

Are we too clean? Reframing the hygiene hypothesis and its implications for allergies, infectious diseases and our lifestyles

On 11th February 2016, the Royal Society for Public Health, in collaboration with the International Scientific Forum on Home Hygiene (IFH), hosted a conference at Portland Place, London. The first aim was to review the issues of allergies and infectious diseases in the light of the recent explosion of data on the human microbiome and its role in our health. The second was to evaluate strategies which might be adopted to tackle these issues – most particularly how to refute the persistent idea that ‘being too clean’ is a root cause of the rise in allergies, a concept which is undermining our attitudes to hygiene and its importance in controlling infectious disease.

The first session provided an update on the burden of infectious and allergic diseases. Dr Paul Turner (Imperial College London) discussed how, although there has been a marked increase in the prevalence of allergic diseases such as eczema, allergic rhinitis and food allergy, increased rates of these diseases have actually occurred at different times in the past 120 years, suggesting multiple rather than a single underlying cause. Dr Rosalind Stanwell-Smith (London School of Hygiene & Tropical Medicine) examined the various issues which taken together show why hygiene is so important, even in the 21st century. She showed how concerns are driven partly by increasing numbers of vulnerable groups at increased risk of infection living in the community and also the increasing amount of health care being delivered in out-of-hospital settings. She also showed how agencies worldwide, developing strategies for dealing with emerging infections such as influenza, severe acute respiratory syndrome (SARS) and Ebola, recognise hygiene as a first line of defence during the early critical period before mass measures such as vaccination become available. Hygiene is also now seen as a key strategy for tackling antibiotic resistance by reducing need for antibiotic prescribing and preventing spread of resistant strains.

The second session examined the relationship between microbial exposure and development of allergic diseases. Professor Graham Rook (University College London) showed how the original hygiene hypothesis concept that lower incidence of childhood infections could be an explanation for the 20th century rise in allergic diseases has now been replaced by the ‘Old Friends Mechanism’. It now seems that vital microbial exposures are not pathogenic microbes that cause infections, but the mostly non-harmful species we acquire from our natural environment and from the humans and animals we live with. If inputs are inappropriate, immune regulatory mechanisms can fail, such that the immune system attacks not only harmful organisms but also innocuous targets such as pollen and food allergens, resulting in allergic diseases. Professor Rook and Professor Sally Bloomfield (London School of Hygiene and Tropical Medicine) outlined our growing understanding of how changes in lifestyle and environmental exposure along with urbanisation, altered diet and excessive antibiotic use have had profound effects on the nature and diversity of the human microbiome. They also reviewed the epidemiological evidence which suggests that these changes may be linked to the rise in allergic diseases. Professor Rook showed how studies using human and animal models are now shaping our understanding of the biological mechanisms involved. A particular issue which Professor Bloomfield addressed is the still prevalent idea that ‘being too clean in our own homes’ is a root cause of the rise in allergies. She argued that if this factor contributes, its role is likely to be small.

The third session was devoted to tackling the paradoxical issue of how to reduce the risks of allergies and, at the same time also, the risks of infectious diseases, since microbial exposure is fundamental to both. In his ‘optimistic perspective on reversing the trends in allergy and other inflammatory disorders’, Professor Fergus Shanahan (University of Cork, Ireland) stressed the importance of early life when the immune system is developing and the need to develop strategies to ensure that neonates begin life with a robust and diverse microbiota. He showed how microbiome science provides glimpses of how the human microbiome might be preserved or restored, but cautioned that because of the multiple factors involved, this may require a personalised approach tailored to individual genetics and lifestyles.

In the final presentation, Professor Elizabeth Scott (Simmons College, Boston, USA) explained how maximising protection from infection while also maximising exposure to Old Friends microbes requires much smarter approaches to hygiene than the ‘scrupulous cleanliness’ approach advocated by Florence Nightingale. Professor Scott outlined the principles of the approach known as targeted hygiene which has been developed for hygiene in home and everyday life settings. This approach is based on understanding the key routes by which harmful organisms are transmitted around the home and other environments and focusing on effective hygiene interventions in the places and at the times that matter.

The final session was a general discussion. A key issue which emerged from this discussion was that if we want to tackle these issues, we first need to change public perceptions, public understanding and public behaviour. The overriding view of conference participants was that the original hygiene hypothesis needs to be not just reframed, but abandoned. The conference presenters have since prepared a review summarising the evidence base supporting these views, which is published in this issue.