LUXEMBOURG INSTITUTE OF HEALTH

PRESS RELEASE

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The weight of pollution: exposure linked to obesity

Chronic exposure to environmental pollutants found to increase risk of cardiovascular disease

In an era where exposure to commonly used pollutants present in our environment, in our homes and in our food, is virtually inevitable, ground-breaking research conducted by Professor Brice Appenzeller of the Luxembourg Institute of Health has unveiled a profoundly surprising health outcome of such exposure: a notable increase in the rates of obesity, diabetes, and dyslipidemia. This pioneering study, spanning across Luxembourg and Belgium, brings a concrete health risk into focus.

Cardiovascular diseases (CVDs) constitute the leading cause of mortality, resulting in a third of global deaths in 2019. Both behavioural and clinical risk factors have been established for CVD development, with the latter thought to be linked to exposure to environmental pollutants, such as polychlorinated biphenyls (PCBs) and some pesticides.

PCBs are a group of synthetic chemicals that have been used in various industrial and commercial applications such as transformers, electrical capacitors and paints. A wide range of pesticides are used in food production and preservation, as well as in the residential and commercial settings, with the estimated global consumption reaching about 3 million tonnes per year. Consequently, the general population is chronically exposed to low-level pesticides through food, water, and air. Although the biological mechanisms underlying the effects of pesticide exposure are not entirely elucidated yet, experimental and epidemiological studies suggest a potential link between pesticide exposure and weight gain, obesity, insulin resistance, glucose intolerance, hypertension, metabolic disorders and/or cardiotoxicity.

In a first-of-its-kind study, Prof Brice Appenzeller, group leader of the Human Biomonitoring Research Unit at the Luxembourg Institute of Health, used data from the NESCAV (Nutrition, Environment and Cardiovascular Health) survey to investigate the possible relationship between obesity, diabetes, hypertension and dyslipidaemia and PCB and pesticide exposure. NESCAV, a cross-sectional, population-based study which aimed to examine the relationship between exposure to environmental pollution and cardiovascular risk, covered two neighbouring regions: Wallonia in Belgium and the Grand-Duchy of Luxembourg. It was conducted during 2007–2013 and recruited 3006 resident adults aged 18–69 years old. Data was collected through a self-administered questionnaire, clinical and anthropometric measurements, and blood, urine and hair sampling.

"*Our study found associations between the prevalence of CVD risk factors and chronic environmental exposure to PCBs and pesticides among the Belgian and Luxembourgish adult populations*," reveals Dr Feng-Jiao Peng of the Human Biomonitoring Research Unit, lead author of the publication. "*The most striking was the correlation with obesity, which was associated with both persistent and non-persistent pesticide exposure in Luxembourg and Belgian residents.*"

Other CVD risk factors that were influenced by pollutant exposure were diabetes, which was related to γ-HCH, PCP, PNP, fipronil, fipronil sulfone and oxadiazon, and was found to affect men at much lower exposures than women in Luxembourg; hypertension, which was associated with chlorpyrifos,

fipronil, oxadiazon and diflufenican; and dyslipidemia, which was related to chlorpyrifos, Cl2CA, trifluralin and diflufenican. Interestingly, dyslipidemia, or the imbalance of fats in the body, was very common in all groups of participants, with the prevalence ranging from 62.6% in Belgian women to 77.7% in Luxembourgish men. As with obesity, diabetes and hypertension, the study found associations between dyslipidemia and pollutants in all groups of participants.

"*Our results add to the existing evidence that organochlorine pesticide exposure may contribute to the development of CVDs*," concludes Prof Appenzeller. "*Ours was the first study to utilize hair samples to investigate CVD risk factors in relation to pollutant exposure. We were able to find an unprecedented association between CVD risk factors and chronic environmental exposure to currently used pesticides, which are still found in most countries. Their associations with CVD risk factors, and how they come to affect CVD risk factors, are topics that need to be investigated further to protect the welfare of citizens worldwide*."

The study was recently published in the Journal of Hazardous Materials under the full title: "Association of hair polychlorinated biphenyls and multiclass pesticides with obesity, diabetes, hypertension and dyslipidemia in NESCAV study." https://doi.org/10.1016/j.jhazmat.2023.132637

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About the Luxembourg Institute of Health (LIH)

The Luxembourg Institute of Health (LIH) is a public biomedical research organization focused on precision health and invested in becoming a leading reference in Europe for the translation of scientific excellence into meaningful benefits for patients.

LIH places the patient at the heart of all its activities, driven by a collective obligation towards society to use knowledge and technology arising from research on patient derived data to have a direct impact on people's health. Its dedicated teams of multidisciplinary researchers strive for excellence, generating relevant knowledge linked to immune related diseases and cancer.

The institute embraces collaborations, disruptive technology and process innovation as unique opportunities to improve the application of diagnostics and therapeutics with the long-term goal of preventing disease.

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