Environmental Science in Allergy and Asthma

Authors:	Theo Wolf, Senior Editorial Assistant
Citation:	EMJ Allergy Immunol. 2022;7[1]:18-20. DOI/10.33590/emjallergyimmunol/10091307. https://doi.org/10.33590/emjallergyimmunol/10091307.

Environmental science in allergy and asthma was a topic discussed at this year's European Academy of Allergy and Clinical Immunology (EAACI) Hybrid Congress 2022, taking place between 1st–3rd July. Of particular clinical relevance was the presentation on climate change, air quality, and health, as well as the presentation on the recent EAACI guidelines addressing the impact of the environment on allergic diseases and asthma from inception to severity.

IMPACT OF CLIMATE CHANGE AND AIR POLLUTION ON HUMAN HEALTH

Stephen Holgate, Medical Research Council (MRC) Clinical Professor of Immunopharmacology, University of Southampton, UK, discussed the importance of climate change on the rising incidence of allergy and allergic diseases, and also the direct effect of air pollution on asthma and other noncommunicable diseases.

Regarding allergy, Holgate began by summarising the findings of a 2021 study that analysed annual pollen integrals and the pollen season start date across 60 sites in North America between 1990 and 2018. During this timeframe, an increase in the total amount of pollen released, as well as earlier start dates, were observed across the majority of the continent. He emphasised that this becomes even more apparent when climate change models are fitted to the data in predictive modelling. Specifically, increases in atmospheric CO_2 are expected to have a dramatic effect on pollen production. "It is the CO_2 going up that's making a difference, but CO_2 isn't of course the only climate change emission we are concerned about," said Holgate. Overall, projections indicate that ragweed pollen allergy will become a common health problem across much of Europe. In addition, sensitisation to ragweed is expected to more than double from 33 million to 77 million people by 2041–2060.

Holgate then spoke about a 2017 study that explored the relationship between air pollution and mortality among beneficiaries of Medicare, the government national health insurance programme in the USA. In the entire Medicare population, there was significant evidence of adverse effects related to exposure to fine particulate matter less than 2.5 µm in diameter ($PM_{2.5}$) and ozone at concentrations below current national standards. "There are no safe levels of any of these pollutants on human health," explained Holgate. Interestingly, the effect was most pronounced in people from racial minorities and those with low income. Based on these and similar findings, the World Health Organization (WHO) in 2021 implemented new air quality guidance limit values for $PM_{2.5}$ and nitrogen dioxide (NO_2). "They've come

to dramatic reductions, halving the $PM_{2.5}$ limit value and dividing by four the NO_2 value," said Holgate. In the UK, even achieving the previous 2005 air quality limits for $PM_{2.5}$ would have substantial benefits for human mortality and morbidity. Further, achieving an annual average $PM_{2.5}$ concentration of 10 µg/m³ (WHO-10) across the UK by 2030 would result in approximately 20 fewer infant deaths per year, 3,100 fewer new cases of coronary heart disease per year, and 8–9 weeks longer life expectancy.

Holgate summarised by underlining the importance of health professionals in promulgating and encouraging societies to clean up the air, improve climate statistics, and enhance environmental conditions and quality of life.

EAACI GUIDELINES ON ENVIRONMENTAL SCIENCE FOR ALLERGY AND ASTHMA

Ioana Agache, Transylvania University of Brașov, Romania, started by listing the five working groups involved in the development of the guidelines and explaining the role of each. An atmospheric science working group explored the cost of illness for pollen-induced asthma; whether information on pollen could improve and forecast allergic rhinitis and allergic asthma outcomes; the relationship between extreme temperature events and asthma exacerbations; and the effect of heavy traffic and smoking on asthma. An ecology working group looked at whether exposure to microplastics and pesticides impacts asthma; whether exposure to dishwasher detergents increases the risk of food allergies and eosinophilic oesophagitis; whether greenness in urban environments can prevent the development of allergic diseases and asthma; and whether living on traditional farms, parasite infestation, and viral infection impact the development of allergic diseases and asthma. A human–environment interaction and social science working group investigated whether regiotypes exist in nasal polyposis, pollen allergy, and atopic dermatitis; whether migration, lifestyle and residence, and modern living impact the development and incidence of allergic diseases; and the effects of breastfeeding, food additives, and emulsifiers on the incidence of allergic diseases. A regulatory group addressed the

economic and political dimensions of the recommendations and the possibility of an integrated surveillance network. The fifth working group focused on deployment of artificial intelligence and machine learning to develop a c ausality model.

Concentrating on pollen exposure and asthma-related outcomes, Agache highlighted that severe asthma exacerbations were divided into lag 0, lag 1 to 3, and lag over 3. The certainty of evidence was highest (moderate level of evidence) for severe asthma exacerbations within the first 1–3 days of exposure. Because of the moderate-quality evidence, reducing or avoiding exposure to pollen should be recommended to reduce the risk of severe asthma exacerbations. Specifically, FFP2 masks may be used to reduce the risk of pollen-induced asthma exacerbations. From a public health perspective, emergency departments and other asthma-related services should be strengthened during the grass, ragweed, and birch pollen seasons, and also in thunderstorm asthma. Finally, Agache noted that dispersion models might be recommended for a better prediction of exposure risk.

Interestingly, the level of evidence for other asthma-related outcomes was either very low or low. "We have better recommendations for severe exacerbations than we do for moderate exacerbations, asthma control, and lung function," noted Agache.

Agache concluded her presentation by considering how to intervene. Pollutant information should be incorporated in pollen information systems, pollen concentration might be recommended as a reliable proxy of pollen exposure, a real-time pollen count might be recommended for managing pollen-induced asthma, and pollen monitoring networks may be recommended for providing exposure data at the population level. Agache also stated that accurate and consistent pollen counting should be recommended.

"Of particular clinical relevance was the presentation on climate change, air quality, and health as well as the presentation on the recent EAACI guidelines addressing the impact of the environment on allergic diseases and asthma from inception to severity."

CONCLUSION

The environment can support health through key pillars of resilience, namely the diet, microbiome, and epithelial barrier. Enhancing environmental health through the incorporation of clean air as a priority within climate action could help combat allergic diseases and asthma, which are environment-driven entities with life-long impacts. Going forward, the development of high-quality, evidence-based guidelines and the implementation of One Health and Planetary Health policies should be prioritised.