Physiologic and Environmental Monitoring of Heat Hazards in The Girasoles Study of Farmworkers

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Background

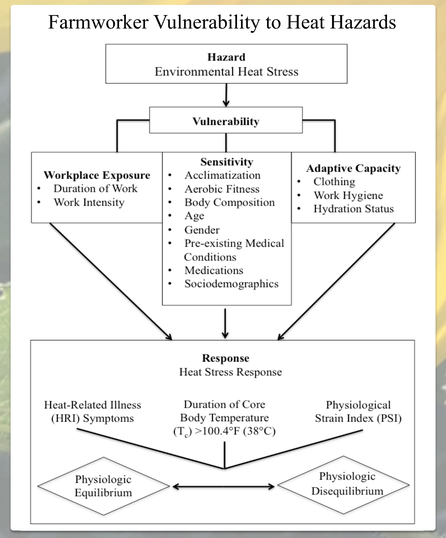
Consistent and comprehensive approaches for characterizing heat-related health hazards are needed to protect vulnerable populations, particularly those that are laboring in these conditions. Workplace-based biomonitoring of physiologic phenomena is key to accurately characterizing the physiologic heat stress response in farmworkers and other outdoor workers exposed to chronic heat. It is the responsibility of scientists, lawmakers and communities to create practical and effective heat adaptation plans, informed by biomoniting to protect the health of outdoor workers.

Objective

To characterize the physiologic heat stress response to occupational heat stress and the risk factors for heat related illness (HRI) in Florida farmworkers.

Methods

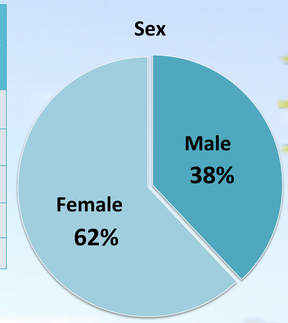
Physiologic monitoring was performed over 3 workdays in a convenience sample of farmworkers (n=252) employed during the summers of 2015, 2016, and 2017 from 5 Florida communities (Pierson, Apopka, Immokalee, Fellsmere, & Homestead). An ingestible temperature pill paired with a heart rate (HR) monitoring strap captured core body temperature (Tc) and HR every 30 seconds during the workday. Time spent in moderate to vigorous activity was collected via actigraphy. Pre-and post-shift hydration status was measured via urine specific gravity (usg). Ambient temperature was collected from local meteorological data.

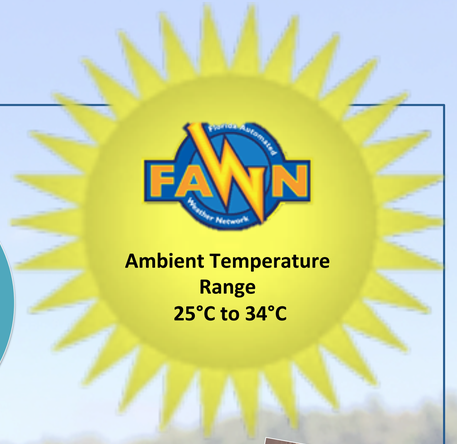


Mac V, McCauley L. Farmworker Vulnerability to Heat Hazards: A Conceptual Framework. Journal of Nursing Scholarship. 2017 Nov; 49(6):617-624

