What role do nanomaterials play in the evolving world of contaminants of emerging concern?

A. T. Reis[1,2,3*], F. Rosário[4], S. Fraga[1,2,3], C. Costa[1,2,3], & J. P. Teixeira[1,2,3]

[1] EPIUnit, Institute of Public Health, University of Porto, Porto, Portugal
[2] Laboratory for Integrative and Translational Research in Population Health (ITR), Porto, Portugal
[3] Environmental Health Department, National Institute of Health, Porto, Portugal
[4] CESAM—Centre for Environmental and Marine Studies & Department of Biology, University of Aveiro, Aveiro, Portugal
* ana.reis@insa.min-saude.pt

The role of nanomaterials in the evolving world of contaminants of emerging concern (CECs) is a complex and dynamic area of study. As researchers delve deeper into this field, they aim to unravel the intricate balance between nanomaterials' potential risks and benefits. These particles possess unique properties that make them valuable in a wide range of applications, from medical treatments and environmental remediation to consumer products and industrial processes. However, the very properties that make nanomaterials advantageous also raise significant concerns about their potential toxicity. Studies have shown that nanomaterials can interact with biological systems, leading to cellular uptake, oxidative stress, and genotoxicity.

Moreover, toxicity resulting from the co-exposure of nanomaterials with other contaminants, such as potentially toxic elements (PTEs) or organic chemicals, adds another layer of complexity to this issue. Research has demonstrated the intricate dynamics of co-exposure, and both synergistic and antagonistic effects have been observed, complicating risk assessments and necessitating a more comprehensive approach to studying environmental and health impacts.

This presentation will discuss the toxicological implications of nanomaterials as CECs. It will cover mechanisms of toxicity, including cellular uptake, oxidative stress, and genotoxicity, and highlight current research findings on human health effects, regulatory challenges, and the need for standardized testing protocols to manage risks associated with nanomaterials' exposure effectively.

Funding: This work was financed by FCT - Fundação para a Ciência e a Tecnologia in the framework of the project MixIng-Tox, 2022.03491.PTDC (https://doi.org/10.54499/2022.03491.PTDC). A.T. Reis thanks the financial support of FCT through individual Grant SFRH/BPD/122112/2016. The authors also thank FCT/MCTES for the financial support to EPIUnit (UIDB/04750/2020) and ITR (LA/P/0064/2020).