



Current Occupational Heat and Pesticide Research in Southeastern Coastal States at the Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) and the Sunshine Education and Research Center (Sunshine ERC)



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The University of Florida's Southeastern Coastal Center for Agricultural Health and Safety and the University of South Florida's Sunshine Education and Research Center are NIOSH-funded centers hosting four projects focused on the physiologic impacts and mitigation of heat-related illness (HRI) and pesticide exposure. This poster summarizes these ongoing and prospective projects.

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Heat Stress and Biomarkers of Renal Disease

Linda McCauley, Emory University, School of Nursing



Photo Credit: Joan Flocks

Problem: The occurrence of Chronic Kidney Disease (CKD) in Mesoamerican agricultural workers has increased and is potentially related to recurrent dehydration caused by excessive heat exposure. However, minimal information exists on the association between renal damage and heat exposure.

Objective: Document the association between heat exposure and CKD in US farmworkers with an innovative metabolomics approach to examine how metabolic pathways are affected by heat exposure.



Photo Credit: L. McCauley

Methods:

- Recruit a sample of 100 workers (age 18-54) born in Mexico and residing in Homestead, FL:
 - 70 workers in heat-intensive agriculture;
 - 30 workers in NON heat-intensive occupations (e.g. service, maintenance).
- Determine if biomarkers of Mesoamerican worker renal damage are also present among Mexican immigrant farmworkers in the US:
 - Characterize workers' occupational environments and physiologic profiles;
 - Determine the presence of biomarkers indicating kidney injury in participants;
 - Compare presence and levels of biomarkers between workers in heat-intensive and non heat-intensive occupations;
 - Use nontargeted metabolomics analysis of blood plasma to explore the molecular mechanisms of renal dysfunction associated with occupational heat exposure.

Results:

- Enrolled first cohort of workers in Homestead, FL April-May 2018:
 - 37 workers in heat-intensive agriculture, 36 workers completed study;
 - 15 workers in NON heat-intensive occupations (e.g. food service, maintenance, hospitality), 13 workers completed study.
- Enrollment of the second cohort to commence in August 2018

Targeted Heat-Adaptive Interventions for Florida Agricultural Workers: A Pilot Study

Roxana Chicas, Emory University, School of Nursing

Problem: In Florida, 90% of agricultural workers exceeded the recommended internal core body temperature threshold limit value (38°C; 100.4°F) at least once during a three-day study period. To date, there are no evidence-based studies of heat-adaptive interventions to protect agricultural workers from exceeding the internal core body temperature thresholds.

Objective: Examine heat-adaptive interventions that can maintain core body temperatures below the recommended physiologic limit of 38°C (100.4°F) and that do not interfere with daily work routines.

Methods:

- Recruit a sample of 80 agricultural workers residing in Homestead and Pierson, FL.
- Assign participants to 1 of 4 groups for 1 workday:
 - No intervention, clothing as usual;
 - Chill-Its® 6700CT Evaporative Cooling Bandana (Ergodyne, St. Paul, MD);
 - HYPERKEWL™ Evaporative Cooling Hybrid Elite Sport Vests (TechNiche, Vista, CA);
 - Both the cooling bandana and vest.
- Capture continuous core body temperatures (T_c) during the workday using a CorTemp® monitoring device (HQInc., Palmetto, Florida).



Photo Credit: La Isla Network



Photo Credit: La Isla Network

Preliminary Results: Enrolled 33 participants during April-May, 2018, assigned as follows: 7 control, 8 bandana, 9 vest, and 9 bandana and vest. Heat-adaptive intervention acceptability was high; workers reported feeling cooler during the workday and that the interventions did not interfere with work routines. Analysis of internal core body temperatures is ongoing.

PISCA: Pesticide & Heat Stress Education for Latino Farmworkers that is Culturally Appropriate

Joseph G. Grzywacz, Florida State University, Dept. of Family & Child Science
Antonio Tovar-Aguilar, Farmworker Association of Florida

Problem: Chronic low-dose pesticide exposure and extreme workplace heat and humidity are occupational health threats to farmworkers, most of whom are Latino immigrants from Mexico.

Objective: Develop and test culturally- and contextually-tailored safety education curricula designed to reduce pesticide exposure and heat-related illness (HRI) among Latino farmworkers. The pesticide curricula meets the EPA's revised Worker Protection Standard (WPS-r).

Methods: Three-phase community advocate/university partnership project:

Phase 1 – Implement farmworker intervention (n=125) to determine preliminary efficacy of beta-version curricula.

Phase 2 – Conduct randomized attention control placebo design (n=325) to determine if PISCA WPS-r curricula outperforms EPA curricula.

Phase 3 – Disseminate curricula to farmworkers (n=400) and conduct effectiveness study comparing implementation via *promotora* and via professional educators.

Results: Phase 1 data analysis indicated that:

Figure 1a - Pesticide knowledge changed for individuals exposed to both curricula, but changed more PISCA WPS-r recipients than for PISCA HRI recipients (F(1)=2.84, p <.05).

Figure 1b - Behavioral intention regarding pesticide safety increased for PISCA WPS-r recipients, but decreased for PISCA HRI recipients (F(1)=2.97, p <.05).

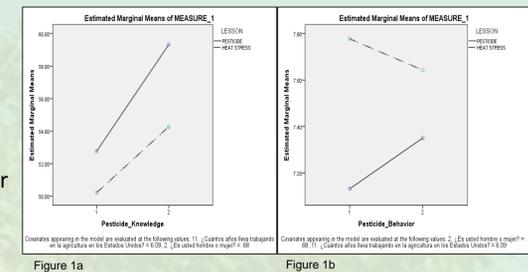


Figure 1a

Figure 1b

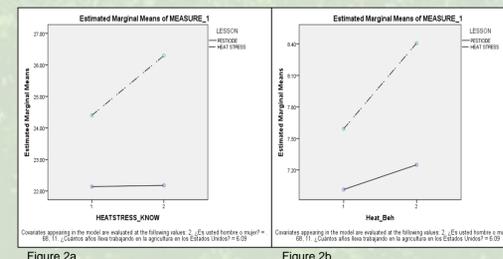


Figure 2a

Figure 2b

Figure 2a - Heat stress-related knowledge changed more for PISCA HRI recipients than for PISCA WPS-r recipients (F(1)=13.12, p <.001).

Figure 2b - Heat stress-related behavioral intention changed more for PISCA HRI recipients than for PISCA WPS-r recipients (F(1)=6.85, p <.05).

Agricultural Chemical Exposure Impact on Kidney Function in Farmworkers

Nancy Denslow, Steve Roberts, & Chris Vulpe
University of Florida, College of Veterinary Medicine

Problem: There is an unexplained increase of renal disease in agricultural workers which may be a result of exposure to pesticides and heat.

Objective: To evaluate the contribution of pesticide exposure and heat to kidney toxicity in a rodent model.

Methods: A controlled study in a rodent model to heat, selected pesticides, and the combination and assessment of kidney toxicity:

Aim 1 - Characterize the nephrotoxicity of the most commonly used formulations of an insecticide, permethrin, and two herbicides, paraquat and glyphosate in the rat.

Aim 2 - Develop a model of hyperthermia and mild dehydration in the rat resembling the heat stress experienced by Southeastern US agricultural workers.

Aim 3 - Determine the combined effect of heat stress and pesticide exposure on renal injury in rats.

This work has not started yet and is anticipated to begin next year.