

# HEAT STRESS

Environmental Health and Safety



Many workers spend some part of their working day in a hot environment, which poses special hazard to safety and health. This hazard is known as heat stress, which occurs when heat is absorbed from the environment faster than the body can get rid of it.

$$\begin{array}{l} \text{High Temperature} \\ + \text{High Humidity} \\ + \text{Physical Work} \\ \hline = \text{Heat Stress} \end{array}$$

### Normal Cooling Mechanism

Working in very hot areas, our bodies get rid of excess heat by sweating, increasing blood circulation and increasing the blood flow to the skin. When this works well, the body temperature drops or stabilizes at a safe level. However, if the body cannot cool off quickly, various forms of heat illness can develop.

In the United States, "According to the National Centers for Health Statistics (NCHS), 7,046 deaths were attributed to excessive heat exposure from 1979-1997, or an average of 371 deaths occurred per year." Understanding the risk factors, signs, symptoms and the seriousness of heat illness is of utmost importance for prevention.

Symptoms such as: dizziness, headaches, fatigue and a lack of thirst can be indications of heat-related illness.

The five major heat illnesses are:

- » Heat Rash
- » Heat Cramps
- » Heat Syncope
- » Heat Exhaustion
- » Heat Stroke

### Heat Rash (Prickly Heat)

Heat Rash is a common condition in which areas of the skin itch intensely and often feel prickly, or sting due to overheating. Heat Rash looks like tiny bumps surrounded by a zone of red skin.

#### Symptoms

Sweat ducts become plugged, rash develops, skin remains wet because sweat does not evaporate readily.

#### Treatment

Rest in a cool area, drink liquids and dry skin regularly.



### Heat Cramps

Heat cramps are muscular spasms that occur when the body loses too much salt during profuse sweating.

#### Symptoms

Rapid heart-beat, hot, sweaty skin, dizziness, cramping of abdominal muscles, nausea.

#### Treatment

Rest briefly and cool down, drink clear juice or an electrolyte containing sports drink, practice gentle, range-of-motion stretching and gentle massage of the affected muscle group, don't resume strenuous activity for several hours or longer after heat cramps go away. Call your doctor if your cramps don't go away within one hour or so.

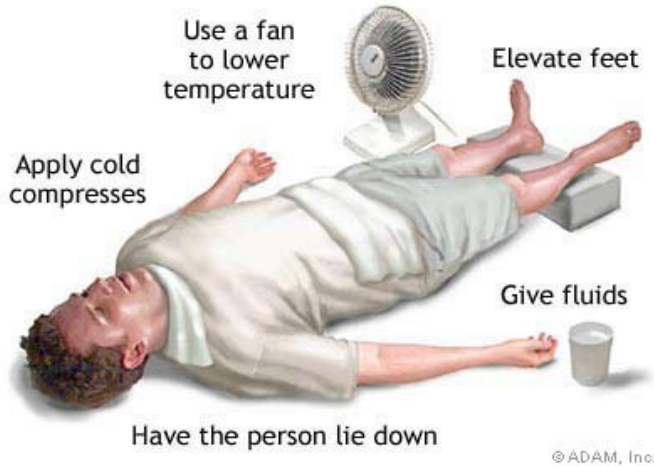
**Heat Syncope (Fainting)**

Heat syncope is the pooling of the blood in the lower extremities in un-acclimatized workers who are required to stand in the heat for long periods of time.

**Symptoms**  
A brief loss of consciousness. *In a worker who is performing any physical labor, consider it HEAT STROKE, call 911 and cool down immediately by any means necessary.*

**Treatment**  
Keep the individual lying down with feet raised, cool with wet cloths and ventilation, provide fluids and then move to a cooler location. Do not return to work and refer for medical evaluation.

The values in the chart below are for measurements taken in the shade. When working in direct sunlight, add 15 degrees.



**Heat Exhaustion**

Heat exhaustion is an early indicator that the body's cooling system is becoming overwhelmed.

**Symptoms**  
Include headaches, dizziness, light-headedness or fainting; weakness and clammy or moist skin; mood changes such as irritability or confusion; upset stomach or vomiting. It can lead to heat stroke if ignored.

**Treatment**

Includes moving the person to a cooler place, and if the person is conscious, providing small amounts of cool water to drink. Fan the victim to circulate the air while applying water with a cool cloth.

