

PRESS RELEASE



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SUMMARY

Heat Stress among workers identified as a principal driver of fatal kidney disease

Occupational & Environmental Medicine

La Isla Network (LIN) would like to announce findings from the first paper from the Adelante Initiative (www.adelanteinitiative.org): Workload and cross-harvest kidney injury in a Nicaraguan sugarcane worker cohort to be published in BMJ's November issue of Occupational and Environmental Medicine. This study finds the clearest associations to date regarding the cause of the disease, several tangible insights that should influence work practices, future research, and most importantly provide insight into protecting workers at risk. LIN is composed of a core staff and researchers from the following academic institutions: Gothenburg University, Lund University, Karolinska Institute, Birmingham University (UK), University of Massachusetts Lowell, London School of Hygiene and Tropical Medicine, UNAN-León, and University of El Salvador.

Background

The increase in temperatures over the past decades coincides with high levels of chronic kidney disease among young workers in vulnerable sectors throughout the tropics. This epidemic cannot be explained by traditional risks such as diabetes or hypertension^{1, 2, 3}. The disease has been designated Chronic Kidney Disease of undetermined aetiology (CKDu). Extreme workload generating metabolic heat, in hot environments, is associated with kidney injury in populations at high risk of CKDu³.

In Central America, CKDu is seen in hot lowland regions^{4,5} especially among sugarcane workers^{6, 7}. Apart from sugarcane workers⁸⁻¹⁶, other heat-exposed workers, such as other agricultural workers without access to shade¹⁷, brick-kiln workers¹⁸, miners^{19, 20}, and endurance athletes such as marathon runners²¹⁻²³ also experience kidney injury. Kidney injury due to heat stress is relevant to several strenuous activities but has special significance for those laboring in conditions of poverty.

This study examines the hypothesis that heat-stress experienced by sugarcane workers laboring in hot environments adversely affects kidney function. Presented here is the first year of our three-year research project. It is an evaluation of the current work practices to prevent heat exposure and kidney damage in sugarcane workers at a Central American mill with a leading occupational safety and health program. This study is the independent research component of the Adelante Initiative, which is a multi-stakeholder program with the aim of addressing working conditions in the sugarcane industry, especially those pertaining to heat stress and kidney health. Funding has been provided by the German Investment Corporation (DEG), the German Federal Ministry of Economic Cooperation and Development (BMZ) and Stavros Niarchos Foundation (SNF).

LIN evaluated the efficacy of current work practices (preventive measures implemented by the mill) by investigating the effect of workload on the kidney health of field workers in different job categories with different physical demands in the same climatic conditions: cutters of burned cane (extreme physical workload), seed cutters (high workload), workers who repair irrigation tubes (medium workload), and support staff present in the field (low physical workload). LIN interviewed workers about their work, health and habits, and collected blood and urine samples to measure markers related to kidney function, just before the start of the harvest and again near the end of the harvest.

Findings

Our most important findings:

1. *Over 1 in 10 workers suffered kidney injury:* 12% of the participating workers developed kidney injury during the harvest season.
2. *Those who work hardest have most injury:* The group of workers with the most demanding workload, and therefore highest core temperature, the cutters of burned cane, were nearly 12 times more likely to have a significant decline in kidney function than those with lighter physical demands in the same environmental heat, from the same communities, and often working in the same fields. The only identifiable difference in exposure was workload intensity.
3. *Healthy Worker Effect:* A high proportion (21%) of workers participating before the harvest did not attend the retesting at the end of harvest. When followed up nearly 1/3 reported kidney injury. This means other studies to date have underreported the incidence of disease as they did not follow up drop outs.
4. *Sufficient for lower workloads, not for higher:* Findings suggest that the water, rest and shade programs in place at San Antonio sugar mill where LIN did the study are sufficient for lower workloads as these groups did not have high incidences of kidney damage. However, they are not yet sufficient for higher workloads.
5. *Hyperthermia and Dehydration:* Earlier studies into CKDu conflated the two conditions. While hydration remains important, high core temperatures, in a hydrated body, can still lead to organ damage. Interventions should focus on both hydration and maintaining a reasonable core temperature via adequate frequency and duration of rest breaks.

In the Context of Other CKDu Research

Recent studies reveal that neither toxins²⁴ nor infectious disease alone²⁵ can explain the CKDu epidemic. In lieu of strong findings among these other hypotheses, addressing heat stress among disadvantaged workers deserves further investigation as it is both plausible and likely addressable. It is important that studies looking into the prevalence of the disease look into workers from the Gulf States and other populations without adequate measuring and reporting of CKDu prevalence or managing risks associated with heat stress. Further, having an intervention, is not the same as having a sufficiently designed and implemented intervention. Years two and three of the Adelante Initiative are focused on these important points.

