



Editorial

Pollution in living and working environments, climate variability, and their impact on non-communicable disease burden



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Ambient air pollution consists of emissions of complex pollutant mixtures from industries, households, construction activities, and air, water, and land transport. Because of their wide distribution throughout the economy and environment, many industrial chemicals enter the earth's ecosystems and come in contact with people, already in utero and over lifetime. Exposure occurs at the workplace and at home, through the use of products, and via air, water, food, and waste streams. The current special issue provides perspectives of ongoing studies that focus on such exposures and their adverse health effects and shows methods to overcome existing shortcomings in addressing the related burden of non-communicable diseases (NCDs).

Specifically, Torres et al. showed effects of air pollutant emissions, ambient air concentrations and health indicators of the period 2009 to 2015 in 3 different regions of Portugal (Torres et al., 2018). In Estonia, Idavain et al. observed that children living near oil shale industries in the Ida-Viru County had significantly greater prevalence of respiratory symptoms than children living in the reference area in the Tartu County (Idavain et al., 2019). A study performed in Belgium analyzed individual exposure to three traffic-related air pollutants, black carbon, polycyclic aromatic hydrocarbons (PAHs) and benzene, and their relationships with respiratory and oxidative stress (Guilbert et al., 2019). The impact of organophosphate pesticides exposure via residential and workplace proximity to commercial applications is addressed in a study by Kimberly et al. who found that chronic low-level organophosphate pesticides exposure is associated with differential DNA methylation in blood and saliva, both in elderly population and parkinson's disease patients (Paul et al., 2018). Petrovic et al. analyzed health risk assessment of

PAHs, PCBs and OCPs in the ambient air of a municipal solid waste landfill in Novi Sad, Serbia, hereby focusing on the gaseous phase of ambient air only (Petrovic et al., 2018). This study will be continued, since many of the carcinogenic and suspected carcinogenic substances are known to be predominantly absorbed to the particle phase of the air medium. Baur et al. confirmed that particulates play also an important role in the transport of environmental contaminants attached to dust particles, which contain varying multitudes of different inorganic components like heavy metals (Baur et al., 2019).

Not only air pollution but also water and soil pollution may have toxic effects and can increase the burden of non-communicable diseases. Heavy metals like Al, Mn, Fe, Co, Ni, Cu, Zn, As, Sb, Cd, with cytotoxic activity (CBM assay) were detected in rainwater samples (Vlastos et al., 2019). Scheepers et al. found intrusion of chlorinated hydrocarbons and their degradation products from contaminated soil in a former dry-cleaning shop in a building currently used as bookshop (Scheepers et al., 2019).

Special vulnerable groups are the children and the elderly. During 2016 pollution was found responsible for 940,000 deaths of children worldwide, two-thirds of them under the age of 5 (Landrigan et al., 2019). Pollution exposures in early life also increase lifelong risk for multiple NCDs, including chronic obstructive pulmonary disease, cardiovascular disease, stroke and cancer. In many areas of the world mercury contamination still poses serious threats to children's health (Budnik and Casteleyn, 2019). Para-occupational exposures to metallic mercury, including exposures to 1–2 million children, are extensive in artisanal gold mining.

Climate change is a growing concern at many levels. Kouis et al. showed that there is a significant association between cardiovascular and respiratory mortality risk and increased temperatures in Thessaloniki, Greece (Kouis et al., 2019). A direct heat effect was found, as the mortality risk increased sharply above the temperature threshold of 33 °C, providing evidence of the link between ambient air temperature and adverse health effects. Grinn-Gofron et al. showed that varied temperature and vapor pressure impact airborne fungal spores of *Alternaria* and *Cladosporium*, highlighting the role of meteorological factors in forming fungal spore concentrations (Grinn-Gofron et al., 2019). The authors created accurate and operational daily-scale predictive models of bioaerosol abundances, allowing more efficient management of phytopathogenic and of human allergic diseases.

In conclusion, although environmental pollution encompassing a number of hazardous exposures through air, water, and soil is increasing and chemical exposures and related non-communicable diseases are on the rise worldwide, often no data on the exposure levels of individual hazardous agents and their combinations exist. In addition, various factors, such as the meteorological parameters, influence the impact

of many chemicals entering the earth's ecosystems, adding further uncertainty in the tasks performed by policy-makers worldwide. This uncertainty is expected to rise in view of the predicted climate change, highlighting the importance of studying exposure, mitigation and vulnerability to air pollutants in a changing climate.

Competing interest/conflict of interest

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