



Guidelines on Heat Stress – Working in Hot Environments

1.0 INTRODUCTION

“Heat stress” is the net (overall) burden on the body from a combination of factors. It includes the heat generated within the body from the work activity, environmental conditions (e.g. air temperature, humidity, air movement, radiation from the sun or other heat surfaces) and the clothing worn.

Heat stress can happen to anybody, including the young and fit. In Ontario, heat stress is usually a concern in the summer. However, in addition to workers who work outside during the summer, there are other hot, indoor environments where workers may be exposed to heat. At the University of Toronto, indoor environments where heat exposure can occur include mechanical rooms/crawl spaces (particularly if steam heating is used) and in kitchens. Faculty may also be exposed to heat stress when conducting field work in hot geographic regions or in hot indoor environments.

The body copes with exposure to heat in various ways (e.g. sweating, pumping more blood to the skin). Most people have heard of heat stroke, the most severe form of heat-related illnesses. However, there is actually a range of illnesses that can result from over-exposure to heat. These include heat rashes, heat cramps and heat exhaustion. Information on these heat-related illnesses are provided in Appendix A. Workers on medication or with pre-existing medical conditions including pregnancy may be more susceptible to heat stress and should discuss their concerns with their physicians and their supervisor.

Scope

This procedure applies to all University of Toronto staff who may be exposed to heat, either indoors or outdoors, during their work. It also applies to external workers (e.g. contractors) who may be contracted to work in hot environment for the University.

2.0 RESPONSIBILITIES

The roles and responsibilities for management, supervisors and workers are documented below. Workers should report concerns to their supervisors and at any time, the Office of Environmental Health and Safety (EHS) can be contacted for assistance or consultation.

Supervisors/management/principle investigators

- Identify work areas/activities where exposure to heat may occur.
- Identify workers who may be exposed to heat during the course of their work and require medical surveillance for heat stress (see Section E).
- Develop, document, and implement appropriate measures and precautions by using these procedures or in conjunction with the Office of Environmental Health and Safety (EHS).
- Ensure that a Job Safety Analysis (JSA) or written work procedure is completed where necessary and that they are readily available to workers.
- Ensure controls identified in the JSA or other work procedures are followed.
- Ensure that workers who are heat-exposed are provided with the equipment, personal protective equipment (PPE), training or other resources as identified by the JSA or other work procedures.
- Where work is contracted to external parties, equivalent procedures should be followed.

Workers

- Report health and safety hazards, including heat stress, to supervisors
- Where requested, assist supervisors in identifying hot environments or heat-stress situations and participate in the development of the JSA or work procedure.
- Review applicable JSA or other work procedures before start of work.
- Follow safety procedures and use equipment and/or PPE as defined in the JSA or work procedure.
- Speak with their supervisors if workers have health conditions or are taking medications which would make them vulnerable to heat stress.

Office of Environmental Health & Safety

- Provide consultation and perform assessments on heat stress-related matters as needed.
- Update and maintain online training module on heat stress (EHS531 Heat Stress: Working in Hot Environments). Supervisors and workers may register via the EHS Training Registration website (<http://www.ehs.utoronto.ca/Training/EHSARegistration2.htm>)
- Update and maintain these Guidelines on a regular basis and/or when new information becomes available.

3.0 GENERAL CONTROLS FOR HEAT EXPOSURE

Controls for reducing heat exposure fall into 4 categories:

- A. Engineering controls**
- B. Administrative controls and work practices**
- C. Personal Protective Equipment (PPE)**
- D. Training**

Generally, the hierarchy of controls starts with engineering controls since they have the ability to reduce or eliminate the hazard. The other controls do not eliminate or reduce the hazard but try to reduce its impact on the worker and provide workers with information to recognize early symptoms of heat stress.

Acclimatization is the concept that your body will become adjusted to the heat. While the human body can adjust and become better adapted to hot conditions, acclimatization can be problematic to achieve / maintain:

- Acclimatization must occur under the same physical conditions and the same level of physical activity as those anticipated for the work.
- Acclimatization is gradual. It takes several days and may take longer if the worker is not experienced in the job.
- If the worker have health problems or is in poor physical condition, acclimatization may also take longer.
- Substantial loss of acclimatization after 4 days (e.g. long weekend) and then entirely after 3-4 weeks (e.g. vacation).

For the reasons listed above, where there is a potential or exposure to heat stress, control measures A-D should be taken to prevent heat exposure in the workplace.

