



Heat Stress in the Workplace

Impact of Climate Change

Rising global temperature is increasing the risk of workplace heat injuries. From 1980 to 2020, the annual mean temperature in Singapore increased from 26.9°C to 28.0°C. The combined extremes of heat and humidity, decreased air movement or lack of shading from direct heat are harmful to human health and may lead to more occurrences of heat stress.¹

Heat stress occurs when the body is unable to cool down through perspiration. This causes the body temperature to rise rapidly, which may cause damage to the brain and other vital organs. Symptoms of heat stress include:²

- Profuse sweating
- Inability to concentrate
- Dizziness
- Cessation of sweating
- Cool, moist skin with goose bumps when in the heat
- Severe thirst - a late symptom of heat stress
- Unconsciousness

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Heat-related illness

Heat-related illnesses range from milder conditions such as heat rash, heat cramps and heat exhaustion, to more serious heat related illnesses such as heat stroke, which can be fatal or cause permanent disability if medical treatment is not administered promptly.^{3,4}

Studies indicated significant deterioration in mental functions, such as short-and long-term memory and visuospatial function, perceptive discrimination and reaction time in dehydrated subjects.⁵ Workers engaged in physical tasks were less productive and took longer to complete their tasks when given less water to drink. There was evidence from studies to indicate that dehydration could be linked to job-related accidents where dehydrated subjects fainted more quickly when subjected to an orthostatic challenge test (change in body posture).⁶

Assessing risk factors for at-risk employees

Workers who are exposed to extreme heat or work in hot environments, for e.g. construction, boiler rooms, laundries, bakeries and kitchens may be at risk of heat stress. When there is a possibility of heat stress, conducting a risk assessment is a good starting point. Some factors (non-exhaustive), to consider include: ⁴

Personal Risk Factor	Environmental Risk Factor	Job Risk Factor
<ul style="list-style-type: none">• Heat acclimatisation• Medical conditions<ul style="list-style-type: none">* Pre-existing medical conditions such as heart disease, diabetes or acute illnesses such as respiratory infection, diarrhoea* On medication* Just recovered from an illness• Fitness level• Alcohol consumption• Sleep deprivation• Accumulated fatigue• Inadequate nutrition• Dehydration• Obesity• Inexperienced/highly motivated worker• History of heat injury	<ul style="list-style-type: none">• Ambient temperature• Ambient humidity• Air movement• Direct heat source	<ul style="list-style-type: none">• Workload severity and duration• Worker clothing

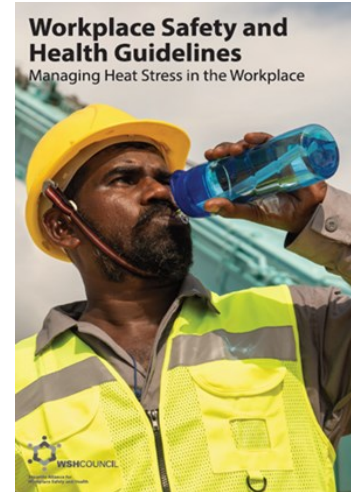
If necessary, seek help from others who are more experienced in determining the risks from hot environments, for e.g. occupational hygienists or occupational health professionals.

Preventing heat stress at the workplace

In December 2020, the Workplace Safety and Health Council (WSHC) published a revised comprehensive guideline on managing heat stress in the workplace (first published in 2010).⁴ The guideline can be downloaded [here](#).

Preventive measures can be taken to limit a worker's exposure to heat, which could raise the ability of the worker to cope with the heat. These include assessing fitness-to-work, work scheduling, adequate water intake and worker awareness.

Additional preventive actions for hot indoor working environments include insulation and shielding from hot surfaces, ventilation and air-conditioning as well as reducing ambient humidity.



Source: WSHC⁴

Ice slurry



There are many studies to show that ingesting ice slurry mitigates heat injuries and improves heat tolerance, by lowering body core temperature by about half degree Celsius. Ingestion of ice slurry is also shown to be more efficient than drinking cold water.⁷

A serving of 200-400ml of ice slurry would cool the body and improve heat tolerance for up to an hour, after which the effects will start to wear off. It is recommended to consume the ice slurry just before high intensity exercises, such as a 10km run.

The science of ice slurry is proven in sports⁸ and there are potential use cases for other industries such as construction, marine and healthcare.⁹ Using ice slurry to mitigate heat stress is also one of the recommended measures under WSH Guidelines⁴, with the added advantage of being a pre-emptive solution rather than a reactive one.

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