At the 5th International Congress on Soldiers’ Physical Performance (ICSPP), which was held in mid February, at the Fairmont Le Château Frontenac in Quebec City, Dr. Jaques Reifman, Director of TATRC’s Biotechnology High Performance Computing Software Applications Institute (BHSAI), delivered three highly regarded presentations on heat stress, Warfighter alertness and core body temperature estimation to a crowd of over 500 participants focused on optimizing the physical performance of the men and women serving our respective countries.

The ICSPP is the most important international congress in applied military human performance research and attracts experts from all over the world. The congress covers a broad range of disciplines including physical training programs and adaptions, occupational and physical performance, testing and assessment, injury prevention, public health and health promotion, nutritional considerations, human factors, ergonomics, equipment design, biomechanics, load carriage, gender integration issues, thermoregulation and environmental issues, deployment considerations, and psychological and cognitive factors.

Dr. Reifman’s first presentation was entitled, “A 3-D Virtual Human Thermoregulatory Model to Predict Heat-Stress Responses.” He highlighted that BHSAI scientists demonstrated the ability of the model to estimate increases in organ-specific temperatures, which often exceeded the core body temperature, when subjects were exposed to environmental and exertional stressors (data provided by the University of Connecticut). The model will afford the ability to link increases in organ temperature with decreases in physical and cognitive performance, providing a unique opportunity to readily compare and contrast dozens of existing and future cooling strategies for the human body, which cannot be evaluated experimentally.

The second presentation focused on “Individualized Interventions to Optimize and Enhance Warfighter Alertness.” Using a recently developed caffeine optimization tool, BHSAI researchers showed that for a group of subjects, the tool provided recommendations that were safer and more efficient than those provided by the group-average recommendations, both for subjects highly vulnerable and those least vulnerable to sleep deprivation (data provided by the Walter Reed Army Institute of Research). This unique tool will help to mitigate the risk of Warfighters with impaired alertness making mistakes, by providing optimal caffeine recommendations that consider the individual’s response to sleep loss.

Dr. Reifman’s presentations concluded with the third and final address entitled, “An AI System for Real-Time Individualized Core Body Temperature Estimation.” This presentation highlighted BHSAI scientists who developed an AI algorithm that provides accurate, real-time, individualized estimates of core body temperature that serve as reliable surrogates for invasive measurements usually obtained by rectal probes (the conventional gold standard method). They showed that the algorithm performed well even when the same subject was exposed to different environmental conditions, and when it was provided with non-invasive measurements involving missing or unreliable data (data provided by multiple institutes in Israel and New Zealand). As heat-related injuries pose a threat to the health and operational effectiveness of Warfighters in hot and humid environments, the algorithm, which is already integrated into a hardware/software system, will help reduce the risk of heat injuries during training and military operations.

The ICSPP Conference is held every three years and the next event will be held in the United Kingdom in 2023.