**Heat Stroke**

Heat stroke, may cause death, is the most severe form of all heat illness caused by the failure of the body's cooling system. It can occur even in people who are not exercising if the weather is hot enough.

**Symptoms**

Include dry, hot skin with no sweating; mental confusion or losing consciousness; seizures or fits.

**Treatment**

Includes all of the elements for heat exhaustion and contacting 911 immediately for medical assistance.

|                                      |     | Relative Humidity (Percent) |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|--------------------------------------|-----|-----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
|                                      |     | 0                           | 5   | 10  | 15  | 20  | 25  | 30  | 35  | 40  | 45  | 50  | 55  | 60  | 65  | 70  | 75  | 80  | 85  | 90  | 95  | 100 |  |
| Air Temperature (Degrees Fahrenheit) | 140 | 125                         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|                                      | 135 | 120                         | 128 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|                                      | 130 | 117                         | 122 | 131 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|                                      | 125 | 111                         | 116 | 123 | 131 | 141 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|                                      | 120 | 107                         | 111 | 115 | 123 | 127 | 135 | 143 | 151 |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|                                      | 115 | 103                         | 107 | 111 | 115 | 120 | 127 | 135 | 143 | 151 |     |     |     |     |     |     |     |     |     |     |     |     |  |
|                                      | 110 | 99                          | 102 | 105 | 108 | 112 | 117 | 123 | 130 | 137 | 143 | 150 |     |     |     |     |     |     |     |     |     |     |  |
|                                      | 105 | 95                          | 97  | 100 | 102 | 105 | 109 | 113 | 118 | 123 | 129 | 135 | 142 | 149 |     |     |     |     |     |     |     |     |  |
|                                      | 100 | 91                          | 93  | 95  | 97  | 99  | 101 | 104 | 107 | 110 | 115 | 120 | 126 | 132 | 138 | 144 |     |     |     |     |     |     |  |
|                                      | 95  | 87                          | 88  | 90  | 91  | 93  | 94  | 96  | 98  | 101 | 104 | 107 | 110 | 114 | 119 | 124 | 130 | 136 |     |     |     |     |  |
|                                      | 90  | 83                          | 84  | 85  | 86  | 87  | 88  | 90  | 91  | 93  | 95  | 96  | 98  | 100 | 102 | 106 | 109 | 113 | 117 | 122 |     |     |  |
|                                      | 85  | 78                          | 79  | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  | 91  | 93  | 95  | 97  | 99  | 102 | 105 | 108 |  |
| 80                                   | 73  | 74                          | 75  | 76  | 77  | 77  | 78  | 79  | 79  | 80  | 81  | 81  | 82  | 83  | 85  | 86  | 86  | 87  | 88  | 89  | 91  |     |  |
| 75                                   | 69  | 69                          | 70  | 71  | 72  | 72  | 73  | 73  | 74  | 74  | 75  | 75  | 76  | 76  | 77  | 77  | 78  | 78  | 79  | 79  | 80  |     |  |
| 70                                   | 64  | 64                          | 65  | 65  | 66  | 66  | 67  | 67  | 68  | 68  | 69  | 69  | 70  | 70  | 70  | 71  | 71  | 71  | 71  | 71  | 71  | 72  |  |

**Heat and Humidity Chart**

- Extreme Danger
- Danger
- Extreme Caution
- Caution

Apparent temperature is how hot the heat-humidity combination makes it feel.

The values in the chart below are for measurements taken in the shade. When working in direct sunlight – add 15 degrees.

| Heat Index                    | General effect of heat index on people in higher risk groups                |
|-------------------------------|---|
| 80-90: Caution                | Fatigue possible with prolonged exposure and physical activity              |
| 90-104: Extreme Caution       | Sunstroke, heat cramps and heat exhaustion possible                         |
| 105-129: Danger               | Sunstroke, heat cramps and heat exhaustion likely, and heat stroke possible |
| 130 or higher: Extreme Danger | Heat stroke highly likely with continued exposure                           |

## What Factors Affect Heat Stress

### Stress Personal Factors

- » Dehydration
- » Lack of experience wearing personal protective equipment
- » Being overweight or underweight
- » Alcohol or drug use
- » Medical conditions
- » Medication use

### Environmental factors

- » High humidity
- » Direct sunlight or other heat source
- » Lack of air movement

### Working Conditions

- » Prolonged shifts
- » Infrequent rest breaks
- » No access to drinking water
- » Heavy clothing

## How To Combat Heat Stress

### Hydrate

Adequate hydration is the most important step to combating heat stress. When the heat index is high, workers should drink copious amounts (1 quart every hour) frequently throughout the work shift: they should consume at least one cup every 15 minutes or a pint every half hour, in order to stay properly hydrated. Workers should be trained not to wait until they feel thirsty to drink; if they are thirsty they may already have lost 2 percent of their body's water. The onset of heat exhaustion can begin after losing 3 percent of the body's water and heat stroke occurs once 8 percent is lost. The bottom line is, if a worker is not regularly urinating or has dark urine, they are dehydrated and at risk for heat illnesses!

