

Occupational Medicine Clinical Update

Dedicated to the prevention of occupational illness and injuries, and promoting the well-being of all workers

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Heat Illness - Is Your Patient at Risk?

This Issue:

- When is it too hot to work?
- Which of your patients are particularly at risk?
- WSIAT case
- New Humidex Based Heat Response Plan

A 54-year-old suffered a cardiac arrest in July 1998, while working at a local refinery. His death became the subject of a coroner's inquest. The coroner concluded that the worker died as a result of an MI. However, due to extreme heat conditions present that day the coroner was also of the opinion that "heat may have been an additional factor."



In this issue of the *Update* we will examine some of the relevant issues

surrounding heat in the workplace, with the hopes of avoiding similar preventable heat-related deaths and illness. The summer of 2002 has proven to be an especially hot one, adding more relevance to the issue of heat and work.

We hope this information will give physicians a sense of what guidelines do exist for working in heat, and how medical conditions can alter the application of these guidelines in our patients.

When is it *Too Hot* to Work?

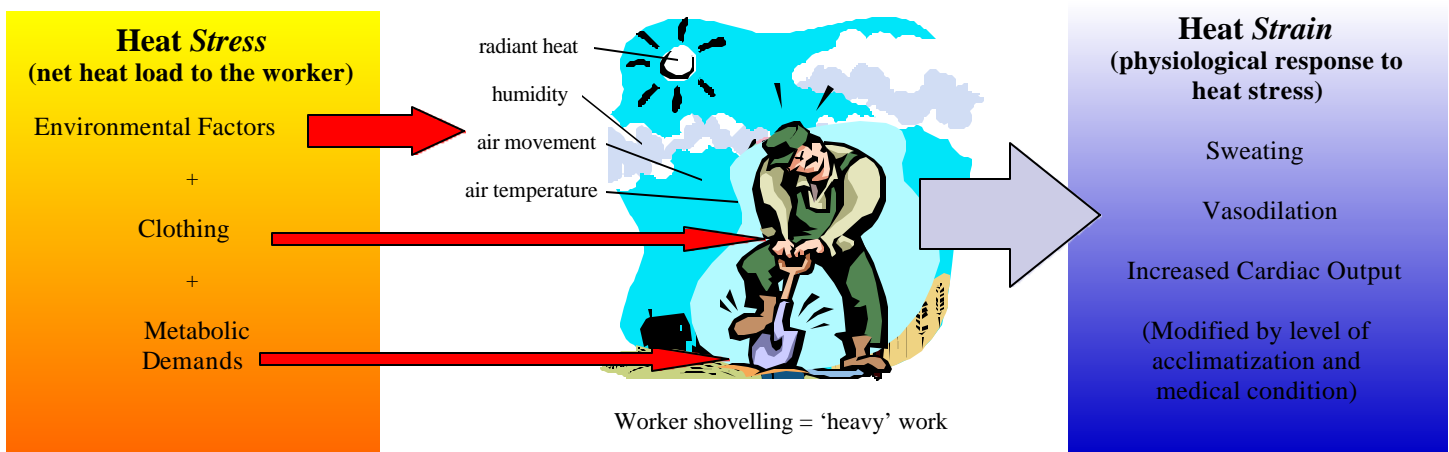
This can be a surprisingly difficult question to answer. As illustrated below, the net heat load to a worker results from a number of factors. This makes quantification difficult. The most accurate tool currently available is the Wet Bulb Globe Temperature (WBGT) which combines the influences of *humidity, radiant heat and air temperature* to arrive at an index of the *environmental heat load* (table 1).

The estimated WBGT for the day the 54-year-old worker died was 29.4°C. Based on ACGIH guidelines (and an estimate he was doing moderate work) he would require a 25% work, 75% rest regime. Clothing is added to WBGT (+3.5° for cloth overalls, +5° for double cloth). This would give our worker a corrected WBGT of 32.9°C, exceeding the limits in both the acclimatized and unacclimatized tables for any work.

The figures shown are for unacclimatized workers. The limits for acclimatized workers are roughly 2°C higher in each category. In Canada, very few workers (Continued on page 2)

Work Demands	Light	Moderate	Heavy
100% Work	27.5°	25°	22.5°
75% Work 25% Rest	29°	26.5°	24.5°
50% Work 50% Rest	30°	28°	26.5°
25% Work 75% Rest	31°	29°	28°

Table 1: ACGIH Guidelines for Unacclimatized Heat Stress Exposure (temperature in WBGT °C)



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achieve acclimatization which requires the following physiologic adaptations:

- ◆ Sweating at lower temperatures
- ◆ Increased quantity of sweat produced
- ◆ Reduced salt content of sweat and urine
- ◆ Increased plasma volume
- ◆ Increased cardiac output (by increasing stroke volume while heart rate decreases)

Partial acclimatization requires working in heat a minimum of 5 out of the last 7 days. Full acclimatization requires 3 weeks.

