Bulletin n°31

Veille thermique
Période : octobre 2025

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 :

EPI, matériaux protecteurs/refroidissants

X. Wang, W. H. Zhao, S. S. Xu and J. Pollard.

Effects of moisture contents on temperature control performance of structural firefighters' gloves with the incorporation of phase change material.

FIRE SAFETY JOURNAL. 2025;156.

https://doi.org/10.1016/j.firesaf.2025.104444

Phase change materials (PCMs) are extensively utilized in thermal management applications. We examined thermal protection enhancement in structural firefighting gloves through the incorporation of PCMs, particularly under conditions influenced by moisture from hand sweating or external water sources. We conducted experiments to assess the impact of varying moisture content (MC) levels within glove fabrics on the temperature regulation performance of PCM-integrated firefighters' gloves. Three scenarios in fire settings were considered in the study, including contact with hot surfaces (conductive heat) and exposure to hazardous environments and flashovers (radiant/convective heat sources). Our findings indicate that under intense heat, the time before reaching a second-degree burn threshold (60 degrees C) on hand skin surface was minimized at lower MC levels. However, when the MC level exceeded specific values, the duration of thermal protection increased with higher moisture levels. The PCM integration extended thermal protection by between 1.4 and 2.1 times during direct contact tests and by between 1.2 and 1.5 times under radiant/convective heat exposures, compared to non-PCM gloves under similar wet conditions. Additionally, PCM layer's release of latent heat during solidification led to a prolonged temperature rise on skin surface at post-exposure, while moisture assisted in enhancing the thermal dissipation rate following heat exposure due to effective water evaporation.

K. J. Glitz, S. Freitag, U. Seibel, U. Rohde, A. Witzki, C. Piekarski and M. A. Hoffmann.

Evaporative microclimate interval cooling reduces heat stress in thermal insulating protective clothing.

JOURNAL OF OCCUPATIONAL MEDICINE AND TOXICOLOGY. 2025;20(1).

https://doi.org/10.1186/s12995-025-00473-6

Background Water vapour resistance of thermal insulating protective clothing impedes sweat evaporation, the most substantial pathway of heat dissipation for working humans. Consequently, metabolic heat can increase body core temperature rapidly, which can result in life-threatening heat illnesses. The evaporative microclimate cooling method Dry Air Comfort (DAC) has been shown to be very effective for reducing the risk of heat induced illnesses. Aim of this study was to determine whether DAC can also prevent heat stress when used in intervals. Methods Using a balanced within-subject design twelve men in protective overalls were randomly assigned (max. 205 min, 25 degrees C, 50% relative humidity/RH, 0.2 m/s wind speed) to a work-rest schedule (5 x 20 min work respectively rest each; work: treadmill, 3 km/h, 5% incline; handling of loads) without cooling and with insufflating conditioned air (30 degrees C, < 3% RH, 600 l/min) into an air-diffusing undergarment during rest periods (interval cooling). Results With interval cooling, all participants tolerated the whole exposure time never exceeding a mean core temperature of 38.0 degrees C. In contrast, without cooling eight subjects had to terminate work because of high core temperatures (39 degrees C, n = 5), subjective exhaustion or reaching 90% of the maximum individual heart rate (HR; n = 3). All parameters indicated lower heat stress and distinctive heat dissipation with interval cooling: e.g., HR between both conditions differed significantly (p <= 0.05; p <= 0.01), as were the skin temperatures (p <= 0.001). HR decline was

more pronounced during rest periods during interval cooling, indicating significant recovery: e.g., 105.1 +/- 17.0 b/min vs. 149.7 +/- 15.5 b/min (rest 4, 165. min vs. work 4, 145. min, n = 12). Without cooling HR showed only minor recovery: e.g., 138.4 +/- 15.0 b/min vs. 158.7 +/- 12.3 b/min (rest 4, 165. min vs. work 4, 145. min, n = 8) and exceeded the level of HR in rest periods of interval cooling. Conclusions Interval heat evaporation during rests periods with the microclimate cooling method DAC was shown to be effective in preventing body heat accumulation during alternating work-rest cycles. The method can improve occupational health and safety of men working in thermal protective clothing.

