HUMAN & ENVIRONMENTAL PHYSIOLOGY RESEARCH UNIT

NEWSLETTER

HOME OF OPERATION HEAT SHIELD CANADA

Generating the science to help Canadians adapt and prepare to rising temperature extremes

NOVEMBER 2022 • VOLUME 1 • ISSUE 2

THE FALL EDITION

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NEWS AND NOTEWORTHY

OVER **1,000+** RESPONSES RECEIVED ON OUR CANADA-WIDE HEAT STRESS QUESTIONNAIRE!

Earlier this spring we launched a Canada-wide online survey on the general public's knowledge, risk perceptions, attitudes and practices related to heat stress. Through the support of our national, provincial and community level public health partners, including Health Canada, the National Association of Federal Retirees, Ontario Ministry of Health, British Columbia Centre for Disease Control, National Collaborating Centre for Environmental Health, Institut National de Santé Publique du Québec, Ottawa Public Health, and Toronto Public Health, and others, we are excited to report that over 1,000+ Canadians, from 10 different provinces and territories, responded to the questionnaire. With four main constructs, 97 questions and numerous rich-open ended responses, we now have a wealth of data to help advance public heat stress prevention and management. The results of this survey are currently being analyzed and will be shared publicly to help increase awareness and knowledge about the importance of heat stress prevention and management programs and assist in directing the development of future programs and protections. **The authors would like to thank all those that completed the survey, and those that helped promote it among others!**

Emily Tetzlaff (Ph.D. Candidate), Dr. Fergus O'Connor (Post-Doctoral Fellow), Dr. Robert Meade (Post-Doctoral Fellow), and Dr. Glen Kenny (Director)

A MESSAGE FROM THE DIRECTOR

The world's first research trials evaluating how the body responds to extreme heat events completed at the Human and Environmental Physiology Research Unit.

As 2022 is drawing to a close, my team is ramping up stage 2 of our work, evaluating the effects of extreme heat on the health and wellness of vulnerable Canadians and Canadian workers. Over the next couple of years, in partnership with Health Canada, we will be evaluating the effectiveness of different heat-alleviation strategies, such as the use of fans, cooling centres and limb immersion in cool water in mitigating dangerous increases in core temperature and reducing the burden on the cardiovascular system during an extreme heat event. This work builds on the recent work we completed evaluating the effects of daylong exposures to heat on human health, which included our work aimed at establishing evidence-based indoor temperature limits to protect the most vulnerable. Notably, this work is assisting the Government of Canada in establishing evidence-based policies to limit overheating in homes. Many of the 619 fatalities that occurred in older adults during the brief heat event in Western Canada in the summer of 2021, occurred in overheated homes, with indoor temperatures in some homes reaching 40°C or higher (Click Here). Health Canada considers strategies to prevent indoor heat stress a critical component of heat-health guidance. Our work is assisting our partners at Health Canada to develop policies to limit indoor temperatures and prevent heat-related injuries and death. Further, Health Canada, in collaboration with the World Health Organization (WHO) and Global Heat Health Information Network, recently launched a multinational project to synthesize evidence and support decision-making for health and housing authorities around the world in protecting heat-vulnerable tenants from indoor overheating (Click Here). I will be serving as a member of the WHO Technical and Advisory Group, where I will be sharing the results of our work. Our work will undoubtedly be of great importance to this ongoing multinational effort to develop evidence-based guidance on safe indoor temperatures.

This work, however, would not have been possible without the unparalleled support of the hundreds of volunteers like you who generously provided their time and energy to assist in this important work. Without your important contribution, this work would not have been possible.

If you are interested in participating in the next phase of our work, please send me an email at gkenny@uottawa.ca. We are looking for men and women 60 to 85 years of age with and without type 2 diabetes or hypertension. All eligible participants will receive a full fitness assessment.

For those individuals who will be visiting or participating in our studies at the Human and Environmental Physiology Research Unit over the next year, you will see several changes. With recent funding received from the Canada Foundation for Innovation and the University of Ottawa ($5M), new tools and instruments will be acquired for our research unit. This initiative is part of our project – Operation Heat Shield Canada – that will involve the collaboration of national and international experts as well as our national (e.g., Health Canada, National Collaborating Centre for Environmental Health), provincial (e.g., Ontario Ministry of Health, Institut National de Santé Publique du Québec, British Columbia Centre for Disease Control) and community (e.g., Ottawa Public Health, Toronto Public Health) health partners. Included will be the addition of the world's first transformable chamber, which will allow us to recreate different living and work environments as we expand our work to understand the impacts of rising global temperatures on human health. Stay tuned for updates!

