

***Cardiac Contractility and Oxygen Consumption  
in Work-related Heat Syncope***  
**Thad E. Wilson, Richard Klabunde**  
**College of Osteopathic Medicine**  
**Ohio University**

People in occupations such as firefighting, as well as road repair, construction, mine, foundry, and bakery work, can experience extreme heat stress while performing work tasks in the upright position. Epidemiological data report incidence rates between 10-38 heat exhaustion cases per 100,000 in workers or soldiers in heat stress environments. Heat syncope is a distinct form of heat exhaustion and is related to postural pooling of blood, decreases in venous return, reductions in cardiac output, and cerebral ischemia. The causes and mechanisms of heat syncope are unclear; we believe there is an increase in left-ventricular contractility but not to an extent enough to prevent a fall in stroke volume during low-to-moderate reductions in preload that are associated with heat stressed humans in the upright position.

The purpose of this pilot proposal is to identify the effect of heat stress on cardiac contractility and myocardial oxygen consumption while independently altering the variables that affect cardiac function in a manner consistent with the development of work-related heat syncope. An isolated rodent heart model will be used to test study hypotheses because human laboratory studies can only manipulate physiological variables to the point of pre-syncope, but field studies and heat exhaustion hospitalizations report more extreme physiological changes during heat syncope which can only safely be performed in the isolated heart model. Our central hypothesis for this project is that moderate heating increases left-ventricular contractility in the isolated heart model either directly (heating alone) or indirectly via interactions with a  $\beta$ -adrenergic agonist (isoproterenol). These data will be informative as to the cardiac role in heat syncope and thereby lead to a combined mechanistic and applied translational research proposal to NIOSH dealing with work-related heat syncope etiology and countermeasure development.



**University of Cincinnati  
11th Annual  
Pilot Research Project  
Symposium  
October 14-15, 2010**

**Main Menu**

Hosted by: The University of Cincinnati Education and Research Center Supported by:  
The National Institute for Occupational Safety and Health.  
(NIOSH) Grant #: T42/OH008432-05

- ◆ **Welcome and Opening Remarks**
- ◆ **Keynote Speakers**
- ◆ **Podium Presentations**
- ◆ **Poster Presentations**
- ◆ **Video Montage of the 11th Annual PRP Symposium**
- ◆ **Participating Universities**
- ◆ **Steering Committee Members**
- ◆ **Acknowledgements**
- ◆ **Problems Viewing the Videos**

Produced by Kurt Roberts Department of Environmental Health  
Copyright 2010, University of Cincinnati