Z. L. Gao, Y. J. Wang, Y. M. Pan, J. Ma, X. H. Liu, C. T. Liu and C. Y. Shen.

Moisture-wicking fabric for radiation cooling.

NANO RESEARCH. 2025;18(10).

https://doi.org/10.26599/NR.2025.94907537

Prolonged exposure to hot weather and direct sunlight can lead to heat exhaustion and skin irritation, which reduces the productivity of outdoor workers and increases health risks. This study has developed a polylactic acid/boron nitride nanosheet composite fabric by electrospinning. Being selectively modified for hydrophilicity, the fabric has combined passive radiative cooling, thermal conductivity and directional sweat wicking to improve thermal comfort in outdoor environments. Compared to conventional cotton fabrics, the composite fibric exhibits excellent solar reflectance (96%) and infrared heat emissivity (93%), along with high thermal conductivity (0.38 W<middle dot>m-1<middle dot>K-1). In outdoor experiments, the composite fabric lowers skin temperature by 2.0 degrees C under direct sunlight during the day and by 3.8 degrees C at night relative to bare skin. The composite fabric features a directional perspiration function and an impressive sweat evaporation rate of 1.67 g<middle dot>h-1, which can efficiently transport sweat and heat to the fiber membrane surface to keep the skin dry and cool. This work should advance human thermal management strategies for high-temperature outdoor environments.

Maladies liées à la chaleur

Développer la sécurité solaire.

Agir magazine. 2025(119):30-8, ill.

https://portaildoc.inrs.fr/Default/doc/SYRACUSE/746435/developper-la-securite-solaire

L'exposition aux rayonnements ultraviolets solaires, première cause de cancer professionnel, concerne 1,5 million de travailleurs en France. Pourtant, la prévention reste peu développée. Seule une stratégie globale de prévention permet d'y faire face efficacement. L'Agence européenne pour la sécurité et la santé au travail (EU-OSHA) identifie l'exposition aux rayonnements ultraviolets (UV) solaires comme le principal facteur de risque cancérogène en milieu professionnel en Europe. Selon les résultats de l'enquête qu'elle a menée en 2023, intitulée Workers' Exposure Survey – WES, plus d'un travailleur sur cinq est concerné, notamment dans les secteurs du BTP, de l'agriculture, des services d'urgence et des transports. Le changement climatique aggrave cette situation en augmentant la fréquence et l'intensité des vagues de chaleur, en réduisant la nébulosité et en amplifiant l'exposition aux UV. Ces conditions entraînent des risques accrus de coups de soleil, de cancers cutanés tels que les carcinomes et, plus graves, les mélanomes, mais aussi des atteintes de cataracte et de dégénérescence maculaire lié à l'âge (DMLA).

V. L. H. Phung, Y. Honda, K. Oka, L. Madaniyazi, C. F. S. Ng, A. Tobias and M. Hashizume.

Determining Location-Specific Thresholds for Heat Warning Systems to Mitigate Heatstroke Mortality in Japan.

ENVIRONMENT & HEALTH. 2025.

https://doi.org/10.1021/envhealth.5c00113

The current nationwide wet bulb globe temperature (WBGT) threshold (33 degrees C) of Japan's heat warning system (HWS) does not adequately account for regional variations in heat sensitivity and heatstroke mortality. In this study, we aimed to determine the critical WBGT threshold for effectively mitigating preventable heatstroke mortality across Japan. To this end, daily heatstroke mortality data (ICD-10: X30; 2010-2019) for all 47 prefectures of Japan were analyzed using a time-stratified case-crossover design based on a conditional quasi-Poisson regression combined with a distributed lag nonlinear model. Assuming that heatstroke mortality is preventable via interventions when prompted by Japan's HWS, the WBGT threshold required to reduce 50% of preventable heatstroke mortalities ("target50") was estimated; subgroup analyses by age, sex, and summer phase were also conducted. According to the results, 9702 heatstroke mortalities were recorded during the study period, with more cases observed in late summer and among older individuals. Further, the current HWS threshold (WBGTmax 33 degrees C) only accounted for 2%-3% of preventable heat-related deaths during summer months. However, a new critical threshold (WBGTmax approximately 31 degrees C), enabling the realization of target50 in most prefectures, was identified. Notably, northern regions required lower thresholds. Significant differences between summer phases (lower thresholds for early summer than those for late summer), as well as regional and demographic variations in heat sensitivity, were also observed. The application of the identified critical threshold, WBGTmax approximately 31 degrees C, aligned with the national target of reducing preventable heatstroke mortalities by half. Therefore, the findings of this study provide a scientific basis for revisiting Japan's HWS and improving mitigation measures.