### Assess

Assess the relative danger of the worksite. Be aware that high heat, high humidity, low air circulation all create a more dangerous working environment. Any time more than one of these variables is present, the danger is compounded. Wearing occlusive non-breathable clothing in combination with heavy exertion compounds these worksite risks and can alone lead to heat illness.

### Acclimate

If an employee is new to a job or is returning after time away: ease them back into full-time work over the course of five days. Starting at half time (50 percent effort) and increasing to full time (increase by 10 percent each day) can greatly reduce the employee's susceptibility to heat stress.

### Heat Stress Resources

IU EHS:

<http://ehs.iu.edu/topics/occupational-safety/heat-stress.shtml>

OSHA: <http://www.osha.gov/SLTC/heatstress/>

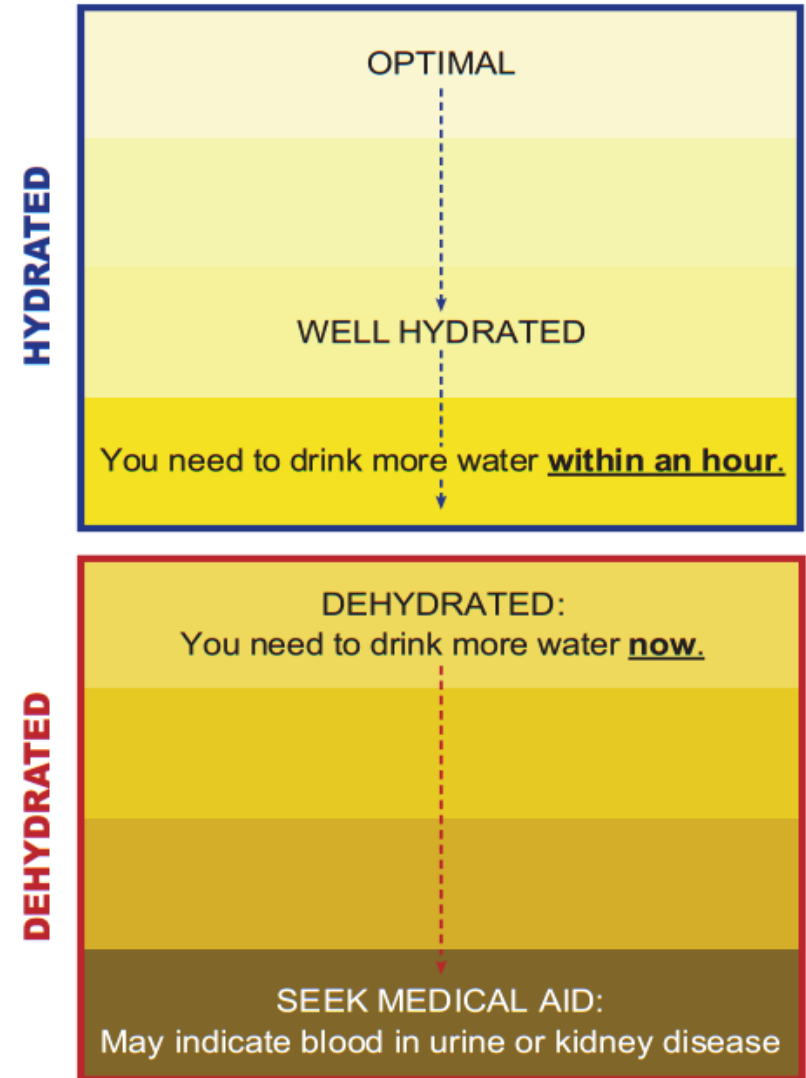
CDC:

<http://www.bt.cdc.gov/disasters/extremeheat>

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Special thanks to Eastern Washington University for providing the template.

## Urine Color Chart\*



\*This color chart is not for clinical use.