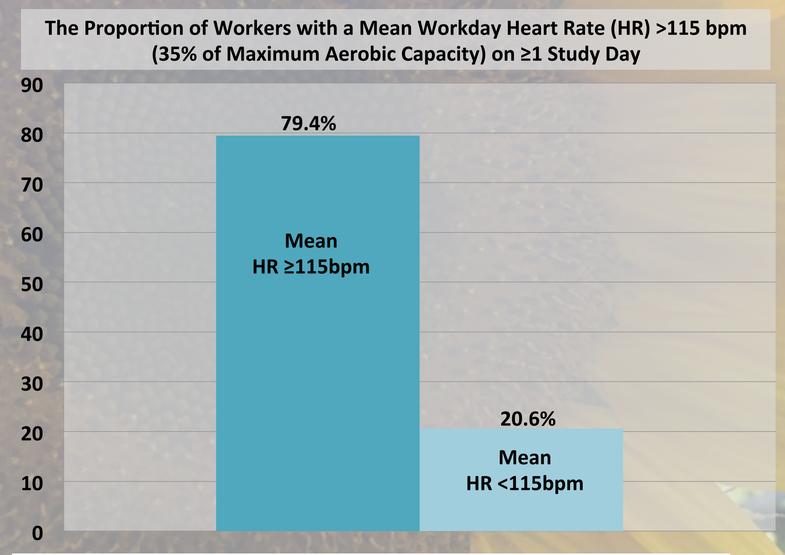
Results

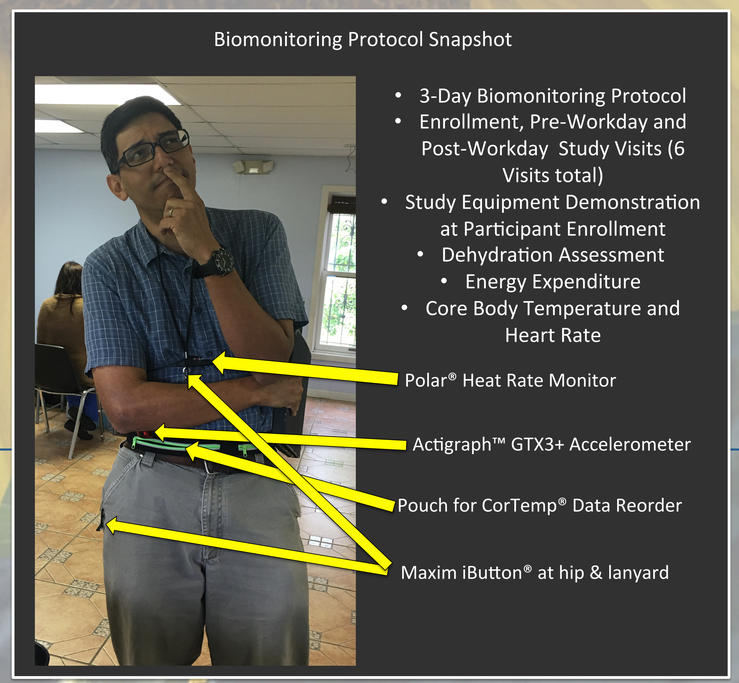
Location	Age Mean(SD)Range	Years Working in U.S. Agriculture	Self-reported Workday Duration Mean(SD)Range	Time Spent in Moderate to Vigorous Activity (Min) Workday Mean(SD) Range)
Apopka	38.6 (9.0) 19-54	11.7 (8.2) 1-34 years	8.3 (1.1) 4-12 hours	115 (81) 7-351 minutes
Fellsmere	36.5 (9.4) 19-54	10.9 (7.4) <1-27 years	8.5 (1.0) 6-10 hours	160 (97) 20-426 minutes
Homestead	40.6 (10.8) 18-54	13.9 (9.8) 1-31 years	8.1 (1.0) 6-10 hours	76 (52) 3-204 minutes
Immokalee	38.2(8.3) 19-54	9.3 (8.2) <1-32 years	7.7 (1.4) 2-10 hours	164 (80) 24-330 minutes
Pierson	37.3(7.4) 19-54	15.0 (6.3) 1-30 years	6.7 (1.2) 5-10 hours	224 (97) 7-494 minutes

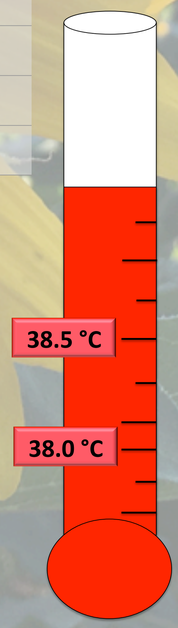


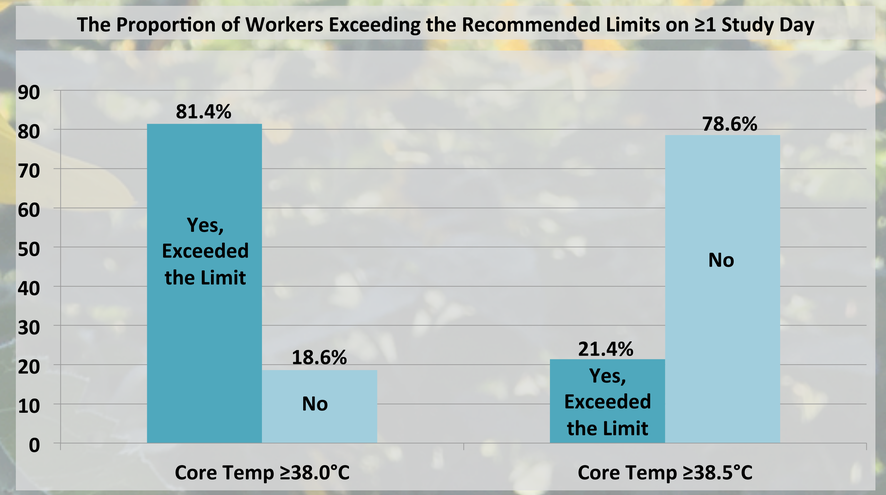


Urine Specific Gravity (USG)	Pre-workday Visit	Post-workday Visit
USG>=1.020 (Mild to Moderate Dehydration)	194 participants (78.5%)	228 participants (91.6%)
USG<1.020	53 participants (21.5%)	21 participants (8.3%)
USG>=1.030 (Severe Dehydration)	23 participants (9.3%)	72 participants (28.9%)
USG<1.030	224 participants (90.7%)	177 participants (71.1%)









The American Conference of Governmental Industrial Hygienist's Recommended Physiologic Limits:
- 38.0°C (100.4°F) for workers who are not medically selected or acclimatized
- 38.5°C (101.3°F) for medically fit, acclimatized workers

Conclusion

This work provides critical information on the heat-related hazards of agricultural work, demonstrating that farmworker populations are vulnerable to heat hazards and are at risk for heat-related illness. Further analysis of the impact of specific risk factors on the resulting physiologic heat stress response will inform the development of interventions to decrease the risk of HRI.

The Girasoles Study (R01OH01657) was funded by The National Institute for Occupational Safety and Health (NIOSH)