

newsletter

Heat-related illnesses

Extended heatwaves in temperate climates can be particularly stressful for the human body and may lead to some serious health problems (heat-related illnesses) in the general population.

Introduction

There is no standard international definition for the meteorological phenomenon known as a heatwave. In simple terms, a heatwave which may affect the general public is considered to be a period of more than 3 consecutive days with air temperatures of over 32 °C (90 °F). This especially applies in geographic regions where such conditions represent an exceptional weather event. Moreover, the heat level experienced (perceived temperature) depends not only on the objectively measurable air temperature, but also on the prevailing air humidity, the wind speed and the radiation temperature of heat sources.

In the following, we will describe heat-related illnesses and their pertinence for underwriting. This article does not deal with direct heat-related damage, such as sunburns, skin burns and scalding, etc.

Human heat regulation and heat injuries

Energy conversion within the human body is linked to heat generation. In order for the body to maintain a constant core temperature, it must dissipate heat outwards. Meanwhile, when the outside temperature is lower than body temperature, the body must actively produce its own heat. The body's temperature regulation system involves complex physiological temperature and metabolic interactions, as well as adjustment processes. The temperature comfort zone for a seated, lightly clothed adult, requiring no thermal regulatory measures (perspiration, shivering), is between 25 and 26°C, with 50% relative humidity. These values change, however, depending on the degree of physical work performed, among other factors. The discomfort zone begins at approx. 30°C. Thermal regulation (homoeostasis) has natural limits determined by environmental conditions and the laws of thermodynamics. The maintenance of a constant body temperature requires stable heat equilibrium in the stationary state, that is, heat production and release must balance out. Outward dissipation of heat is largely accomplished via vasodilation of blood vessels close to the surface of the skin, through breathing and through cooling provided by perspiration. When perspiration covers 100% of the skin, the adult body can no longer compensate for the heat imbalance, and this results in heat accumulation (hyperthermia). Among the health problems associated with long-lasting exposure to high environmental temperatures, four forms may be distinguished:

- Sunstroke (insolation, heliosis): An uncovered head and neck exposed to long periods of direct sunlight leads to swelling of the meninx. This can result in severe headaches, nausea, vomiting, fever, ringing in the ears and circulatory collapse, and in extreme cases can provoke comas and generalised seizures due to increased intracranial pressure.
- Heat exhaustion / heat collapse: Extended exposure to heat results in shock symptoms. This is caused by a decrease in fluid levels in the vascular system due to extreme water and electrolyte loss through increased perspiration

(dehydration). Symptoms are early or advanced circulatory function failure: thirst, dry mouth, light-headedness, nausea, pale, cool and damp skin and a quick, shallow pulse, as well as headaches, rapid breathing and shortness of breath. The body temperature is not elevated. Heat collapse frequently occurs after sporting activities or during long walks in severe heat.

- Heat stroke (hyperthermic syndrome): The body's heat regulation systems break down in the case of persistent fluid deficits, relentless heat-producing physical activity, extended exposure to extreme high temperatures, or a sudden large increase in temperature. This causes the body to overheat, which is signalled by: increase of body temperature to over 40 °C, red, dry, hot skin (perspiration has ceased), heightened pulse rate, headache, nausea, loss of consciousness. This poses an acute risk to life.
- Heat seizures: Muscle convulsions and seizures will result from a fluid deficit of 2-4 litres, accompanied by a substantial electrolyte deficiency. These most often occur during arduous work in high-temperature environments and also pose a risk to life.

Consequences and measures

When left untreated, heat damage leads to heat-related death, e.g. through the failure of circulatory and renal functioning. It eventually becomes impossible for body cells to maintain their biological functions. Should the symptoms described above occur, immediate measures should be taken: Bring the affected person to a cool environment, keep his/her head elevated, or level in the case of collapse, remove clothing, cool the person down using cold, damp cloths, supply beverages with mineral content, provide emergency medical attention. Preventative measures include rest periods in the shade or cool spaces, keeping the head covered, reducing body movement, consuming sufficient fluids. It is also important for the population to be provided with appropriate information and for officials to employ preventative measures (heat warning systems, recommendations for proper conduct).

