

Recognizing, Managing and Preventing Heat Exhaustion and Heat Stroke

A public health bulletin for physicians from the Cuyahoga County Board of Health

***** Heat-related mortality is entirely preventable with timely and appropriate management *****

PATHOPHYSIOLOGY

- Heat-related illness occurs when normal core temperature cannot be maintained due to excessive heat load and/or decreased ability to dissipate heat.
- Normal thermoregulatory responses to increased body temperature include increased heart rate, increased cardiac output, increased minute ventilation, sweating, and vasodilation. Any condition or drug hindering these mechanisms increases risk.
- Children may be at increased risk given their higher basal metabolic heat production, slower acclimatization to heat, and decreased sweating response compared to adults.

CLASSIFICATION

- **Heat exhaustion** (a precursor of heat stroke) - Core temperature between 37.0°C (98.6°F) and 40.0°C (104.0°F)
- **Heat stroke** - Core temperature > 40.0°C (104.0°F) with CNS dysfunction

RISK FACTORS

	Conditions	Drugs	
Age <4 or >65	• Cardiovascular disorders	• Alcohol	• Calcium channel blockers
Confinement to bed	• Endocrine disorders	• Alpha Adrenergics	• Cocaine
Non-air-conditioned home	• Respiratory disorders	• Amphetamines	• Diuretics
Social isolation	• Renal disease	• Anticholinergics	• Laxatives
Urban dwelling	• Liver disease	• Antihistamines	• Psychotropics
Chronic volume depletion	• Neurological disorders	• Benzodiazepines	• Thyroid agonists
	• Certain psychiatric disorders	• Beta blockers	• Tricyclic antidepressants

CLINICAL PRESENTATION

Heat Exhaustion:		Heat Stroke:	
Signs	Symptoms	Signs	Symptoms
• Core temp 37°C - 40°C	• Fatigue/Malaise	• Core temp >40°C	• Hepatic failure
• Tachycardia	• Weakness	• CNS dysfunction	• Renal failure
• Cutaneous flushing	• Dizziness	• Hyperventilation	• Pulmonary edema
• Emesis	• Thirst	• Anhidrosis	• Rhabdomyolysis
• Oliguria	• Nausea/Anorexia	• Cardiac arrhythmias	• Shock
• Anxiety	• Headache	• DIC	
• Confusion	• Visual disturbances	• ARDS	• As with heat exhaustion

MANAGEMENT

Heat stroke is a medical emergency! It should be managed at an appropriate facility.

Maintain **A**irway, **B**reathing, **C**irculation.

Remove patient from hot environment.

Monitor core temperature (rectal, bladder, esophageal, or intravascular probe).

Rapidly reversing hyperthermia is critical.

Heat *exhaustion* symptoms should resolve within 2-3 hours of treatment initiation.

External cooling

- Evaporative (preferred) – Cool water misted onto skin while air is fanned over.
- Immersion – Ice bath or cooling blankets with ice packs to groin, axilla, neck, and head. Causes vasoconstriction and reflex bradycardia; impedes examination.

Internal cooling

- Rectal/gastric/bladder cold lavage

Rehydration

- Isotonic, sodium-containing fluids orally for mild dehydration
- If hyponatremia present
 - AVOID HYPOTONIC FLUIDS!
 - Use IV normal saline at a rate not exceeding 2.5 mEq (2.5 mmol) / L / hour.
 - Manage at an appropriate facility.

PREVENTION DURING HOT AND HUMID WEATHER

- Increase fluid intake without waiting for thirst, reduce outdoor activity, and take frequent rest periods.
- Wear loose-fitting, light-colored clothing
- Do not leave children in cars unattended, and keep cars locked when not in use.
- Vulnerable individuals should stay in an air-conditioned environment when possible. Those unable to care for themselves should be monitored for signs of dehydration and encouraged to drink extra fluids.
- In high heat/humidity environments, cooling with a fan is ineffective.
- See www.ccbh.net for a list of emergency cooling centers. Report clusters of heat-related illness to CCBH: **216-857-1433**