Relevance to stakeholders

Brands: Brands espousing sustainability should ensure that no workers in their supply chains are facing working conditions in heat without proper water, rest and shade programs in place throughout. They should also work with their suppliers to guarantee measures are well implemented.

Producers and Employers: Similar to brands, these parties must ensure water, rest and shade programs are sufficient and in place, and LIN are very happy to work with interested parties into assessing and helping to improve current programs.

Governments: Health and Labor ministries in countries likely affected by CKDu should work with industry to protect the workforce from heat stress.

ILO: This research provides the basis for International Labor Organization to create guidelines to ensure the protection of workers and basic labor standards with which to do so.

Certifications: Sustainability certifications should prioritize occupational health, as currently it is often an afterthought in sustainability discussions.

Development Banks and Institutions: Those giving loans should guarantee proper steps are taken to address heat stress and hydration for workers.

Insurers: Those insuring industries with CKDu in their workforce should include provisos insisting on at least rudimentary protections for heat stress for workers.

Additionally, and to be published soon, preliminary analysis shows workers cut 0.5 tons more per day and the company had a return on investment of at least 160,000 USD with the intervention.

Next Steps for continuing research

Validation: Interventions should be assessed on whether they maintain an acceptable core temperature, sufficient hydration, and whether kidney injury develops over the day, and/or develops over the harvest in those who do not maintain a healthy working core temperature.

Healthy Worker Effect: Continuing participants and drop outs should continue to be followed to see if those who experience kidney injury during work evolve into sustained CKDu.

Economic Studies: The cost of implementing and maintaining better occupational safety and health practices needs to be assessed to determine the return on investment for companies, as well as the economic impact of CKDu on individuals, communities and health systems.

Figure 1: Observed WBGT Median and 90% Range and comparison of rest schedules

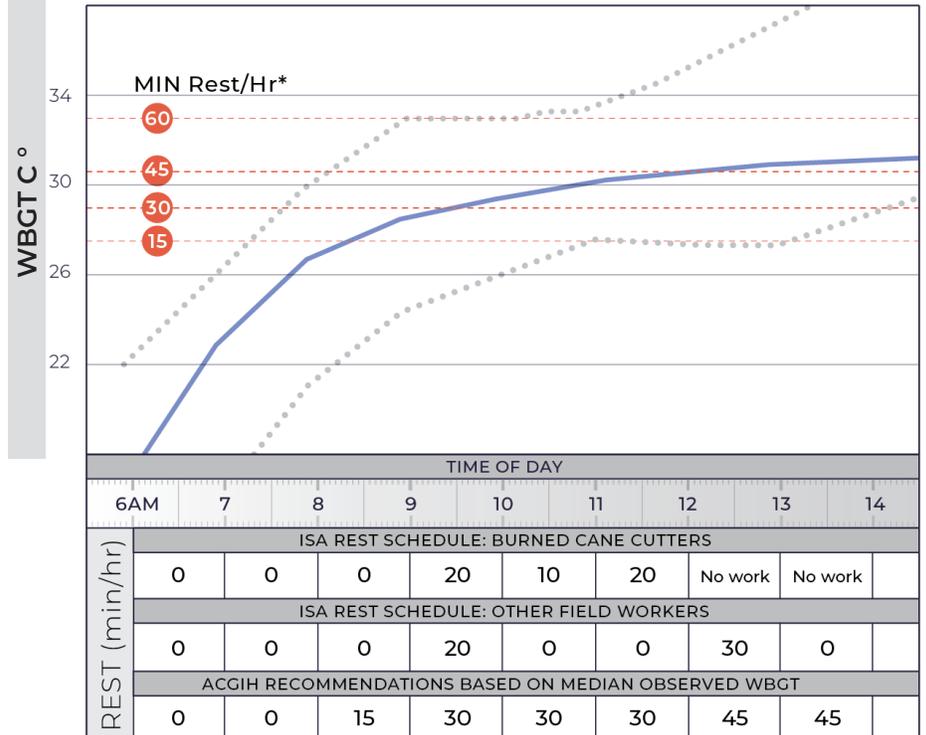


Figure: Median (solid blue line) and 90% range (grey dotted lines) wet-bulb globe temperature (WBGT) in the sugarcane fields of Ingenio San Antonio (ISA) during harvest in 2017–2018. The ISA rest schedules during harvest in 2017–2018 are compared with the American Conference of Governmental Industrial Hygienists (ACGIH) recommendations for heavy physical work according to the median WBGT. *Threshold limit values (red dashed lines) for the number of minutes of rest per hour recommended by the ACGIH for heavy physical work. We can see that current condition in the global south are not amenable to US standards and we must identify safe and new systems to protect workers.

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