Xu, Q. Wang, O. Anikeeva, P. Zhu, P. Bi and C. Huang.

Effects of extreme heat on physiology, morbidity, and mortality under climate change: mechanisms and clinical implications.

BMJ. 2025;391:e084675.

https://doi.org/10.1136/bmj-2025-084675

Climate change is escalating the frequency and severity of extreme heat events, significantly augmenting disease burden through heat exposure. However, understanding of the underlying mechanisms remains insufficient, hindering the development of targeted interventions for heat related illnesses. This review summarizes the multifaceted mechanisms by which heat exposure induces systemic and organ specific damage. It elucidates how heat stress not only triggers systemic physiological dysfunction but also exacerbates specific organ injuries, thereby increasing morbidity and mortality risks across populations. These mechanisms drive shifts in disease profiles toward acute heat related illnesses, cardiovascular diseases, renal disorders, and other conditions, particularly affecting vulnerable groups. Susceptibility to heat exposure spans the entire life course, from prenatal stages to old age, and is amplified by socioeconomic disparities. The review proposes initiatives to reduce negative health outcomes and advocates for the integration of heat exposure into clinical practice guidelines, to safeguard public health in an era of unprecedented thermal challenges.

N. Rao, A. Shakeb, A. Chandra, M. R. Kulshreshta and A. Singh.

Symptoms of heat stress predict changes in serum creatinine among rural patients with chronic kidney disease during heatwave conditions in Northern India.

BMC NEPHROLOGY. 2025;26(1).

https://doi.org/10.1186/s12882-025-04356-0

Background Heat waves are being increasingly experienced in many parts of the world, including in subtropical dry zones in northern India. Patients with pre-existing chronic kidney disease are more likely to develop acute kidney injury, but the extent of the problem and its predictors are currently unknown. The objective of the present prospective, observational study was to evaluate the association between self-reported heat stress symptoms and changes in kidney function during heat wave conditions, among patients conforming to chronic kidney disease of unknown etiology (CKDu) clinical phenotype. Methods The study participants were recruited in the months of April-May in 2023 and 2024, from an ongoing hospital-based registry for patients with CKD conforming to CKDu clinical phenotype from central and eastern districts of Uttar Pradesh. In addition to clinical, information, symptoms of self-reported heat stress [modified from health hazard evaluation of heat stress (HETA questionnaire)] were noted. The questionnaire has sixteen questions, each scored ordinally from 0 to 2 for frequency of the symptom, and therefore, a maximum score of 32, constituting the heat stress index. Blood was drawn for serum creatinine at study inclusion and at one month (in the same lab providing isotope dilution mass spectrometry (IDMS)-traceable values), among study participants and all were advised for maintaining hydration, avoiding continuous outdoor heat exposure > 2 h and continued on usual care. Results Of a total of 266 screened patients with CKD from the hospital-based registry, 138 were included in the final analysis, of whom 58 reported agriculture as their occupation (42%), 53% were males, majority belonged to CKD Stage III (38%) and 64% had mild hypertension. The median heat stress index among the study participants was 6 (IQR 3-9) and 58.7% had any reduction of serum creatinine, with 24.6% having > 10% reduction on repeat serum creatinine values drawn at a median of 38 days (IQR 26-45). Baseline estimated glomerular filtration rate and heat stress index were significant predictors for reduction of serum creatinine in a multivariate logistic regression model. [odds ratio 1.028 (95%

confidence interval = 1.003-1.053), p value = 0.028 and odds ratio 1.196 (95% confidence interval = 1.076-1.329), p value = 0.001, respectively]. Conclusion Among rural patients from northern India with chronic kidney disease pertaining to CKDu phenotype, during heat wave conditions, heat stress index predicted any reduction of serum creatinine after one month.