Risk groups

In temperate climates such as central Europe, healthy adults who lead sensible lifestyles and consume sufficient fluids are generally not at risk, even during extended heatwaves. The situation is different for infants and children under four years of age, due to the particularities of the body's heat balance system. A serious risk is also faced by elderly people, who often suffer from illnesses such as diabetes or cardiovascular disease, and whose bodies adapt poorly to heatwaves. Excess body weight is another risk factor. Even a healthy body requires days, or possibly weeks, to adapt to and tolerate extended heatwaves. The body's water balance (fluid levels in the sound cardiovascular system) plays a key role in thermal regulation. Water deficiencies have an especially heavy impact under heatwave conditions, as the body's overall water balance decreases in old age, and it has been empirically shown that regular fluid uptake also diminishes when the thirst instinct weakens with age. Further risk factors, especially for persons with pre-existing illnesses and elderly people include the following: Diseases of the central nervous system (e.g. dementia, stroke), restricted physical mobility, consumption of drugs that impact the body's water balance or circulatory system as well as social isolation and need for help. The consumption of alcohol and caffeine results in fluid deficiencies, per se, and is also a risk-heightening factor in conjunction with heat. While healthy young

adults merely need to drink in order to quickly compensate for extreme fluid loss caused by perspiration, elderly people need several days. The overly rapid replacement of fluids, e.g. through medical measures (infusions), poses a particular risk to the functioning of the cardiovascular system and the brain. The consumption of beverages with low levels of electrolytes, such as tea, may cause organs to swell due to the excess of water in proportion to salt losses. Heat also impacts immune defences, creating a greater susceptibility to infection. The symptoms of heat injuries resemble those of infections and can lead to incorrect treatment.

For at-risk professions (e.g. persons performing work with heat-emitting devices, in heated spaces, or under solar radiation) it is important to supply and utilise the necessary compensatory measures. Examples of this include: Rest periods and cool-down phases, sufficient fluid intake, appropriate clothing, UV and light protection, use of climate control methods in the workplace, use of technical aids to facilitate work, adjustment of working hours, etc.

Information for the underwriter

Past experience indicates that heatwaves in temperate climates provoke an excess mortality rate for elderly people, as well as serious health risks for other demographic groups. There is an overall increase in the population's mortality rate during heatwaves (> 30 °C over 3 days) (GMS notification from the AWMF – Association of the Scientific Medical Societies of Germany - 2004). According to the report from a US health organisation (www.earth-policy.org), the number of deaths in Europe during the heatwave of summer 2003 may have totalled 35000. However, exact data is difficult to collect, since heat-related deaths are not necessarily actually recorded as such in cause-of-death statistics. In general, elevated mortality rates are to be anticipated for seriously ill and elderly people during all heatwaves (with increased heatwave frequency expected in the future). Here, the numerical increase in risk factors such as age, multimorbidity and excess body weight becomes especially significant. Increased rates of hospitalisation and confinement to care homes can be anticipated, which will have an impact on health and long-term care insurance. During heatwaves, it becomes extremely difficult to ensure proper fluid balance, in particular, for persons in poor health and for the elderly, and this requires medical expertise. This applies also for medicinal treatments. Both can affect the professional liability of hospital employees, emergency physicians, general practitioners, mobile nursing services, nursing homes, residential homes for the elderly and social services. Employers are required to provide acceptable working conditions within the scope of the legal duty of care and responsibility towards employees. However, in most countries, no claim can be invoked for a temperature-controlled workplace and it is not possible to refuse to work. It should be noted that increased heat exposure causes performance levels to drop, which can manifest itself in non-productive time.

Contact

AssTech GmbH
Postfach 1211
85766 Unterföhring bei München
Telephone + 49 89 3844-1585
Telefax + 49 89 3844-1586
info@asstech.com
www.asstech.com