

# Heat Stress: Overview, Regulations and Solutions

Hosted by **TENAQUIP**  
OCCUPATIONAL HEALTH AND SAFETY

Speaker:

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## 2012 Canadian Heat Facts

- Many parts of Canada had **30+ days** of temperatures in excess of **30° C (86° F)**
- Average relative humidity during this time period was over **75%**
- The HEAT INDEX for the above calculates to a real temperature of **35° C (95° F)**
- Moving this into indoor warehouse applications will increase the real ambient temperature to **between 38° C (100° F) and 43° C (110° F)**
- Consider how the temperature increases when;
  - you are working in or around applications such as foundries, extrusion processes, bakeries, etc.
  - imagine what the real ambient temperature is when wearing flame resistant, impermeable clothing or standard work uniforms
- **FACT - MANY WORKERS ARE WORKING IN TEMPERATURES IN EXCESS OF 43° C (110° F)**



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- The hazards workers can be exposed to aren't always visible to the naked eye and heat is one example
- Exposure to extreme heat, whether due to the weather or from equipment, can make workers sick—and even kill them
- Employers need to understand their duty and how to protect workers from heat stress
- Heat illness is dangerous but it doesn't strike without warning



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- There are usually signs and symptoms associated with the various forms of heat illness which are collectively referred to as HEAT STRESS
- Supervisors and workers aren't always attuned to these signs - they lose the chance to help themselves or their co-workers
- It's essential to educate your workers and supervisors about the dangers of heat stress
- Education isn't just required by law; it can be the difference between life and death.



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- Although it's not an officially recognized term, there is a "law of heat stress"
- There is a legal duty on the part of employers in Canada to protect workers against heat stress risks
- Failure to meet this obligation exposes your workforce to illness and death and your company to prosecution, stop-work orders, fines and even criminal liability under bill C-45



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- Trying to find “the law of heat stress” can be tricky, especially if you come from a province like Alberta or Ontario where the laws don’t even mention the topic
- Even in those provinces there is a law of heat stress
- We’ll show you “where” the laws of heat stress are found; how different provinces regulate heat stress; and outline what employers are required to do when dealing with heat stress



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## The Five Indirect Regulation Provinces

- In Canada, there are five provinces where the OHS regulations don't mention heat stress— AB, MB, NT, NU and ON
- It might appear that employers in these provinces don't have an obligation to protect against heat stress - this is completely untrue
- All of the various OHS statutes include a broadly worded provision that requires employers to ensure a generally safe and healthy workplace
  - **For example**, Section 25(2)(h) of the Ontario OHS Act requires employers to “take every reasonable precaution in the circumstances for the protection of the worker”
  - This is referred to as the “General Duty” clause
  - The government can use the clause to require employers to guard against hazards that aren't specifically mentioned in the OHS regulations—such as heat stress



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- At least two provinces have done this:
  - In 1998, Manitoba Labour issued guidelines stating that “regulating exposure to hot environments” . . . “is part of the employer’s overall responsibility to provide a safe and healthy workplace under Sec. 4(2),” (Manitoba’s version of the General Duty clause)
  - In 2003, the Ontario Ministry of Labour (MOL) published guidelines stating that developing “hot environment policies and procedures to protect workers” is required “under Section 25(2) (h)”.
- Provinces that use the General Duty clause to impose heat stress requirements take things a step further: The regulatory agency that enforces the OHS laws in the province issues bulletins or guidelines listing specific measures for employers to take

## REMEMBER BILL C-45!



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## Here is what you need to know about the heat stress regulations of your province:



### Federal

- Labour Canada sets exposure limits based on temperature. Maximum levels which, if reached, require halting of operations and relocation or release of workers:
  - Food preparation areas: 29°C
  - Materials Handling-operators compartments: 27°C
  - First aid rooms: 24°C
- Treasury Board Guidelines sets exposure limits for office work based on Humidex: 26°C - 41°C Humidex Stop work at 41°C Humidex
- Emergency plans required in extreme environments
- Guidelines recommend monitoring with American Conference of Government Industrial Hygienists (ACGIH) threshold limit values (TLVs) for physical agents
- Using engineering controls, safe work practices and training

*(CCOHS "OSH Answers: Hot Environments - Control Measures" Sept 18, 2001)*



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# Requirements By Jurisdiction

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## British Columbia Regulations require:



- Complying with ACGIH TLVs and clothing correction provisions
- Heat stress assessment and an exposure control plan if exposure levels warrant
- Use of engineering controls to limit exposure, if “practicable”
- If not practicable, use of administrative controls and PPE; 5. Providing “adequate supply of cool potable water” near the site
- Removal by first aid attendant or doctor of workers who show signs or report symptoms of heat stress

*(OHS Regulation, Part 7, Secs. 7.27-32) (more fully explained in Guidelines, Jan. 1, 2005)*

