The AXA Research Fund Announces 10 New Fellows in the Field of Harmful Substances

The AXA Research Fund has earmarked €1.25 million to advance research and inform public and private decision-making around the health and environmental impacts of contaminants.

Harmful chemicals pose a threat to public health and the economy. The health costs of exposure to endocrine-disrupting chemicals are estimated at 163 billion euros per year in Europe alone,[1] while human exposure to preventable environmental chemicals represents 10% of global GDP in health costs.[2] Contact with certain chemicals can cause irreversible health conditions such as hormonal cancer, metabolism disorders like obesity and diabetes, or behavioral. In addition to direct health costs, the long-term exposure to harmful substances affects the economy through reduced labor productivity; for instance, in 2060, lost working days due to air pollution are projected to be around 3.75 billion days at the global level.[3] Furthermore, insufficient information on the effects of various contaminants limits policymakers' capacity to enact adequate regulations in this area. To address these issues, scientific research on the sources and mechanisms of hazardous substances exposure, as well as their health consequences, is critical.

The AXA Research Fund Fellowship on harmful substances aims to build a solid multidisciplinary toxicological understanding of contaminants' effects on human health and the environment, with a goal to inform industrial and risk management strategies and to enable public policy design in this area. The Fund is delighted to present the ten new Fellows whose projects shall address the issue of contaminants in textiles, renewable energy, and agrochemicals, and explore the effects of microplastics, and mercury emissions.

"The Harmful Substances Fellowship grant supports the AXA Research Fund's mission to accelerate top-tier research around risk. Identifying emerging contaminants and assessing their impacts will help develop appropriate corporate and public strategies to protect public health and the environment," says **Marie Bogataj, Head of the AXA Research Fund and Group Foresight.**

The new Fellows join an AXA-supported scientific community of almost 700 researchers working to improve the understanding and management of major societal risks.

About the AXA Research Fund

[1] Endocrine Disruptors: From Scientific Evidence to Human Health Protection. European Parliament Think Tank, 2019

[2] Grandjean, P., Bellanger, M. Calculation of the disease burden associated with environmental chemical exposures: application of toxicological information in health economic estimation. Environ Health 16, 123 (2017).

[3] OECD. POLICY HIGHLIGHTS The economic consequences of outdoor air pollution. April 2016

Since its launch in 2008, AXA's scientific philanthropy initiative has committed €250M to support transformative academic research on major global risks. The Fund also helps scientists disseminate their findings to inform decision-making and contribute to societal progress. To learn more, click here.

Discover the 10 projects:

1. **Bridging science and policy to mitigate the impact of climate change-induced mercury emissions**

Dr Hélène Angot, Grenoble – INP

The 2017 Minamata Convention aims to reduce global mercury pollution by requiring its current 137 parties to control man-made mercury releases. However, the Convention's effectiveness could be undermined by the Arctic warming that accelerates the release of mercury stored in its permafrost. Dr Hélène Angot at Grenoble-INP intends to quantify the amount and timing of permafrost mercury remobilization under different warming scenarios by developing a new modelling tool. She will also design a key global metric that accounts for climate change mercury feedback. Moreover, the findings will provide policymakers with information to optimize public health policies to limit long-term mercury exposure and inform climate change adaptation strategy.

2. **Investigating the impact of glyphosate on health: the role of gut microbiota**

Dr Lauris Evariste, National Institute for Agricultural Research (INRAe)

Despite its widespread use in agriculture and farming, glyphosate is undoubtedly the most controversial herbicide, with toxicological properties potentially altering the health of non-targeted organisms. Exposure to contaminants may cause the loss of beneficial bacteria from the intestinal microbiota, resulting in a physiological imbalance and the development of long-term metabolic diseases. Dr Lauris Evariste's research aims to investigate the impact of chronic glyphosate exposure on the mouse and human gut microbiota, as well as the consequences for the host's metabolic health. The findings of studies aim to inform public health policymaking and possibly pending political decisions regarding glyphosate.

3. **Using new data sources to better manage substances of concern (SoC)**

Dr Oona Freudenthal, Luxembourg Institute of Science and Technology – Environment Research and Innovation

The EU has set up regulatory measures to control the presence of substances of concern (SoC) in the environment, but little is known about their overall impact on human health and the planet. Dr. Oona Freudenthal seeks to demonstrate how policy-derived databases could be useful for the identification of SoC's use while determining their sources of emission. Her research project aims to help authorities and policymakers draft appropriate regulatory frameworks for these substances and thereby better manage their risks. The outcomes of this project will allow for a more accurate understanding of the risks posed by SoC.