The obvious problem with WBGT is very few have the instruments to measure it, and it is not a very easy index for people to relate to. To

Medical Conditions - What Physicians Need to Know

What is *not* taken into account by either WBGT or Humidex-based guidelines are medical conditions. These include any condition that inhibit sweat production or evaporation:

- ◆ Obesity
- ◆ Skin disease (e.g. scleroderma, psoriasis, sunburns, heat rash)
- ◆ Dehydration/hypotension
- ◆ Endocrine diseases (e.g. diabetes, thyroid, adrenal)
- ◆ Neurologic diseases (e.g. Parkinson's, dystonias, autonomic)
- ◆ Cardiac disease (decreased cardiac output)
- ◆ Drugs - alcohol, anticholinergics, TCA's, phenothiazines, diuretics, laxatives, antihistamines, MAOI's, lithium, vasoconstrictors, beta-blockers, stimulants (LSD, cocaine, PCP, amphetamines)

Some occupational medicine specialists advocate stress testing prior to working in heat exposure for the following conditions:

- ◆ Known heart disease
- ◆ Significant risk factors for CAD
- ◆ Hypertension
- ◆ Age > 50

There are calls that national guidelines for medical evaluation of heat - exposed workers be established.

Workplace Safety and Insurance Appeals Tribunal (WSIAT) Case

A 54-year-old welder appealed a decision of the Hearings Officer denying entitlement for a heart attack in November 1987. The worker had been a welder since 1973. In September 1987, he moved from a light welding shop to a heavy welding shop. The new job required use of heavier flux core welding wire, which produced more heat. He also had to wear heavy protective clothing.

On the evidence, the Panel found that the worker was exposed to excessive heat in the course of his employment prior to and on the day of his injury. One of the possible causes of heart problems due to heat is haemoconcentration, thickening of the blood causing clotting. Dehydration, or volume contraction, can also contribute to myocardial infarction by causing release of norepinephrine and epinephrine, which are simultaneously hormones and neurotransmitters, and which in high concentrations can precipitate arrhythmia and myocardial infarction.

The Panel concluded that the worker's employment was a significant contributing factor to his heart attack.

The appeal was allowed.

Humidex Based Heat Stress Response Plan

Humidex	Action
45+	Stop work
43-44	75% relief / 25% work
40-42	50% relief / 50% work
38-39	25% relief / 75% work
34-37	Warning & double water
30-33	Alert & water
25-29	Water as needed

deal with this problem the **Humidex Based Heat Stress Response Plan** (above) produced by OHCOW-Hamilton, was recently released. It is being implemented by General Motors of Canada working with the Canadian Auto Workers (CAW). The new tool is simpler and more accessible for employers as a guide to prevent heat illness in workers. It does not, however, take radiant heat sources into account (e.g. foundries, or working in sunlight) and thus is not intended to replace WBGT.

These indexes are guidelines only, not absolute rules. They should be used to identify the potential for heat illness before workers develop symptoms. Furthermore, there may be workers and conditions that permit work despite WBGT/Humidex readings that exceed these limits.

If this summer is any indication of the effect global warming is having, physicians may be called upon more frequently to assess the special risks that heat in the workplace create for their patients.

References

- American Conference of Governmental Industrial Hygienists 2002. TLVs. Threshold limit values and biological exposure indices for 2002. Cincinnati OH: ACGIH pp.170-178.
- Guyton AC. 1991. Textbook of Medical Physiology. 8th Edition. Philadelphia: Saunders.
- LaDou, J. 1997. Occupational and Environmental Medicine. Stanford: Appleton and Lange
- Levy BS, Wegman DH. 2000. Occupational Health: Recognizing and Preventing Work-Related Diseases and Injury. Fourth edition. Philadelphia: Lippincott.
- Ontario Ministry of Labour. Health and Safety Guidelines - Heat Stress. Available: <http://www.gov.on.ca/lab/ohs/heate.htm>
- WSIAT Decision No. 376/96. Available: http://www.wsiat.on.ca/extdec/DecisionPDF/1996%5C376_96.PDF