

30 Years of the Hygiene Hypothesis

PS - 5

Julian Crane

Wellington School of Medicine and Health Science, University of Otago, New Zealand

There is evidence that the prevalence of asthma, hay fever and eczema have been increasing over the last 30-40 years. This has been most evident in economically developed countries but rising prevalence has also been shown in less economically developed countries as well. However, it is important to recognise that while much of the increase in asthma prevalence is most likely related to changing definitions of wheezing illness, a real increase in sensitivity to common environmental allergens has probably occurred and this would in turn increase the prevalence of these diseases.

The origins of the hygiene hypothesis date back almost 30 years to a small study published in 1976, amongst the Metis Indian community in Saskatchewan. In this community, viral, bacterial and helminth infections were common, while allergic disease was rare, compared to non-Metis children living in Saskatchewan. In 1989, this idea was rediscovered following evidence from two cohort studies showing that the prevalence of hayfever was inversely related to the number of older siblings. It was proposed and that this effect was associated with protection from atopy by increasing exposure to viral infections amongst later born children. Similar effects have been observed in children attending early day care who develop more upper respiratory tract infections in early childhood but are subsequently protected from developing atopy in later childhood.

The hygiene hypothesis has led to many studies exploring the relationships between hygiene and allergic disease. These will be discussed, including the protective effect of specific infections and the use of antibiotics particularly in the first year of life, which have been associated in some studies with an increased risk of subsequent atopy and allergic disease. This is a controversial area and to date studies of antibiotics have been inconsistent.

One of the most interesting aspects of the hygiene hypothesis has been studies of children raised on farms. This has been particularly well documented in rural central Europe, particularly small family farms in Austria, Bavaria and Switzerland. Regular exposure to farm animals or the regular ingestion of unpasteurised milk in the first year of life is associated with significant protection from allergy and allergic disease by age 10-11 years. These authors have taken this idea further and shown that the protective effect is associated with higher domestic levels of endotoxin in the home environment. Genotyping these children for the toll like receptor genes has further suggested that particular polymorphisms in genes encoding these receptors are largely responsible for the protective effect of endotoxin.

The hygiene hypothesis provides a coherent framework for linking the immunology and epidemiology of allergic disease. To date there are many pieces of evidence that broadly support the hypothesis but there remain many unanswered questions about details and mechanisms. These are well worth pursuing as a detailed understanding might lead to interventions that would reduce the acquisition of atopy and the development of allergic disease.