



COLD HARD FACTS: COLD STRESS IS DANGEROUS

AN ERGODYNE WHITE PAPER

COLD AIR IS NOT GOOD FOR YOU (OR WHY BEING “FULL OF HOT AIR” IS)

When we're young we take in a lot of tall tales—otherwise known as misinformation. One of them is the idea that cold air causes the common cold. Even though the common term for being sick (having a “cold”) comes from the belief that weather can cause illness, we're eventually smart enough to know that these are infections caused by bacteria and viruses.

Still, cold air can present a serious threat to the body's vital organs and systems.

The body uses a few different means to protect itself from cold, the first lines of defense being the nose, mucus system, and lungs.

The nose is built to help protect the lungs. Adding and extracting moisture and temperature, the nose adjusts the air heading to the lungs to a relative humidity of about 75% and a comfortable 98.6 degrees. When a person is exposed to cold temperatures, the tissue lining the nose swells as the capillaries open. This brings warm blood to the nose to heat the cold air. In fact, often it's too much blood in the nose (not increased mucus) which results in nasal congestion.

The body's next defense is mucus. The respiratory system is covered by a thin layer of this stuff – the “mucus blanket” – which acts as a filter, protecting the lungs from dangerous particles and organisms (including bacteria that can cause colds and infections). Mucus, like other substances, becomes thicker in cold temperatures. When this happens, the system might not work as effectively to remove inhaled viruses and bacteria.

Further, if cold air does reach the lungs despite nose and mucus defenses, lungs react with histamine – a natural chemical often released by the body during allergic reactions. In people with sensitive airways or asthma this causes wheezing.

On average, a human breathes 1,100 times per hour, with each breath measuring about one liter in volume. When this inhaled air is cold, the body works to heat the air to 98 degrees. This extra work represents a significant heat loss to the body that is preventable. So while catching a respiratory infection requires exposure to bacteria or organism, it still is more likely that an individual will become sick if he or she has been breathing cold air than if they were not.

There are countless other affects that cold can have on the body aside from the respiratory system. Unfortunately, the effects of cold on the body (i.e. cold stress) often go unnoticed until conditions have created a life or death situation. And while these sneak attacks can be deadly, cold stress is actually quite preventable if the proper precautions are taken.

WHAT IS COLD STRESS?

Extreme cold temperatures can affect the body in a number of ways. These include dehydration, numbness, shivering, frostbite, immersion foot (trench foot), and hypothermia. As the list shows, effects can be both local and systemic.

Shivering is the first and most common symptom. It's also the most often ignored. When the body drops below 98.6 degrees, blood begins to flow away from extremities and towards the core. This results in the immediate cooling of exposed skin and extremities and increases the risk of cold stress, specifically hypothermia. If body temps continue to fall, dexterity decreases and speech may be slurred. At 85 degrees Fahrenheit, severe hypothermia sets in which can result in unconsciousness. And at 78 degrees or below, the body is at maximum risk for brain damage and even death if not treated immediately.

SYMPTOMS OF HEAT LOSS AND HYPOTHERMIA

According to the CDC, early signs and symptoms of heat loss include:

- Shivering (first, most common symptom)
- Fatigue
- Loss of coordination
- Confusion and disorientation

Late symptoms of heat loss include

- No shivering
- Blue skin
- Dilated pupils
- Slowed pulse and breathing
- Loss of consciousness

If enough heat loss occurs, signs and symptoms of the resulting hypothermia include:

- Cool skin
- Slower, irregular breathing
- Slower heartbeat
- Weak pulse
- Uncontrollable shivering
- Severe shaking
- Rigid muscles
- Drowsiness
- Exhaustion
- Slurred speech
- Memory lapses

WHO IS AT RISK?

While workers in the construction, agriculture, maritime, and commercial fishing industries are often exposed to the most extreme risks, cold stress is not exclusive to outdoor workers.

People who work in cold storage or food processing, as well as those in facilities without heat or insulation, are also at risk. If workers do not have proper protection, the body is unable to warm itself, and, this can lead to serious cold-related illnesses, permanent tissue damage, or even death.

While risks are of course highest in colder regions, in areas where the seasons change less drastically, workers are often less prepared, and it can only take near freezing temperatures to trigger the onset of cold stress.

Individuals who are more prone to cold stress than others include those who are:

- Not physically fit

- Living with an underlying condition or illness (those with asthma or other respiratory ailments are particularly at risk)
- Under the influence of alcohol or drugs (illegal or prescription)
- Working in wet or damp conditions
- Exposed to vibration from tools
- Working without proper personal protective equipment (PPE)
- Not acclimated to the cold

NIP COLD STRESS IN THE BUD

- Employers can help protect workers from cold stress through several means. They should
- Provide training
- Control the work environment with heaters and windbreaks
- Establish worker rotations
- Schedule work during the warmer hours of the day and times of the year
- Remind workers to pace themselves
- And keep emergency supplies on hand

Equally important, workers in cold conditions should themselves take necessary precautions to protect themselves from the cold, including wearing proper PPE and being aware of cold stress warning signs.

The CDC recommends the following safety tips for employers and workers:

- Train employees for the cold and changing weather
- Use a buddy system
- Adjust work schedules to the cold or changing weather
- Eat and drink hot or warm foods and liquids
- Layer clothing (water vapor permeability is important)
- Wear proper PPE

THE BENEFITS OF BREATHING 'HOT AIR'

To prevent the loss of body heat from breathing cold air, mountaineers and other extreme sport participants have used heat exchange facemasks and balaclavas for many decades. Similar to the value provided by putting warm food and liquids into the body, a heat exchanger provides warmth from the inside out. Heat exchangers capture the warmth and humidity from exhaled breath, store it temporarily, and warm and humidify inhaled air. Now, with the recent introduction of this technology to the workplace, workers have an additional opportunity to protect themselves on the job when temperatures are most extreme.

With a proper heat exchanger, condensation produced from exhaled breath stays on the mask – not on your face or your fleece – and most of it is evaporated and returned to your body. Heat exchangers also help workers maintain full lung capacity, which is especially important for individuals with underlying heart or respiratory problems. In fact, heat exchangers are so effective that workers often find that less PPE clothing is required while using one.

SUMMARY

Cold stress is just as dangerous as heat stress – but with its sneaky symptoms, it often goes undetected until it's too late. Awareness is key. Being informed about the dangers of cold stress and the importance of breathing warm air can help save lives and keeps workers warm, comfortable, and productive.

RESOURCES

CDC

- <http://www.cdc.gov/>

Benefits of Breathing War Air, Lee Bagby, President, QXtec, Inc

ELcosh

- <http://www.elcosh.org/en/document/428/d000420/cold-stress.html>

Talus Outdoor Technologies

- <http://www.talusoutdoor.com/coldavenger/technical-specifications>

PSolar Outdoor Performance Gear

- <http://www.psolar.com/faq.html>

Don't Leave Safety Out in the Cold, EHS Today

- http://ehstoday.com/ar/ehs_imp_76091/

State Compensation Insurance Fund

- <http://www.scif.com/safety/safetymeeting/Article.asp?ArticleID=17>

www.DrGreene.com