Outils et capteurs de mesure

Li, H. Xue, X. Lin, J. Wang, J. Li, H. Zhao and T. Zhang.

High-sensitivity temperature sensors via ion capture-release dynamics for human thermal comfort monitoring.

Microsystems & Nanoengineering. 2025;11(1):193.

https://doi.org/10.1038/s41378-025-01030-1

Various high-performance wearable sensors have attracted increasing interest from researchers for the accurately monitoring of physiological signal. Wearable temperature sensors, as an important part of wearable sensors, allow accurate access to temperature information and are widely used in fields such as intelligent robotics and health monitoring. Improving key characteristics of wearable electronics is essential to expanding their application areas. In this study, we develop a wearable temperature sensor that leverages an ion capture and release dynamics mechanism, based on hydrogen bonding, to enhance the sensitivity of a wearable temperature sensor via a novel silica-in-ionogel composite. The developed sensor demonstrates ultra-high temperature sensitivity (0.008 °C) and excellent stability. Departing from conventional healthcare applications of physiological temperature monitoring, our work pioneers a novel paradigm to mirror our subjective thermal sensations, utilizing sensor data that exceeds the sensitivity of the human skin. As proof of concept, we demonstrate the sensor's potential of apparent temperature monitoring for the purpose of establishing a smart dynamic temperature control system, with the aim of keeping the human in a thermally comfortable environment throughout. Our work opens up a potential application scenario for wearable temperature sensors in personalized temperature regulation.

D. Bandiera, J. de Bardonnèche, P. Janry, S. Calas-Étienne, J. C. Aubin, A. Tessitore, Y. Pitsiladis and S. Racinais.

Validation of the iButton and Flex sensors for measuring skin temperature.

EUROPEAN JOURNAL OF APPLIED PHYSIOLOGY. 2025.

https://doi.org/10.1007/s00421-025-06020-9

Purpose Skin temperature is a critical component of athletes' heat strain during exercise in the heat. This study evaluated the innovative Flex sensor (BodyCap, Caen, France), allowing real-time measurements, against a data logger (iButton hygrochron DS1923, Analog Devices, Wilmington, USA), commonly used in sports science. Methods In a first study, the accuracies of iButton faces as well as the Flex sensor were tested on a constant-temperature Peltier module affixed to a brass plate. In a second study, concurrent skin temperature measurements were conducted with both sensors on eight participants cycling in hot conditions. Results Both faces of the iButton underestimated plate temperature, with the base (ME = mean error: 0.59 +/- 0.25 degrees C at 30 degrees C, 1.62 +/- 0.48 degrees C at 40 degrees C) being significantly more accurate than the top (ME: 1.14 +/- 0.26 degrees C at 30 degrees C, 3.02 +/- 0.71 degrees C at 40 degrees C, p < 0.001). The rate of temperature increase of the base was also higher than the top at 30 degrees C (1.97 +/- 0.16 degrees C/min vs 1.49 +/- 0.15 degrees C/min) and 40 degrees C (4.41 +/- 0.46 degrees C/min vs 3.14 +/- 0.16 degrees C/min, both p < 0.001). The Flex sensor underestimated plate temperature (ME: 1.31 +/- 0.32 degrees C at 30 degrees C, 3.00 +/- 0.84 degrees C at 40 degrees C), showing larger errors than the iButton base (p < 0.001). During exercise, the Flex sensor (36.91 +/- 1.19 degrees C) measured higher skin temperature compared to the iButton (36.50 +/- 1.15 degrees C), with an ME of -0.41 +/- 0.55 degrees C. Conclusion In the

absence of a gold standard, for scenarios where real-time monitoring is not required, using the iButton with its base applied to the skin is therefore recommended. To enhance the Flex sensor's accuracy, implementing a calibration protocol before use is strongly suggested, enabling its full potential for real-time monitoring.

