CURRENT TOPICS

Cooling Methods to Prevent Heat-Related Illness in the Workplace

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Abstract: The common practice of workers resting in the shade to dissipate body heat can be complemented by ingestion of crushed ice or immersion in temperate water to rapidly lower core body temperature.

Keywords: heat stress, hot and humid, ice, occupational health, water immersion

Lindsley and Cadorette (2015) provided 10 discussion points for occupational health nurses to raise with employees, management, and safety professionals to prevent heat-related illness in the workplace. One of the discussion points addressed employee cooling: "Shade: whether indoors or outdoors, ensure there are shaded and cool places for workers to take breaks" (Lindsley & Cadorette, 2015, p. 192). Exposure to hot and humid conditions can cause substantial increases in worker core body temperature (T_c), particularly when undertaking arduous work and/or wearing protective clothing. Short rest breaks in the shade are unlikely to offset elevated T_c (Walker, Driller, Brearley, Argus, & Rattray, 2014), heightening the risk of heat-related illness during subsequent work periods. Hence, strategies that rapidly lower worker T_c in hot and humid conditions are warranted.

Cooling methods beyond resting in the shade are infrequently used in work settings and are generally reserved for treating workers suffering from heat-related illnesses. Employee cooling should be a preventive strategy that lowers T_c prior to development of heat-related symptoms. Evidence-based, field-tested cooling options to complement resting in the shade include ingestion of crushed ice and immersion in water.

The conversion of ingested ice to liquid uses body heat to lower T_c. In addition to ice and water, this cooling method only requires an ice shaver or blender and access to power. Crushed ice ingestion during rest breaks has demonstrated its superiority to resting in the shade among firefighters (Walker et al., 2014) and has been implemented for electrical utility crews (Brearley, Harrington, Lee, & Taylor, 2015), construction teams, and underground miners working in hot and humid conditions. Although the specifics of each worksite dictate cooling requirements, crushed ice ingestion of 4 to 5 ml per kg body mass is a recommended starting point during rest periods (Brearley, 2012).

The logistics of establishing reservoirs of water restrict the broad application of immersion cooling to occupational settings. However, cooling by immersion is well suited to workplaces with high risk of heat-related illness that necessitate frequent rest periods. Although whole body immersion in cold water achieves the highest T_c cooling rates, it is well tolerated and effective when limited to the lower body (Walker et al., 2014). Temperate water immersion is also well tolerated and rapidly lowers T_c when large body surface areas are exposed to circulating water (Taylor, Caldwell, Van den Heuvel, & Patterson, 2008). Restricting water immersion to small regions such as the hands and forearms drastically reduces the T_c cooling rate (Brearley & Walker, 2015), limiting the effectiveness of this approach. When establishing water immersion in work settings, schedule approximately 20 minutes to incorporate doffing and donning protective clothing and chlorinate water to maintain hygiene standards.

Programs to prevent heat-related illness should include monitoring employee T_c and heart rate (Brearley et al., 2015) to complement subjective feedback from workers about cooling methods, thereby ensuring programs are guided by evidence.

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The author(s) declared no potential conflicts of interest and received no financial support with respect to the research, authorship, and/or publication of this article.