

# Bulletin n°11

## Veille thermique

### Période : octobre 2023

#### Objectifs :

L'INRS est de plus en plus sollicité sur des questions concernant les activités en entreprise par forte chaleur : les activités en extérieur, l'été en période de canicule, mais aussi les activités en intérieur, dans des lieux aux conditions thermiques extrêmes. L'objectif de cette veille est de se tenir informé sur ces thématiques, dans une période où la problématique thermique croît avec les changements climatiques.

*La bibliographie extraite de la base de données INRS-Biblio, permet la consultation des ressources en version PDF.*

*Les liens mentionnés dans le bulletin donnent accès aux documents sous réserve d'un abonnement à la ressource.*

*La validation des informations fournies (exactitude, fiabilité, pertinence par rapport aux principes de prévention, etc.) est du ressort des auteurs des articles signalés dans la veille. Les informations ne sont pas le reflet de la position de l'INRS.*

#### Sommaire :

<b>Maladies liées à la chaleur .....</b>	<b>2</b>
<b>Travail dans un ambiance thermique extrême.....</b>	<b>4</b>
<b>Travail par fortes chaleurs et périodes de canicule .....</b>	<b>5</b>
<b>Actualités octobre 2023 .....</b>	<b>7</b>
• Travail par fortes chaleurs et périodes de canicule .....	7
• Outils et capteurs de mesure .....	7
• Maladies liées à la chaleur .....	7

## Maladies liées à la chaleur

C. J. Koo, C. Hintz and C. R. Butler.

### Return to Duty Following Exertional Heat Stroke: A Review.

MILITARY MEDICINE. 2023.

<https://doi.org/10.1093/milmed/usad388>

*Exertional heat stroke (EHS), which presents with extreme hyperthermia and alteration to the central nervous system, disproportionately affects the military, where warfighters are expected to perform in all types of environmental conditions. Because of an incomplete understanding of individualized recovery from EHS, there are several shortcomings with the current guidance on return to duty (RTD) following an EHS. The purpose of this manuscript is to provide an updated literature review of best practices for return to duty following EHS to guide decision making regarding EHS and explore areas of future research for medical staff who work with warfighters. Materials and Methods A literature review related to EHS in both athlete and military populations, as well as any existing guidelines for RTD, was conducted using PubMed and Covidence. Results Twenty-one articles were identified for this updated review on EHS and RTD, with recommendations focused during and after an EHS event, as well as the role of heat tolerance testing (HTT). Conclusions EHS has a high morbidity and mortality rate if not treated rapidly. Because the extent of end-organ damage is dependent on the amount of time that the individual is hyperthermic, rapid diagnosis via rectal thermometry, and efficient cooling methods are imperative to the wellbeing of EHS patients. Following EHS, gradual RTD recommendations within the limits of operational demand should be implemented to reduce the risk for a subsequent heat injury event. While many versions of HTT, most notably the Israeli Defense Force (IDF) protocol, have been created to guide RTD recommendations, a universal assessment for heat tolerance has yet to be adopted. As such, medical personnel should apply a multifactorial approach to ensure safe RTD.*

R. Shanmugam, P. K. Latha and V. Venugopal.

### Comparison of women's heat risk profiles among those working in indoor and outdoor sectors.

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH. 2023.

<https://doi.org/10.1080/19338244.2023.2272733>

*Rising temperatures and heat events may affect workers, especially women, by increasing the risk of Heat Related Illnesses (HRIs). We conducted a cross-sectional study among 903 women in outdoor and indoor sectors. We measured Wet Bulb Globe Temperature (WBGT) and physiological Heat Strain Indicators (HSI), as well as self-reported symptoms of HRIs using a HOTHAPS questionnaire. Multivariate Logistic Regression models were used to compare the heat risks. WBGT exposures were high in both the outdoor (Avg. WBGT = 28.8 degrees C +/- 2.4 degrees C) and indoor (Avg. WBGT = 28.7 degrees C +/- 3.5 degrees C) sectors. Outdoor Women Workers (OWW) reported higher HRI symptoms (94% vs. 81%), and heat exposures were positively correlated with HRIs (AOR: 3.7; 95%CI: 2.4-6.1). OWW showed a 1.5-fold higher risk of measured HSI above safe limits (95%CI: 1.1-2.1) and a 2.1-fold higher risk of urogenital issues (95%CI: 2.1-3.8) than Indoor Women Workers (IWW). Due to direct sun exposure, intensive labor, and a lack of welfare facilities, OWW has a higher HRI risk.*

R. K. Sokas and E. Senay.

**Preventing Heat-Related Illness among Outdoor Workers - Opportunities for Clinicians and Policymakers.**

NEW ENGLAND JOURNAL OF MEDICINE. 2023.