Travail dans une ambiance thermique extrême

E. J. Tetzlaff, B. E. Oddson, K. T. Janetos, R. D. Meade and G. P. Kenny.

An Evaluation of Health and Safety Personnel and Workers' Occupational Heat Stress Knowledge in Ontario: Paper B.

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE. 2025.

https://doi.org/10.1002/ajim.70025

Introduction With the frequency and intensity of extreme heat events rising, occupational health and safety (OHS) personnel must be well-informed about heat management solutions. Consequently, assessing the knowledge level and technical expertise of OHS personnel is essential for equipping workplaces to operate safely in hotter conditions. Methods The Human and Environmental Physiology Research Unit-Occupational Heat Stress Knowledge Assessment Test (HEPRU-OHSKAT) was distributed among OHS personnel and the general working population (GWP) (> 18 years) throughout Ontario, Canada, to assess their current knowledge regarding managing occupational heat stress. The instrument included 31 items grouped into four core competency areas including: (A) General Heat Stress Knowledge (items (q): 8, max score (ms): 13), (B) Knowing the Signs and Symptoms of Heat Stress and First Aid (q: 7, ms: 32), (C) Exposure Limits and Heat Monitoring Practices (q: 13, ms: 40), and (D) Workplace Controls for Heat (q: 3, ms: 15). The number of respondents and the percentage of the total sample were calculated based on individual response rates to each question. Results A total of 317 respondents (female: 110, median age: 42 years, range: 18-74) from 17 industries (OHS: 68% vs. GWP: 32%) completed the HEPRU-OHSKAT. The average total knowledge score for all respondents was 54 +/- 22% (56 +/- 22% vs. 48 +/- 21%), with no respondents exceeding 90% overall and scores on individual knowledge categories varying substantially. Conclusions The HEPRU-OHSKAT identified knowledge gaps among OHS personnel in Ontario's workplaces, particularly for knowledge of control measures for reducing or preventing exposure to heat stress.

B. Alahmad, W. Kessler, Y. Alwadi, J. Schwartz, G. R. Wagner and D. Michaels.

A nationwide analysis of heat and workplace injuries in the United States.

ENVIRONMENTAL HEALTH. 2025;24(1).

https://doi.org/10.1186/s12940-025-01231-1

BackgroundExposure to heat leads to physiological and cognitive impairments that increase the risk of workplace injuries. This study estimates the number and proportion of work injuries reported to the United States Occupational Safety and Health Administration (OSHA) that can be attributed to heat exposure. These estimates contribute to the calculation of the benefits of standards, policies, and programs that reduce workplace exposure to extreme heat.MethodsWe analyzed all 2023 injury cases reported to OSHA's Injury Tracking Application by establishments with 100 or more employees, primarily in high-hazard industries. Each injury was geocoded and matched with high-resolution weather data for the specific injury date. Using a case-crossover design, we compared heat index on each injury day (case) with matched non-injury control days for the same worker. Conditional logistic regression was applied separately for summer-only and year-round periods with a non-linear term for heat index to estimate the odds ratios for injury occurrence. We additionally examined heat-injury patterns by industry sectors and in states with/without workplace heat standards.ResultsThe odds of work injury increased non-linearly with a rising heat index: the pooled national estimate showed a clear upward trend starting around 85 degrees F and accelerating above 90 degrees F. Our results were

consistent across nearly all industry sectors, including those that are predominantly indoors. Using a heat index of 80 degrees F as reference, odds ratios (OR) of injuries at or above 90 degrees F, 100 degrees F and 110 degrees F were 1.03 (95% confidence intervals [CI]: 1.02, 1.04), 1.10 (1.07, 1.13), and 1.20 (1.13, 1.26), respectively. At a heat index of 110 degrees F or higher, the odds increased by 22% in states without occupational heat rules (OR=1.22; 1.15,1.29) versus 9% in states with rules (OR=1.09; 0.84, 1.41), suggesting a protective effect, although confidence intervals overlapped. Overall, we estimate 1.18% (95% empirical CI: 0.92%, 1.45%) of all injuries were attributable to heat exposure on days exceeding a heat index of 70 degrees F.ConclusionHeat exposure increases the overall risk of work injury, an effect consistent across nearly all major industries.