A: Engineering Controls

- Reduce physical demands of work task through mechanical assistance (hoists, lift-tables, etc.).
- Control the heat at its source through the use of insulating and reflective barriers (e.g. insulate furnace walls).
- Exhaust hot air and steam produced by operations.
- Reduce the temperature and humidity through air cooling.
- Provide cool, shaded work areas.
- Provide air-conditioned rest areas.
- Increase air movement if temperature is *below* 35°C (e.g. use fans). Fanning air greater than 35°C will cause workers to become hotter.

B: Administrative Controls and Work Practices

- Assess the demands of all jobs and have monitoring and control strategies in place for hot days and hot workplaces. For outdoor workplaces, triggers for applying control strategies could include:
 - Humidex (local or specific site) reaching or exceeding 35
 - Environment Canada humidex advisory (air temperature exceeding 30°C and humidex exceeding 40)
 - Environment Canada weather reports
 - Heat waves (three or more days of temperatures of 32°C or more)
 - Ontario Ministry of the Environment smog alert.
- Increase the frequency and length of rest breaks – EHS can assist in interpreting available guideline.
- Schedule strenuous jobs to cooler times of the day.
- Provide cool drinking water near workers and remind them to drink a cup about every 20 minutes or more frequently, to stay hydrated. **Do not wait until thirsty.**
- Avoid sugary, caffeinated or alcoholic drinks.

- Caution workers to avoid direct sunlight.
- Assign additional workers or slow down the pace of work.
- Train workers to recognize the signs and symptoms of heat stress and start a buddy system since people are not likely to notice their own symptoms.
- Investigate any heat-related incidents.
- Where appropriate, develop an emergency response plan should be in place in the event of a heat related illness.
- Pregnant workers and workers with a medical condition – or those taking certain medications – should discuss with their physicians and their supervisors regarding working in the heat.

C: Personal Protective Equipment (PPE)

- Light summer clothing should be worn to allow free air movement and sweat evaporation.
- If working outdoors, wear light-coloured clothing, preferably long-sleeve shirt and pants, and cover the head to prevent exposure to direct sunlight.
- In a high radiant heat situation, wearing reflective clothing to shield radiant heat may help.
- For very hot environments, consider air, water or ice-cooled insulated clothing.
- Vapour barrier clothing, such as chemical protective clothing, greatly increases the amount of heat stress on the body. Extra caution may be required and consultation with EHS is recommended.

D: Training

- Workers who are exposed to heat as part of their job and their supervisors should take the online training course EHS531 Heat Stress: Working in Hot Environments. Supervisors and workers may register via the EHS Training Registration website (<http://www.ehs.utoronto.ca/Training/EHSARegistration2.htm>).
- Supervisors and managers should also take the course on Job Safety Analysis. This tool assists supervisors and managers in planning out a job safely from beginning to end. Visit the above EHS Training Registration Website if interested (EHS303 Job Safety Analysis).
- In addition to formal training such as the online course, supervisors can also take the opportunity to review department- or work-specific procedures for heat stress (or other health and safety requirements) in other forums such as toolbox talks, operations meetings, etc.
- Health and safety videos are available to University of Toronto staff. This video library contains a large range of videos including heat hazards. Please contact EHS (ehs.office@utoronto.ca or 416.978.4467) for access.

E: Medical Surveillance

- Supervisors/management/principle investigators who identify workers who may be exposed to cold (continuous work greater than 30 minutes with the air temperature is lower than -15 °C, or when wind chill is lower than -25 °C) during the course of their work are recommended to have those employees partake in the medical surveillance survey. Appendix 2: Hot/Cold Exposure Medical Surveillance Survey, is a screening tool that can be used by the department to determine if there are any workers exposed to cold working environments who have health conditions which requires an additional review by Occupational Health Services.
- For those identified workers who may be exposed to the cold, and do NOT use respiratory protection:
 - Complete [Appendix 2: Hot/Cold Exposure Medical Surveillance Survey](#).
 - Completed surveys are to be kept on file by the department.
 - If your employee indicates “Yes” to any of the medical conditions listed in the survey in Appendix 2, Supervisor/management/principle investigators are to contact Occupational Health Services.
- For those identified workers who may be exposed to the cold, and do USE respiratory protection:
 - The survey as required in the Respiratory Protection Program takes into account the medical surveillance for cold stress and cold exposure. Appendix 2 does not need to be completed. No additional action required.