<https://doi.org/10.1056/NEJMp2307850>

*Preventing Heat-Related Illness among Outdoor Workers Efforts to implement heat-safety protections for workers are falling short. Given these gaps, clinicians can help support their patients who may be at risk for heat-related illness.*

## Travail dans un ambiance thermique extrême

M. B. Debela, A. M. Begosaw, N. Deyessa and M. Azage.

### The Burdens of Occupational Heat Exposure-related Symptoms and Contributing Factors Among Workers in Sugarcane Factories in Ethiopia: Heat Stress Wet Bulb Globe Temperature Meter.

SAFETY AND HEALTH AT WORK. 2023;14(3):325-31.

<https://doi.org/10.1016/j.shaw.2023.08.003>

*Background: Heat stress is a harmful physical hazard in many occupational settings. However, consequences of occupational heat exposure among workers in a sugarcane factory in Ethiopia are not well characterized. This study aimed to assess the level of occupational heat exposure-related symptoms and contributing factors. Methods: In this cross-sectional study, five workstations were selected for temperature measurement. Heat stress levels were measured using a wet-bulb globe temperature index meter. A stratified random sampling technique was used to select 1,524 participants. Heat-related symptoms were assessed using validated questionnaires. Results: The level of occupational heat exposure was 72.4% (95% CI: 70.2%-74.8%), while 71.6% (95% CI: 69.3%-74.9%) of participants experienced at least one symptom related to heat stress. The most common heat-related symptoms were swelling of hands and feet (78%), severe thirst (77.8%) and dry mouth (77.4%). The identified risk factors were a lack of reflective shields (AOR: 2.20, 95% CI: 1.53, 3.17), not enclosed extreme heat sources (AOR: 1.76, 95% CI: 1.23, 2.51), a lack of access to shade (AOR: 9.62, 95% CI: 6.20, 14.92), and inappropriate protective clothing provision (AOR: 1.58, 95% CI: 1.27, 2.71). Conclusions: The burden of occupational heat exposure and heat-induced symptoms was high. Lack of reflective shields, the absence of enclosed extreme heat sources, a lack of access to shade, and inappropriate protective clothing provision were considerable attributes of heat stress. Therefore, the use of mechanical solutions to stop heat emissions at their sources and the key factors identified were areas for future intervention.*

## Travail par fortes chaleurs et périodes de canicule

M. A. Borg, J. J. Xiang, O. Anikeeva, B. Ostendorf, B. Varghese, K. Dear, D. Pisaniello, A. Hansen, K. Zander, M. R. Sim and P. Bi.

### Current and projected heatwave-attributable occupational injuries, illnesses, and associated economic burden in Australia.

ENVIRONMENTAL RESEARCH. 2023;236.

