ToxTidbits

Maryland Poison Center
UNIVERSITY OF MARYLAND SCHOOL OF PHARMACY

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The Maryland Poison Center's Monthly Update: News, Advances, Information

Hyperthermia in Poisoning

A "fever" isn't always a fever. It can signal a problem and appear across many diagnoses. Many drugs can also increase body temperature through various mechanisms as an unwanted side effect from stimulants to antibiotics, many therapies carry a risk of heat related illness.

The hypothalamus maintains an optimal temperature between 97.7°F and 99.5°F. Acting like a thermostat, it sets a specific target and uses serotonin, dopamine, neurotensin, GABA, and prostaglandins to hold that set point. Peripheral and central thermoreceptors relay temperature information to the hypothalamus so the appropriate response can occur.

Infectious fever raises the hypothalamic set point so antipyretics work. Drug-induced hyperthermia and environmental heat illness leave the set point normal, and the body simply cannot dissipate excess heat. As a result, antipyretic medications such as acetaminophen are ineffective at lowering body temperature in drug induced or environmental hyperthermia.

Drug-Induced Hyperthermia

- Stimulants (methamphetamine, cocaine, MDMA) increase metabolic heat production
- Antihistamines/anticholinergics (diphenhydramine) inhibit sweating via anti-muscarinic pathway
- Serotonergic agents (SSRIs, SNRIs, MAOIs) disrupt hypothalamic regulation; muscle activity through clonus/tremor/rigidity generates additional heat
- Levothyroxine raises basal metabolic rate

Complications

Uncontrolled hyperthermia is independently associated with increased morbidity and mortality. It can cause rhabdomyolysis, liver failure, disseminated intravascular coagulation, and multiorgan failure. Hyperthermia also heightens the excitotoxic neurotransmitter release, increases production of reactive oxygen free radical species, accelerates cytoskeletal protein degradation, and increases the risk for seizures[1].

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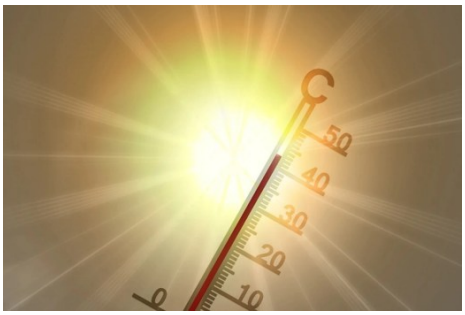

Did you know?

Saudi Arabia's Hajj season provides some of the largest real-world case series on heatstroke management. Given mass exposure to extreme desert heat often exceeding 45° C during Hajj season, hospitals have employed a rapid cooling-first protocol which has been shown to lower morbidity and mortality in this setting.

References:

1. Eyer F, Zilker T. Bench-to-bedside review: mechanisms and management of hyperthermia due to toxicity. Crit Care. 2007;11(6):236. doi:10.1186/cc6177
2. Barletta JF, Palmieri TL, Toomey SA, et al. Society of Critical Care Medicine Guidelines for the Treatment of Heat Stroke. Crit Care Med. 2025;53(2):e490-e500. doi:10.1097/CCM.0000000000006551
3. Wang AZ, Lupov IP, Sloan BK. A Novel Technique for Ice Water Immersion in Severe Drug-Induced Hyperthermia in the Emergency Department. J Emerg Med. 2019 Nov;57(5):713-715. doi: 10.1016/j.jemermed.2019.08.041. Epub 2019 Oct 16. PMID: 31629579.

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Management:

Rapid cooling is the priority intervention to minimize morbidity and mortality. Identify and discontinue the offending agent. This is the definitive step in drug-induced cases.

Cooling options include ice packs, cold IV fluids, cold-water sprays, cooling fans, and cold or ice-water immersion. Current critical care guidelines identify ice-or cold-water immersion as the fastest and most effective cooling method, and recommend prioritizing methods that achieve a cooling rate of at least 0.155 °C/min, with a target of reaching below 39°C within 30 minutes of recognition. Weighted mean cooling rates confirm this hierarchy: ice-water immersion (1–5°C) achieves approximately 0.178°C/min, compared to just 0.039°C/min for cold IV saline and 0.021°C/min for commercial ice packs at the neck, axilla, and groin[2]. Ice-water immersion is markedly faster than either cold IV fluids or ice packs alone and should be prioritized whenever feasible. When standard immersion isn't feasible, the "body bag" method (placing the patient in a body bag, filling a separate body bag with ice water, and placing the patient's body bag inside the ice water-filled bag) has been used effectively to achieve cold-water immersion[3]. Antipyretics (APAP, NSAIDs, Salicylates) should be avoided for temperature reduction as the mechanism differs and is ineffective for these types of exposures.

Supportive care for complications is recommended, including IV fluid resuscitation, electrolyte correction, and monitoring for rhabdomyolysis-related renal injury. Benzodiazepines are used for seizure management and to decrease muscle rigidity.

As environmental temperatures rise, the risk of hyperthermia increases and should be managed promptly. We encourage everyone to familiarize themselves with cooling protocols to increase emergency preparedness.

For further questions, contact your local poison center at 1-800-222-1222.