Appendix 1: Heat-Related Illnesses and Disorders

	Cause	Symptoms	Treatment	Prevention
Heat Rash	Hot humid environment; plugged sweat glands.	Red bumpy rash with severe itching.	Change into dry clothes and avoid hot environments. Rinse skin with cool water.	Wash regularly to keep skin clean and dry.
Heat Cramps	Heavy sweating from strenuous physical activity drains a person's body of fluid and salt, which cannot be replaced just by drinking water. Heat cramps occur from salt imbalance resulting from failure to replace salt lost from heavy sweating.	Painful cramps occur commonly in the most worked muscles (arms, legs or stomach); this can happen suddenly at work or later at home. Heat cramps are serious because they can be a warning of other more dangerous heat-induced illnesses.	Move to a cool area; loosen clothing, gently massage and stretch affected muscles and drink cool salted water (1½ to 2½ mL salt in 1 litre of water) or balanced commercial fluid electrolyte replacement beverage. If the cramps are severe or don't go away after salt and fluid replacement, seek medical aid. Salt tablets are not recommended.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Fainting	Fluid loss, inadequate water intake and standing still, resulting in decreased blood flow to brain. Usually occurs in unacclimatized persons.	Sudden fainting after at least two hours of work; cool moist skin; weak pulse.	GET MEDICAL ATTENTION. Assess need for cardiopulmonary resuscitation (CPR). Move to a cool area; loosen clothing; have the person lie down; and if the person is conscious, offer sips of cool water. Fainting may also be due to other illnesses.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Move around and avoid standing in one place for too long. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Heat Exhaustion	Fluid loss and inadequate salt and water intake causes a person's body's cooling system to start to break down.	Heavy sweating; cool moist skin; body temperature over 38°C; weak pulse; normal or low blood pressure; person is tired and weak, and has nausea and vomiting; is very thirsty; or is panting or breathing rapidly; vision may be blurred.	GET MEDICAL ATTENTION. This condition can lead to heat stroke, which can cause death quickly. Move the person to a cool shaded area; loosen or remove excess clothing; provide cool water to drink; fan and spray with cool water. Do not leave affected person alone.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Heat Stroke	If a person's body has used up all its water and salt reserves, it will stop sweating. This can cause body temperature to rise. Heat stroke may develop suddenly or may follow from heat exhaustion.	High body temperature (over 41°C) and any one of the following: the person is weak, confused, upset or acting strangely; has hot, dry, red skin; a fast pulse; headache or dizziness. In later stages, a person may pass out and have convulsions.	CALL AMBULANCE. This condition can kill a person quickly. Remove excess clothing; fan and spray the person with cool water; offer sips of cool water if the person is conscious.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke

Appendix 2: Hot/Cold Exposure Medical Surveillance Survey

Parts A and B of this form to be completed by the supervisor of the any worker identified with potential exposure to hot or cold working environments.

Part C of this form is to be completed by the worker

- Completed surveys are to be kept on file by the department
- If the employee indicates “Yes” to any of the medical conditions listed in the survey Part C, Supervisor/management/principle investigators are to contact Occupational Health Services.

A: PERSONNEL INFORMATION

Last Name: _____ First Name: _____
 Personnel Number: _____
 Employing Department: _____
 Job Title: _____
 Telephone: (____) _____ Fax: (____) _____
 Supervisor Name: _____

B: CONDITIONS PERTAINING TO HEAT OR COLD STRESS

Check all that apply:

- Indoor/Outdoor Humidex > 30C
- Continuous work >30 min in hot indoor areas (e.g. steam plant, mechanical area with elevated temperatures)
- Continuous work >30 min in temperatures <-15C or wind chill < -25C

C: WORKER HEALTH CONDITIONS

Some conditions can seriously affect your ability to safely work in hot or cold environments. Do you have or do you experience any of the following, or other conditions that may affect working in hot or cold environments? **(check YES or NO box only. Do not specify)**

Hot Environment – Health Conditions
<input type="checkbox"/> YES <input type="checkbox"/> NO
Shortness of breath
Breathing difficulties
Chronic Bronchitis
Emphysema
Lung Disease
Severe Allergies
Heart Problems
Chest pain on exertion
Hypertension
Cardiovascular disease
Diabetes
Fainting spells
Seizures
Asthma
Pacemaker
Skin conditions
Other medical condition or drugs that reduce your ability to sweat

Cold Environment – Health Conditions
<input type="checkbox"/> YES <input type="checkbox"/> NO
Shortness of breath
Breathing difficulties
Chronic Bronchitis
Emphysema
Lung Disease
Heart Problems
Chest pain on exertion
Hypertension
Cardiovascular disease
Diabetes
Fainting spells
Seizures
Panic attacks
Asthma
Pacemaker

Other condition(s) affecting ability to work in hot or cold environments:

Signature of Employee: _____ Date: _____