J. E. Pedersen, K. K. U. Petersen, M. H. G. Andersen, A. T. Saber, U. Vogel, N. Ebbehoj, J. P. Bonde, T. K. Jensen, R. S. Wils and J. Hansen.

Non-malignant kidney diseases in Danish firefighters.

OCCUPATIONAL AND ENVIRONMENTAL MEDICINE. 2025.

https://doi.org/10.1136/oemed-2025-110285

Objectives Firefighters face a range of hazards, including strenuous tasks in high-temperature environments and exposure to chemicals. These hazards may increase the risk of kidney diseases. However, limited evidence supports this hypothesis within this occupational group. Hence, this study aimed to assess the relationship between firefighting and kidney diseases. Methods A cohort comprising 10 094 male Danish firefighters was analysed, including 3455 full-time and 6639 part-time/volunteer firefighters. Diagnoses of kidney disease from 1994 to 2014 were retrieved from the Danish National Patient Registry. Morbidity among firefighters was compared with that of a sample of the male working population, and standardised incidence ratios (SIR) were used to estimate relative risks. Results The results indicated a positive association between full-time firefighting and urolithiasis (SIR 1.36; 95% CI 1.13 to 1.63). Shorter employment (<5 years) was associated with a higher risk of glomerulonephritis and chronic kidney disease, whereas longer employment (>= 5 years) was linked to lower risks for most outcomes, except for urolithiasis, which remained elevated regardless of employment duration. Full-time specialised smoke divers were indicated to have a higher risk of glomerulonephritis, renal failure and chronic kidney disease. Urolithiasis risk was associated with an elevated risk in both regular and specialised full-time firefighters. Risk estimates for the assessed kidney diseases among part-time/volunteer firefighters generally reflected a lower risk. Conclusions This study provides evidence for elevated risks of certain kidney diseases in full-time firefighters, especially urolithiasis. Awareness of sufficient hydration in relation to extreme heat exposures may be particularly important among firefighters.

Travail par fortes chaleurs et périodes de canicule

J. W. Petersen, M. J. Hite, E. Tourula, J. Specht, A. Bailly, J. Raef, L. Sweitzer, M. J. Lignier, J. Glaser, D. H. Wegman, F. T. Amorim and Z. J. Schlader.

Accuracy Of A Heart Rate Based Estimate Of Core Temperature In Construction Workers In The Summer: 2556.

Medicine & Science in Sports & Exercise. 2025;57(10S).

