

## Pesticide contamination of produce and medicinal plants in Suriname: An emerging environmental health threat

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**Background:** Pesticides are used widely in Suriname, an upper middle-income country, in large and small-scale agriculture and family gardens. The levels of imported pesticides in 2013 include 73,144.77 kg of insecticides, 447390.80 kg of fungicides and 277,234.00 kg of herbicides. While import is regulated, no policies exist regarding distribution and sale. National monitoring of pesticide residues in produce is absent; however, data from the Netherlands (2011-2013) on imported produce from Suriname show that approximately 20% of samples confirmed pesticide residues above the European Union Maximum Residue Limits. The Caribbean Consortium for Research in Environmental and Occupational Health is designed to address high-priority environmental and occupational health risks in Suriname. Among the consortium's key studies is examining the public health implications of agricultural pesticides use.

**Methods:** The study is being conducted in three phases. Phases 1 and 2 entail the environmental characterization; pesticide residue analysis of mostly consumed crops and medicinal plants cultivated or harvested in Suriname in the 2 main seasons. Phase 1 consists of a preliminary characterization; analysis of the biota collected in the rainy season from the largest fresh market of Suriname, district Paramaribo. In Phase 2 the environmental characterization is expanded with spatial sampling in the dry season and with an additional pesticide test panel. Sampling is conducted at the largest fresh market of district Paramaribo as well as district Wanica; the 2 most densely populated districts. Additionally, the most popular produce item Tannia is sampled at 3 other fresh markets in district Paramaribo. Phase 3 focuses on human health assessment including a comprehensive dietary assessment to conduct a risk factor analysis and biomarker testing to ascertain organ system function impact.

**Findings:** In Phase 1, 32 insecticides (e.g. lambda-cyhalothrin) and 12 fungicides (e.g. carbendazim) were tested on 7 crops (tannia, cabbage, long beans, peppers, rice, sweet potatoes, and banana) and 1 medicinal plant (*Phyllanthus amarus*). Tannia had levels of Endosulfan that exceeds the MRLs of the EU. Endosulfan is an insecticide that is prohibited in Suriname and is being phased out globally. Phase 1 results are only based on collection of crops from 1 fresh market in only 1 season. Also, the Surinamese population consumes not solely locally cultivated crops. However, this study is the first to characterize pesticide contaminated produce and to conduct the future human health assessment.

**Interpretation:** The results indicate that pesticide residue levels may pose a threat to human health. Produce samples are currently being analyzed using an expanded pesticide panel including other organophosphates, herbicides and fungicides. The findings will be available and will be presented at the upcoming conference.

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## Establishing an environmental and occupational health hub for research and training in Eastern Africa: Lessons learned and next steps

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**Program/Project Purpose:** The burden of disease due to environmental and occupational health hazards and from the consequences of global climate change are of growing concern in Eastern Africa. To tackle these challenges, Addis Ababa University in Ethiopia and the University of Southern California, along with regional partners from Kenya, Rwanda and Uganda, conducted planning activities towards establishing a regional hub for training and research with focus on indoor/outdoor air pollution, occupational health, and climate change.

**Structure/Method/Design:** Country-specific situational analysis and needs assessments (SANA) on all three themes and policy frameworks have now been conducted to assess the current status and to identify the most critical evidence and capacity gaps. In this presentation, we outline the steps followed in building a strong partnership within the region and with US partners, by focusing on progress made so far and future plans towards achieving a sustainable regional hub.

**Outcomes & Evaluation:** The SANAs have indicated that, while many policies and regulatory provisions are already in place, environmental tracking is lacking as are implementation of the policies/strategies and enforcement of regulatory measures. Lack of adequate local scientific evidence to inform policy and insufficient skilled personnel to implement any relevant policies are arguably the most critical gaps identified in the SANA. Future success in developing and implementing environmental health policies will depend on addressing the cross-cutting gaps in the different sectors. Most key stakeholders lack adequate trained professionals. Research activities on the health impacts of air pollution exposure, on occupational health and safety, and on climate change are quite limited at present. Consequently, evidence-based decision-making and monitoring and evaluation are hampered. The SANA findings highlight the complexity of the challenges in East Africa and by their multi-sectoral nature. Current lack of mechanisms for coordination and integration reduces the engagement of stakeholders mandated by the respective governments. The need to build training and research capacity, develop clear implementation guidelines, and create effective inter-sectoral coordination mechanisms are some of the most important findings from the SANAs. Moreover, due to the commonality of the most pressing environmental health issues in the region, there is a compelling support for having a regional hub.

**Going Forward:** Several interlinked training and research activities have been initiated to produce crucially needed local evidence on the health effects of environmental hazards, and build sustainable human and infrastructural capacity. The objectives of the hub are highly relevant to the development, enforcement and implementation of policies that are in line with the national and regional priorities. We aim to meet these objectives by systemically engaging the major