Biodiversity loss and climate change are now being associated with various adverse health effects. Biodiversity loss is a global concern with a variety of possible adverse consequences for humanity. The reasons for this loss are complex and are in large part due to the consequence of industrialization, pollution and utilization of chemicals, which impact the environment and the microorganisms with which humans have lived since time immemorial. Indeed, the two global megatrends, one in the state of biodiversity and the other in the prevalence of mucosal inflammatory diseases, may be more closely linked than is commonly recognized.

Environmental Factors: Irrespective of major efforts to clarify the genetic causes, which predispose to the onset of asthma and allergic diseases, the results remain rather modest, underscoring the genetic complexity of these multi-trait diseases. Increased attention is now focused on critical environmental factors in the search for the origins of these diseases. Studies of immigrants, epigenetic studies and mapping of the gut microbiota have provided compelling evidence that the environment can fundamentally modulate immune function in humans. Poorly developed or broken immune tolerance plays a role in the pathogenesis of many diseases such as allergy and asthma, autoimmunity, cancer and chronic infections.

Living in urban environments with higher exposure to chemicals and with reduced green has been linked with immune dysfunction and impaired tolerance in humans. Reduced contact with nature and environmental microbiota appears to be associated with a range of civilization diseases, including allergy and type 1 diabetes. Of considerable concern is that these chronic inflammatory diseases are becoming increasingly prevalent in low and middle-income countries in parallel to their improving economic development and adoption of western-type urbanization. It is possible that a more biodiverse exposure confers more protection, not only against infectious diseases, but also against chronic inflammatory diseases.

Microbiota: Dysbiosis, the reduced diversity and disturbed composition of the gut microbial community, not only has an influence on the occurrence of asthma and allergies, but also on other chronic and relapsing inflammatory conditions. Studies in both mice and humans indicate that some common members of the normal microbiota could exert a special role in maintaining homeostasis and immune health. A decrease or absence of these microbes in the colon has been shown to lead to impaired development of regulatory T lymphocytes (Treg cells), the T cell subset that mediates suppression of T-cell mediated inflammatory responses. Moreover, an imbalance of ‘pro-inflammatory’ and ‘anti-inflammatory’ microbes may also result in an increased susceptibility of the host to inflammatory diseases and could explain the increase in pediatric inflammatory bowel disease, reported with increasing frequency in westernized countries.

Air pollution: Indoor and outdoor pollution is a major environmental risk factor for asthma and allergy not only increasing the prevalence of long-term symptoms but also acute attacks. The association studies indicate that ambient air pollution is connected to asthma, rhinitis, rhinoconjunctivitis, acute respiratory infections and hospital admissions because of respiratory symptoms. Indoor tobacco smoke is the most obvious risk factor. In Turkey a tobacco ban initiated in 2009 resulted in a 24% decrease in respiratory emergency visits in Istanbul in one year. The main ambient air pollutants are derived from fuel combustion (traffic and various industrial sources like power plants and refineries). Fine particulate matter, nitrogen and sulphur compounds (NOx, SOx) are the most important pollutants emitted directly to the atmosphere. Ozone (O3) is produced by the reaction of sunlight with air containing hydrocarbons and NOx. In China, ambient air pollution is associated with 300,000 deaths and 20 million cases of respiratory illnesses annually.

Climate change: The prevalence of asthma and allergic rhinitis has markedly increased globally since the 1960s. Climate change has direct impacts on aeroallergens, in particular pollens and mold spores and allergic diseases. Pre-Industrial CO2 levels in 1870 were 280 ppm, followed by a steady increase of 35% by 2005 to 379 ppm, with urban areas exhibiting the highest levels. Several studies have demonstrated direct correlations between rising CO2 and increases in both pollen and biomass levels, as well as increased allergenicity of the pollen. Lewis Ziska, at Duke, tested the hypothesis that ragweed pollen levels were impacted by pre-industrial revolution CO2 level (280 ppm), current CO2 levels (370 ppm) and CO2 levels (600 ppm), projected level for the year 2100. All variables remained constant, with the exception of rising CO2 levels. There was a 132% increase in ragweed pollen from pre-industrial to current and an additional 90% increase in pollen level at projected 2100 levels. In the greater Baltimore area between 2000 and 2001, Ziska demonstrated that the urban levels of
CO2 were 30% higher and temperature 2 degrees Celsius higher than surrounding rural areas. In the urban area, the ragweed plants produced 189% more pollen, compared with the surrounding rural area. A fundamental aspect of climate change is the potential shift in flowering phenology and pollen initiation associated with milder winters and warmer seasonal air temperature. Earlier pollination, in turn, may have a role in allergic rhinitis and asthma by increasing the time of exposure.


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