https://doi.org/https://doi.org/10.1249/01.mss.0001161988.03824.38

Core temperature (Tcore) is a key safety indicator in occupations involving heavy workloads in hot environments. Traditionally, Tcore is measured in the field using an ingestible pill, which is invasive, expensive, and poses risks, limiting widespread use. To overcome these limitations, entities have sought to develop approaches to accurately estimate Tcore. One such approach, developed by researchers at the U.S. Army Research Institute of Environmental Medicine (USARIEM), involves continuous measurement of heart rate (ECTemp). ECTemp provides a reasonably accurate measure of Tcore in agriculture workers. However, the accuracy of ECTemp has not been examined in other workforces at high risk of heat illness, such as outdoor construction. PURPOSE: Test the hypothesis that ECTemp provides an accurate measure of Tcore in construction workers. METHODS: Over eight days in two consecutive summers, 98 workers (39 ± 12 y, 5 women) employed at large commercial construction sites in the Midwest U.S. were instrumented with a heart rate monitor (Polar H10) and ingested a Tcore pill (eCelsius, BodyCAP) before work. Workers then worked a normal workday (547 ± 125 min in duration). ECTemp was calculated post hoc using the most recent USARIEM ECTemp algorithm. Inter-worker accuracy of ECTemp vs. Tcore was independently assessed using mean and peak values. RESULTS: Mean - ECTemp (37.5 ± 0.2 °C) was higher than Tcore (37.3 ± 0.2 °C, $p < 0.001$). ECTemp was significantly positively correlated with Tcore ($r = 0.374$, $p < 0.001$). Bland-Altman plot analyses indicated relatively wide 95% limits of agreement (0.3 to -0.7 °C) and a bias towards ECTemp overestimating Tcore by 0.2 ± 0.2 °C. Peak - ECTemp (37.8 ± 0.3 °C) and Tcore (37.8 ± 0.3 °C) did not differ ($p = 0.393$). ECTemp was significantly positively correlated with Tcore ($r = 0.452$, $p < 0.001$). Bland-Altman plot analyses indicated relatively wide 95% limits of agreement (0.6 to -0.6 °C) yet no systemic bias for ECTemp estimating Tcore (0.0 ± 0.3 °C). CONCLUSIONS: ECTemp slightly overestimated mean Tcore but provided a reasonably accurate estimate of peak Tcore. Before implementing this technology in the construction sector, future work should examine the intra-worker validity of ECTemp.

V. Mishra, D. S. Chuphal, Q. Q. Kong, C. Raymond, L. Parsons, R. Kumar, C. Tumbe and M. Huber.

Migrant Laborers in India Face Increased Heat Stress Driven by Climate Warming and ENSO Variability.

EARTHS FUTURE. 2025;13(11).

https://doi.org/10.1029/2025EF006167

Migrant laborers typically work long hours at physically demanding tasks without air conditioning, and they account for a considerable fraction of India's population-a share that is increasing with urban growth. However, changes in heat stress and labor capacity in major urban centers that attract rural-to-urban work migrants remain unexplored. Moreover, it remains unclear how the increased heat stress and reduced labor capacity under the warming climate will alter the most preferred workplaces for migrant laborers in India. Here, we use station-based observations, reanalysis data, and climate model projections to reconstruct trends and variability in heat stress metrics, including wet-bulb temperature

for indoor exposure and wet-bulb globe temperature for outdoor exposure based on migrant data from the 2011 Census. We show that during 1980-2021, most rural-to-urban migration hotspots in north, east, and southern India witnessed a significant ($p < 0.05$) rise in Tw, indicating elevated indoor heat stress. Over that interval, outdoor heat stress has considerably increased and led to a similar to 10% decline in labor capacity in these hotspots. A substantial rise in the indoor and outdoor heat stress exposure of migrants and a reduction in their physical labor capacity is projected with each additional degree of global warming. El Ni & ntilde;o-Southern Oscillation variability can also significantly enhance these effects. Effective mitigation and adaptation options are needed to reduce the risks migrant workers face due to increasing indoor and outdoor heat stress in India.

Actualités octobre 2025

- ## Travail par fortes chaleurs et périodes de canicule

Pour lutter contre la chaleur, le plan Été 2026 se réfléchit partout dès maintenant. Lettreducadre.fr, 19 septembre 2025

Face aux déconvenues, les artisans toujours en quête de stabilité. Lemoniteur.fr, 03 octobre 2025

Study Shows California Heat Standard Reduced Work Injuries on Hot Days. Insurancejournal.com, 02 octobre 2025

Garment factories are sweltering. These simple fixes could keep workers safe. Sydney.edu.au, 21 octobre 2025

- ## Maladies liées à la chaleur

Voilà comment la chaleur extrême met les corps comme les esprits sous pression : étude de cas à Karachi. Atlantico.fr, 07 octobre 2025

Heat Waves May Speed Aging, Study Suggests. Everydayhealth.com, 02 septembre 2025

What Extreme Heat Is Doing to Your Body. Publichealthwatch.org, 02 octobre 2025

Growing Threat to Heat-Exposed Workers: Chronic Kidney Disease. Insideclimatenews.org, 30 octobre 2025