In closing, on behalf of my team at the Human and Environmental Physiology Research Unit and my partners at Health Canada, thank you to all those individuals that volunteered in our studies.

Dr. Glen P. Kenny

Director
Human and Environmental Physiology Research Unit

FRESH OFF THE PRESS

Understanding How Exercise in the Heat Affects Cellular Function

James J. McCormick, Melissa D. Côté, Kelli E. King, Morgan K. McManus, Nicholas Goulet, Karol Dokladny, Pope L. Moseley, and Glen P. Kenny

Autophagy is a vital process that occurs in nearly all cells in the human body that is responsible for protecting normal cellular function during exposure to physiological stressors associated with exercise or high temperatures. When the stressor overwhelms the cell to an extent that is not deemed survivable, cell death mechanisms are activated (i.e., apoptosis) to eliminate the cell to prevent further harm to surrounding cells or tissues. As a first step to understanding these crucial cellular mechanisms in humans, we evaluated responses in immune cells from healthy young men, during and up to 6 hours after 30 minutes of semi-recumbent cycling exercise at low-, moderate-, and high-intensities in a temperate environment (25°C) and during high-intensity exercise in a hot environment (40°C). We found that cellular survival mechanisms (i.e., autophagy) are activated during moderate-, and high-intensity exercise in a thermoneutral environment, although, when high-intensity exercise was performed in the heat, a shift-toward cellular death mechanisms occurred (i.e., apoptosis). Our upcoming work aims to evaluate if these responses are altered by aging and whether differences occur between men and women. These important findings will provide a basis for understanding cellular vulnerability during exercise- and heat-induced stress to safeguard human health.

CLICK HERE TO READ MORE!

Exploring How Age Affects the Regulation of Skin Blood Flow

Gregory W. McGarr, Kelli E. King, Casey J.M. Cassan, Kristina-Marie T. Janetos, Naoto Fujii, Glen P. Kenny

Skin blood flow is controlled by a series of steps that produce nitric oxide to dilate blood vessels, however, the ability to produce nitric oxide tends to worsen with age. One receptor of interest within this sequence (called transient receptor potential channels; TRPA1 channels) is known to increase skin blood flow when activated. Cinnamaldehyde is a natural compound derived from cinnamon bark that stimulates TRPA1 channels, however, the regulation of this receptor is poorly understood in humans. In this study, we explored how age may affect TRPA1 activation from increasing doses of cinnamaldehyde and whether this response can be enhanced using an antioxidant (i.e., ascorbate) along with the underlying mechanisms by using an inhibitor of nitric oxide production (i.e., L-NAME). We found that skin blood flow increased with higher doses of cinnamaldehyde and that responses were not different between the different age groups. However, lower skin blood flow in the presence of L-NAME in both age groups indicates a reliance on nitric oxide production to allow cinnamaldehyde to increase skin blood flow. In essence, cinnamaldehyde is reliant on nitric oxide production to stimulate blood flow and the activity of this receptor is not affected by age. Given skin blood flow is an important mechanism for regulating heat loss during exposure to hot environments, advancing our understanding if how aging may affect the regulation of skin blood flow will help us better why older adults may be at greater risk of heat-related injuries during an extreme heat event. With your continued help, we will continue to move our work forward!

CLICK HERE TO READ MORE

HEPRU TEAM HIGHLIGHT

MEET DR. ROBERT MEADE

For the better part of a decade, Rob has been a driving force behind HEPRU's cutting edge research on the health and physiological impacts of extreme heat.

Through the completion of his Undergraduate (2014) and Masters (2016) degrees, he led numerous projects evaluating how factors like aging and dehydration impact a person's ability to regulate body temperature. During his doctoral studies, Rob's interests shifted toward how physiological research can contribute to the development of public health guidance on the health impacts of extreme heat. To this end, his doctoral research consisted of some of the first studies assessing how older persons respond to day long heat exposure. Look for the results of these almost 2400 hours of experiments in upcoming publications from HEPRU!

