Toenail sampling to assess the exposure to trace elements in epidemiological studies: a difficult task.

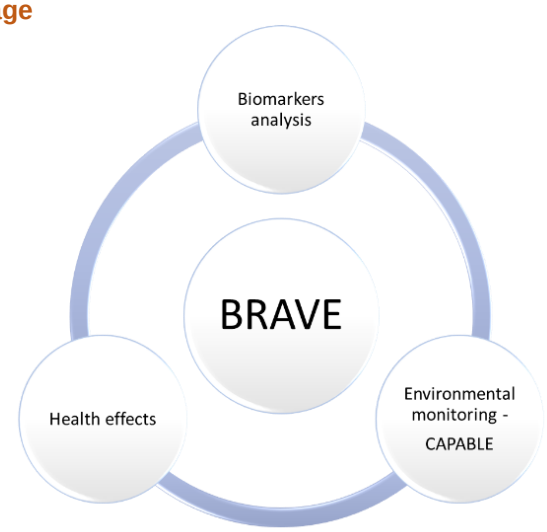
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Abstract

Statement of the Problem: Coronary heart disease, and in particular myocardial infarction, is one of the leading causes of death in Bangladesh. The BRAVE (Bangladesh Risk of Acute Vascular Events) and CAPABLE (Cambridge Programme to Assist Bangladesh in Lifestyle and Environmental risk reduction) studies are large-scale comprehensive assessements aimed at investigating the effects of environmental, genetic, lifestyle and biochemical factors on cardiovascular disease in Bangladesh.[1,2] As part of the BRAVE project, this study aims to identify the association between environmental toxic elements and coronary heart disease, by using toenails as a biomarker of exposure. Exposure to toxic elements is effectively a global public health concern,[3] and a better understanding of their role in relation to Non-Communicable Diseases (NCDs) is needed in order to achieve the Sustainable Development Goals Target 3.4 for reducing NCDs by 2030.[4] Methodology & Theoretical Orientation: Toenail clippings of 4,000 participants recruited by the BRAVE study have been analysed, of which 2,000 cases and 2,000 controls. The cleaning protocol applied in this study includes the use of different solvents in sequence: acetone, milli-Q water and 0.5% Triton X-100 solution, before microwave digestion and ICP-MS estimation of element concentrations. Findings: The obtained data revealed high elemental variabilities among samples. Additionally, intrapersonal variability is significant, with replicates analysis showing little reproducibility for most trace elements analysed in this study. The problem of sample heterogeneity is reiterated by the LA-ICP-MS studies, which revealed differences between the separate layers of the nail structure, highlighting the presence of inclusions in both washed and unwashed specimens. Conclusion & Significance: The analysis of the toenail samples includes a number of procedures that aims at limiting the ambiguity of external contamination: sampling with questionnaire, washing, digestion, ICP-MS analysis, and interpretation with statistical analysis. However, external contamination poses a critical problem, ultimately affecting data interpretation.

Image



Recent Publications

1. Chowdhury R, Alam DS, Fakir II, et al, Cardiology Research Group. The Bangladesh Risk of Acute Vascular Events (BRAVE) Study: objectives and design. Eur J Epidemiol 2015;30:577-87.
2. Capable Bangladesh. Available from: http://www.capable-bangladesh.org/
3. Chowdhury R, van Daalen K. Arsenic: a metal that might break your heart. Circ Cardiovasc Imaging 2019;12:e009185.
4. Chowdhury R, Lawrence R, van Daalen K, Hawkes S, Feldmann J. Reducing NCDs globally: the under-recognised role of environmental risk factors. The Lancet 2018;392:212.

Photograph



Biography

Camilla obtained her BSc (Hons) Chemistry degree from the University of Aberdeen in 2018. She is now pursuing her PhD under the supervision of Prof Feldmann in the TESLA research group at the University of Aberdeen, focusing on the exposure to trace elements in Bangladesh and its monitoring.

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Notes/Comments: