in Amish homes compared to Hutterite (5). Other previously reported protective allergic disease associations include the independent effects of family size (≥ 3 siblings) and farming exposures (9). In our survey, the Amish and OOM family size was significantly different, but this is an unlikely explanation since both groups had large family sizes. Both the Amish and OOM practice similar living lifestyles. Some OOM communities will incorporate tractors to farm and electricity to cool milk barns and use of this type of technology may explain the larger farm size and greater number of farm animals reported by OOM compared to the Amish.

Our findings suggest that seemingly comparable farming lifestyles in genetically similar populations can have varied degrees of protection from allergic diseases and emphasize the need for comprehensive lifestyle and environmental assessments. In summary, our survey findings provide additional evidence for the Amish population being highly protected from allergic diseases and support continued study within these communities to identify the beneficial farm environmental factors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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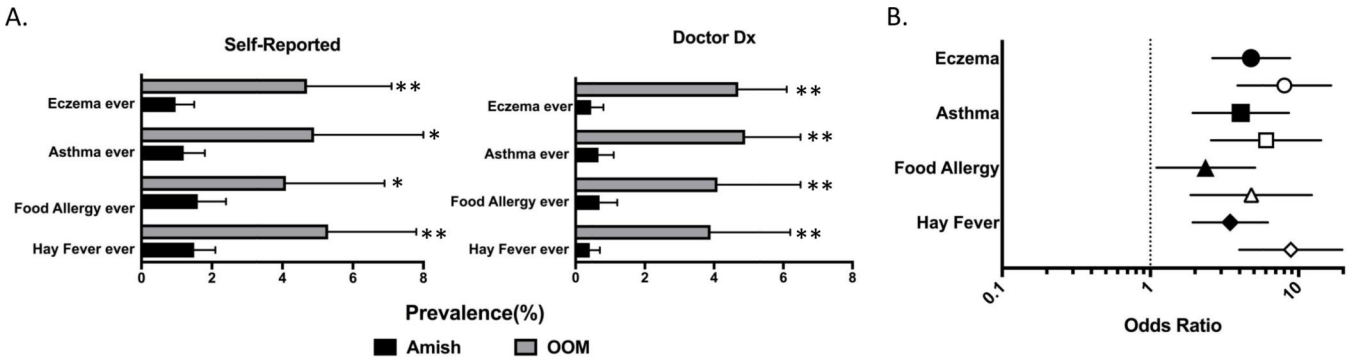

Figure 1: The Prevalence of Allergic Diseases is Lower in Wisconsin Amish Compared to Old Order Mennonites.

A. Generalized estimating equation analysis with repeated measurements to account for family clustering was used to compare Individual level self-reported and health care professional diagnosed prevalence rates of allergic diseases between Amish (N=3705 total individuals) and OOM populations (N=566 total individuals). B. Odds ratio with 95% confidence intervals for specific allergic disease in OOM compared to Amish. Closed symbols self-reported. Open symbols health care professional diagnosed. * $p<0.05$; **$p<0.0001$