Following on from his doctoral work, Rob remains with HEPRU as a postdoctoral fellow and, in his spare time, is completing a Masters of Public Health at Harvard. In his current role, Rob is leading a large-scale meta-analysis synthesizing data on the effects of heat on the heart, gleaned from over 400 laboratory-based studies published over the last 80 years. He also remains highly involved in the laboratory work at HEPRU, overseeing our new series of Health Canada and Canadian Institute of Health Research funded studies evaluate whether low-cost cooling strategies (e.g., electric fans, lower limb immersion in cool water) are effective for protecting older adults during day long heat exposure.

Looking into the future, Rob hopes to continue to blend his expertise in physiology and public health in order to develop evidence based guidance and policy for protecting vulnerable persons from extreme heat and climate change.

Dr. Robert Meade

Click here to read view Rob's ResearchGate profile.

Click here to read view Rob's GoogleScholar profile.

HEPRU TEAM HIGHLIGHT (CONTINUED)

MEET EMMA MCCOURT

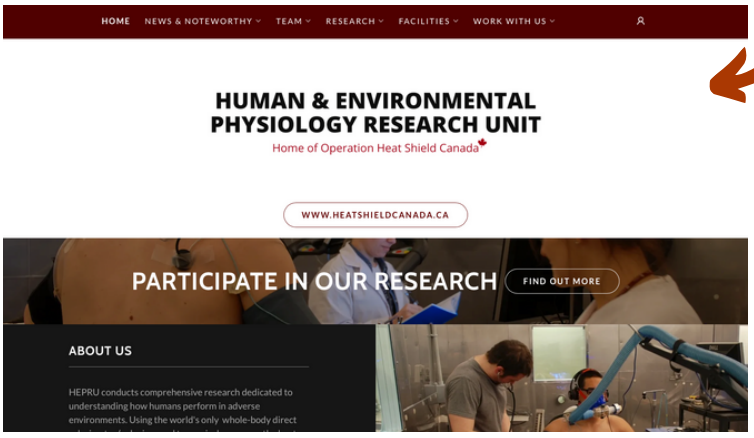
Emma is a first-year master's student at the Human and Environmental Physiology Research Unit. She joined the laboratory in 2019 to expand on the knowledge she gained in her undergraduate physiology classes and develop hands-on experience in a laboratory setting. Throughout her undergraduate degree, Emma shadowed and collaborated with senior laboratory members at HEPRU and assisted in all aspects of research work. Notably, she contributed to occupational heat stress studies and systematic reviews exploring cardiac adjustments to passive heat stress.

This year, determined to develop her skills as a young researcher, Emma is taking on a leading role in the research team by running her own study. Her project will evaluate the effect of lower limb immersion with and without application of cold towels to the neck for mitigating thermal and cardiovascular strain in older adults during simulated heat wave conditions. Emma is also currently applying to medical schools. She is hoping to translate the theoretical and interpersonal skills she has gained at HEPRU to a successful career in medicine.

Emma McCourt

Click here to read more about Emma.

LEARN MORE ABOUT OUR TEAM AT WWW.HEPRU.CA



RECRUITMENT CORNER

DOES SLEEP AFFECT YOUR HEAT TOLERANCE DURING EXERCISE?

A quality night of sleep is important for the body. It is an essential function that allows your body and mind to recharge, leaving you refreshed and alert when you wake up. It also helps the body remain healthy and stave off diseases. When it comes to heat exposure, sleep may play an important role in reducing your risk of a heat-related injury. Research suggests that individuals who are sleep-deprived may be more vulnerable to heat-related injuries during exposure to hot environments or physical activity. Our team is undertaking a study to determine to what extent sleep deprivation may impact the body's ability to dissipate heat. Further, relative to young adults, older adults have a reduced ability to lose heat. Our study will also examine if a lack of sleep may worsen this response. If you may be interested in participating, sleep on it for a day and then reach out.

This study is looking for participants that meet the following criteria:

- Male and females
- 60-85 years of age
- With and without type 2 diabetes or hypertension
- May be physically active but not engaged in intense exercise training programs

Please contact Dr. Glen P Kenny at gkenny@uottawa.ca to participate.

STAYING HYDRATED DURING EXERCISE IS IMPORTANT - BUT SHOULD YOU DRINK COLD FLUIDS?