4. **Assessing the impacts of endocrine-disrupting chemicals (EDCs) on human health using cutting-edge methods**

Dr Luke Govers, University of Melbourne – School of BioSciences

Endocrine-disrupting chemicals (EDCs) are found everywhere in our daily lives. EDC exposure during pregnancy can significantly impact the developing fetus, resulting in differences in sexual development (DSD) or abnormal development of sexual anatomy. These DSDs include decreased male fertility and hypospadias, a penis malformation. Dr. Luke Govers hopes to develop more automated methods for rapidly assessing chemical impacts and accurately predicting EDC toxicity for human health and the environment. The research findings will inform public health policy for better regulation of EDC use and exposure levels, ultimately contributing to reducing population health risks.

5. **Understanding human exposure to contaminants of emerging concern through new biomarkers**

Dr Chang He, University of Queensland – Queensland Alliance for Environmental Health Sciences

Every year, ten million new substances are developed and introduced to the market, exposing humans to an ever-expanding range of chemicals with unknown long-term impacts on human health. Existing human biomonitoring (HBM) programs, which allow the assessment of human exposure to chemicals, can only evaluate a tiny fraction of the chemicals in use due to a lack of biomarkers and assessment methods for the majority of chemicals. Dr. Chang He seeks to address the gap in HBM programs by developing a systematic method for evaluating human exposure to hazardous pollutants, allowing for a more comprehensive risk assessment for emerging chemicals.

6. **Better controlling airborne microplastic exposure in plastic material recycling facilities**

Dr Joseph Levermore, Imperial College London – School of Public Health

Workers in the plastic-specific Material Recycling Facilities (pMRFs) in the United Kingdom are at high risk of exposure to them to airborne microplastic in addition to bioaerosols and hazardous volatile organic compounds. Dr Joseph Levermore at the Imperial College London aims to investigate the health impact of occupational exposure to airborne microplastics resulting from different activities along the recycling chain by identifying biomarkers for airborne micro-and nano-plastic exposure in the workers' biological samples. The findings will inform the development of appropriate practices and legislation to reduce health impacts in this expanding waste-management sector on a national and international scale.

7. **Overcoming the ecotoxicological impact of perovskite photovoltaic technologies**

Dr Meng Li, Queen Mary University of London - Faculty of Science and Engineering

Solutions-processed perovskite solar cells are one of the most promising next-generation photovoltaic technologies. They are instrumental in developing energy solutions for spacecraft and satellites constructing power plants and manufacturing sensor power. Critical concerns remain over their potentially high ecotoxicological impact due to lead contamination. Dr. Meng Li seeks to study the link between perovskite semiconductors' materials structure and their ecotoxicity. The knowledge will be valuable for creating novel perovskite semiconductors with lower lead leaching rates but optoelectronic properties. The project's outcomes could potentially revolutionize the EU and UK solar energy sectors and help achieve carbon neutrality.

8. **Harmless and eco-friendly solution as an alternative to replace synthetic agrochemicals**

Dr Johan Rodriguez-Melo, Instituto de Agrobiotecnología del Litoral – National University of Litoral

Agrochemicals were introduced to protect crops from pests and enhance crop yields. However, they are increasingly perceived as a hazard to both producers and consumers, exposing them to cancer risks and nervous system damage. At the environmental level, they are likely to trigger land degradation, declining crop yield, air pollution, and resistance in fungal species to fungicides among many other negative impacts. During his AXA Fellowship at the National University of Litoral, Dr. Johan Rodríguez Melo intends to develop a new organic and harmless approach to replace synthetic agrochemicals, through the combination of nanoparticles with double stranded-RNA methods.

9. **Better identifying and mitigating microplastics' threats to preserve ecosystems and protect human health**

Dr Saija Saarni, University of Turku, Department of Geography and Geology

High concentrations of microplastics have the capacity to weaken ecosystems' functionality, harm human health, and disrupt a variety of businesses including fishing, farming, and water production which constitute vital sources of revenue for different communities. However, very little is known regarding microplastic concentrations' harmful levels. During her AXA Fellowship at the University of Turku, Dr. Saija Saarni intends to reduce the knowledge gap on microplastics' toxicity and harmfulness. She aims at providing evidence-based estimations geared toward identifying the chemical reactions arising from microplastics and natural sediments' interactions to assess future risks and environmental impacts.

10. **The unnatural 'natural': assessing the transport and chemical pollution risk of natural textile fibres**

Dr Thomas Stanton, Loughborough University

Despite undergoing extensive chemical modification, natural fibres (e.g. cotton and wool) are promoted as an environmentally-friendly substitute for plastic analogues (e.g. polyester and nylon) in the textile industry. Additionally, natural fibres have also been found to persist in aquatic environments for decades to centuries. Dr Thomas Stanton at Loughborough University aims to assess the harmful chemical leaching associated with natural textile fibre pollution, the fibres' interaction with common chemical pollutants in the environment, and their movement throughout the freshwater environment. The findings will help the textile industry make informed decisions to reduce the environmental impact of their products.