Non-invasive monitoring of hydration status in warfighters
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Abstract. Proper fluid balance is critical for Warfighter performance and health during training and deployment. Dehydration is one of the fundamental physiological mechanisms of illness and injury in extreme environments. Dehydration is also a significant public health issue. Over 90 million people are expected to become dehydrated in the U.S. each year. Most of them are children, the elderly, sports participants, and patients with trauma, cancer, diabetes, kidney disease and dementia. The goal of this project is to develop a rapid noninvasive test for monitoring hydration status in the field. The test principle is based on saliva biomarkers of dehydration. Candidate biomarkers of dehydration were identified using Stress Response Profiling (SRP), a new proteomic method for quantitative measurement of physiological perturbations. SRP biomarkers monitor principal molecular pathways involved in cellular and systemic stress responses. SRP biomarkers (n=80) were measured in longitudinal samples of whole saliva during human clinical trials of moderate dehydration induced by exercise or a diuretic pill. Results identified candidate biomarkers of dehydration with over 90% diagnostic accuracy for hypertonic and isotonic dehydration. The candidate biomarkers are clinically specific for dehydration, and offer new insights into the molecular mechanism of osmotic stress and dehydration. Current work includes the development of a commercial FDA-approved dehydration test, and field studies during military training exercises.
Dehydration is a significant problem for Warfighters as well as a public health issue. Over 90 million people are expected to become dehydrated in the U.S. each year. Most of them are children, the elderly, sports participants, and patients with trauma, cancer, diabetes, kidney disease and dementia. The new dehydration test will allow improved hydration management and return-to-work metrics during training and combat for Warfighters, and will have wide commercial applications in pediatrics, geriatrics and sports medicine.

Key words: Fluid balance, dehydration, diagnostics, biomarker, noninvasive, saliva, field-expedient

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