The body water has an important role as a thermoregulator, regulating the overall body temperature by helping dissipate heat. If the body becomes too hot, water is lost through sweat and the evaporation of this sweat from the skin surface removes heat from the body. Keeping your body hydrated is therefore important in reducing your risk of a heat-related injury during exercise in the heat. Consuming fluids such as water has many advantages; not only does drinking water help you cool down and regulate your body temperatures, but it also helps to replenish the water leaving your body through sweat. However, studies suggest that ingesting cold fluids may suppress sweat production. For older adults, this may represent a big problem, given that our ability to sweat is reduced with increasing age. To understand this process, our team is conducting a study to evaluate the effect of drinking cold beverages on heat loss during exercise in young and older adults. If you love to exercise in the heat, and feel a little thirsty, why not consider participating in our study!

This study is looking for participants that meet the following criteria:

- Male and females
- 60-85 years of age
- With and without type 2 diabetes or hypertension
- May be physically active but not engaged in intense exercise training programs

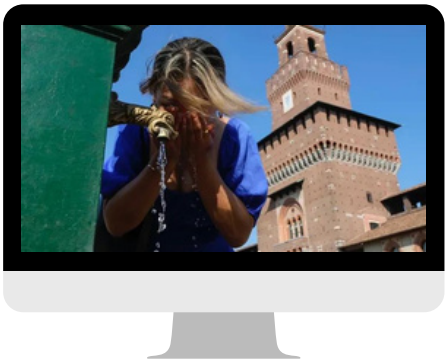
Please contact Dr. Glen P Kenny at gkenny@uottawa.ca to participate.

www.hepru.ca gkenny@uottawa.ca Montpetit Hall, University of Ottawa, 125 Universite Pvt. Ottawa, Ontario K1N 6N5, Canada

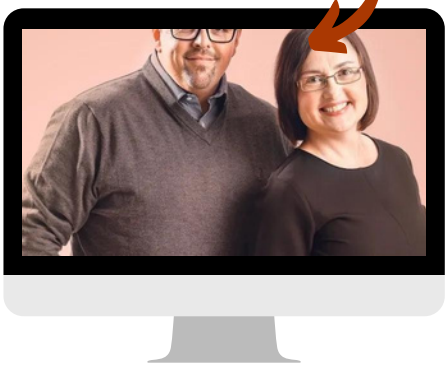
NEW IN THE NEWS

Over the course of the 2022 summer, HEPRUs research was highlighted by various local, provincial and national media outlets showcasing how our practical, action-oriented research is impacting public health in Canada. **Click the images below to read more!**

America Is Going to Have a 'Heat Belt' How can cities prepare for more regular extreme heat?

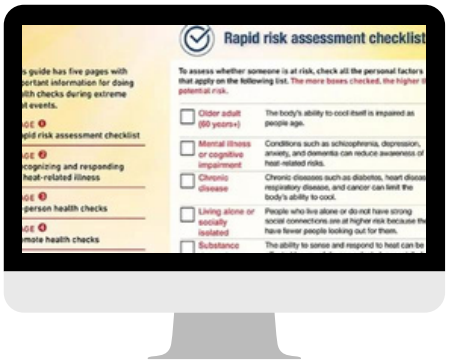


How to protect the people you care about from extreme heat



High temperatures and the human body

It's getting hot in here! - Protecting the most vulnerable from indoor heat

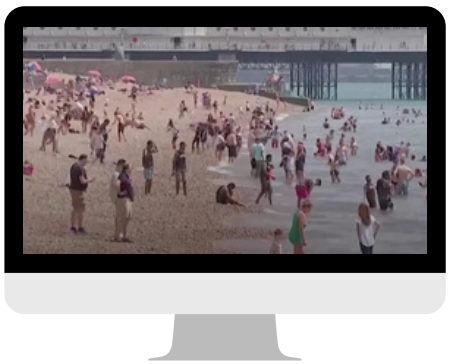


Health checks during heat waves can help protect the most susceptible

Heat waves are Canada's deadliest form of extreme weather. Do we need better warning systems?

'SILENT KILLER' A SERIES ON SURVIVING THE EXTREMELY HOT FUTURE: How to not die from heat on a too-hot

Heat stroke or heat exhaustion? How to tell the difference, according to experts



Extreme heat is scorching Europe. How should Canadians prepare for summer travel?

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