<https://doi.org/10.1016/j.envres.2023.116852>

*Introduction: The costs of global warming are substantial. These include expenses from occupational illnesses and injuries (OIs), which have been associated with increases during heatwaves. This study estimated retrospective and projected future heatwave-attributable OIs and their costs in Australia. Materials and methods: Climate and workers' compensation claims data were extracted from seven Australian capital cities representing OIs from July 2005 to June 2018. Heatwaves were defined using the Excess Heat Factor. OIs and associated costs were estimated separately per city and pooled to derive national estimates. Results were projected to 2030 (2016-2045) and 2050 (2036-2065). Results: The risk of OIs and associated costs increased during heatwaves, with the risk increasing during severe and particularly extreme heatwaves. Of all OIs, 0.13% (95% empirical confidence interval [eCI]: 0.11-0.16%) were heatwave-attributable, equivalent to 120 (95%eCI:70-181) OIs annually. 0.25% of costs were heatwave-attributable (95%eCI: 0.18-0.34%), equal to \$AU4.3 (95%eCI: 1.4-7.4) million annually. Estimates of heatwave-attributable OIs by 2050, under Representative Concentration Pathway [RCP]4.5 and RCP8.5, were 0.17% (95% eCI: 0.10-0.27%) and 0.23% (95%eCI: 0.13-0.37%), respectively. National costs estimates for 2030 under RCP4.5 and RCP8.5 were 0.13% (95%eCI: 0.27-0.46%) and 0.04% (95%eCI: 0.66-0.60), respectively. These estimates for extreme heatwaves were 0.04% (95%eCI: 0.02-0.06%) and 0.04% (95%eCI: 0.01-0.07), respectively. Cost-AFs in 2050 were, under RCP4.5, 0.127% (95%eCI: 0.27-0.46) for all heatwaves and 0.04% (95%eCI: 0.01-0.09%) for extreme heatwaves. Attributable fractions were approximately similar to baseline when assuming theoretical climate adaptation. Discussion: Heatwaves represent notable and preventable portions of preventable OIs and economic burden. OIs are likely to increase in the future, and costs during extreme heatwaves in 2030. Workplace and public health policies aimed at heat adaptation can reduce heat-attributable morbidity and costs.*

A. Santurtún, S. L. Moraes, P. Fdez-Arroyabe, M. Obregón and R. Almendra.

### Descriptive analysis of occupational accidents in Spain and their relationship with heatwaves.

PREVENTIVE MEDICINE. 2023;175.

<https://doi.org/10.1016/j.ypped.2023.107697>

*Objective: The purpose of this work is to carry out a descriptive analysis of occupational accidents and to evaluate the relationship between heatwaves and work accidents in Spain's three most populated provinces: Madrid, Barcelona and Valencia. Methods: Daily data of work accidents (including for each case: gender, age, date, length of time in the position, type of work, place of accident and duration of medical leave) was collected. A heatwave was defined when daily mean temperatures above the threshold (95th percentile) of the climatological period (1990-2021) were recorded for at least three consecutive days. To estimate the association between daily workplace accidents and heatwave events, we applied a Generalized Additive Model combined with a Distributed Lag Non-linear Model with a quasi-Poisson distribution. Results: The average annual accident rate was 33.2 work accidents/100,000*

*employees in Madrid, 35.8 work accidents/100,000 employees in Barcelona and 31.8 work accidents/100,000 employees in Valencia. The total accident rates followed a downward trend between 2005 and 2021. The difference in work accident rates between sex decreased over the studied period ( $p < 0.005$ ). In the first month of work, the highest casualty rate occurs among construction workers in Madrid and Barcelona, and in primary sector workers in Valencia. Work accidents tend to increase during heatwaves. The highest risk was recorded when considering a cumulative lagged effect of 3 days in Madrid and Barcelona and 5 days in Valencia. Conclusions: Since work accidents increase during heatwaves, risk prevention services and public administrations must take special measures to prevent them.*

## Actualités octobre 2023

- **Travail par fortes chaleurs et périodes de canicule**

[Témoignage. Changement climatique : avec la canicule, « ça devient très dur sur les chantiers »](#). Ouest-France, 27 octobre 2023

['Y'all don't scare me. I know my rights': Why extreme heat is pushing low-wage workers to unionize.](#) Fastcompany.com, 10 octobre 2023

[Extreme Heat Pushes More Farmworkers to Harvest at Night, Creating New Risks.](#) Insideclimateneeds.org, 31 octobre 2023

- **Outils et capteurs de mesure**

[Un patch portable pour surveiller votre glucose, température et pH en continu.](#) Enerzine.com, 2 octobre 2023

[Microdul and InPlay Collaborate on Pioneering Medical-Grade Wireless Body Temperature Monitoring Solution.](#) Morningstar.com, 11 octobre 2023

[Ces gélules de Caen sont utilisées par la NASA, Cristiano Ronaldo et les athlètes des JO de Paris.](#) Actu.fr, 30 octobre 2023

- **Maladies liées à la chaleur**

[EGA achieves another summer of zero heat-related illnesses.](#) Trade Arabia.com, 3 octobre 2023

[Multiple residents displaced by Glace Bay fire, firefighters treated on scene.](#) Saltwire.com, 27 octobre 2023