## Alberta No regulations.



## Guidelines recommend:

- Engineering and work controls
- Complying with ACGIH TLVs

*(“Workplace Health and Safety Bulletin: Working in the Heat,” April 2004)*



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## Saskatchewan Regulations require:



- Maintaining “reasonable thermal comfort” (accounting for air temperature, radiant temperature, humidity and air movement) at indoor workplaces
- Measure conditions at indoor workplaces where thermal environment “is likely to be a health or safety concern”
- At outdoor workplaces or indoor workplaces where it’s “not reasonably practicable” to control thermal conditions, use administrative controls to ensure thermal comfort
- Require workers who aren’t used to working in hot conditions to use PPE and appropriate clothing

*(OHS Reg., Sec. 70).*

## Guidelines require:

- Offices and retail outlets to comply with thermal comfort guidelines of American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)

*(Saskatchewan Labour, “Thermal Comfort in Offices and Retail Outlets” )*



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## Manitoba

No regulations.



### Guidelines recommend:

- Complying with ACGIH TLVs
- Engineering controls to cool the workplace
- Use of administrative controls if engineering controls aren't feasible
- Or, if that's not feasible either, use of PPE
- Creation of a plan including procedures for acclimatization and educating workers

*("Guidelines for Work in Hot Environments," Feb. 1998)*



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## Ontario



No regulations.

### **MOL guidelines require:**

- Developing hot environment policies and procedures;

### **MOL guidelines recommend:**

- Complying with ACGIH TLVs
- Use of engineering controls
- Use of administrative controls
- Use of PPE

*(MOL Guidelines, "Heat Stress," Aug. 12, 2005)*



Quebec



Regulations require:

- Workplaces of over 50 that meet or exceed continuous work curve must take Wet Bulb Globe Temperature (WBGT) measures twice a year, including during summer at each work station meeting or exceeding curve
- Any workplace that exceeds curve must provide medical supervision, water between 10-15°C and one shower per 15 exposed workers
- Use of engineering controls including reflecting screens and ventilation
- If engineering controls don't get the heat down, use administrative controls such as control of work load, time of exposure and rest
- If neither engineering or administrative controls work, use of PPE materials

*(OHS Regs., Div. XIII)*



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# Requirements By Jurisdiction

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## New Brunswick Regulations Require:



- Competent person must measure and record thermal conditions at “frequent intervals”
- JHSC access to findings
- Complying with ACGIH TLVs
- Instruction of exposed workers about risks of heat stress

*(OHS Regulations, Secs. 22-23)*

## Nova Scotia Regulations Require:



- Complying with ACGIH TLVs

*(Occupational Health Regs., Sec. 4(1))*

## Government bulletin suggests:

- Offices must meet thermal comfort standards set out in CSA Standard Z412-00 on Office Ergonomics

*(NS Environment and Labour, Health and Safety, “Heat Stress,” July 1, 2002)*



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## Prince Edward Island Regulations Require:



- Complying with ACGIH TLVs

## Guidelines recommend:

- Use of engineering controls
- Use of administrative controls
- Use of PPE

*(PEI Workers' Comp. Board, "Guide to Heat Stress," Jan. 2003)*



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## Newfoundland/Labrador Regulations Require:



- Complying with ACGIH TLVs
- Monitoring
- Administrative controls such as posting of warning notices, providing special equipment or clothing, medical supervision, cold drinks, acclimatization and limited work schedules with rest periods
- Shielding of open flames, steam pipes, and other high temperature sources to prevent burns or is that's not possible provision of PPE

*(OHS Reg., Sec. 10)*



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# Requirements By Jurisdiction

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Yukon



## Regulations Require:

- Maintaining “reasonable and appropriate” thermal condition (accounting for air temperature, radiant temperature, humidity and air movement) at indoor workplaces;
- Measure conditions at indoor workplaces where thermal environment “is likely to be “of discomfort or danger”; and
- At outdoor workplaces or indoor workplaces where it’s “not reasonably practicable” to control thermal conditions, use administrative controls and appropriate PPE or clothing to ensure thermal comfort (Occupational Health Reg., Sec. 9(e)). Government bulletin recommend:
- Training workers on the dangers of heat stress;
- Use of WBGT to monitor risks; and
- Use of a Sling Psychrometer to provide heat-humidity readings in offices, retail outlets and “other workplaces where heat conditions may cause discomfort and fatigue, but not serious illness”

*(Workers’ Comp. Board, “OHS Bulletin: Hot Working Conditions)*



Northwest Territories & Nunavut

No regulations or guidelines addressing heat stress.



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- The law of heat stress boils down to five principles:
  - 1. Conduct heat stress assessments to determine workers' risks of hazardous exposure**
  - 2. Develop a heat stress exposure control plan**
  - 3. Implement engineering or administrative control policies & procedures**
  - 4. Train the worker on Heat Stress, the warning signs and the PPE being used to protect them**
  - 5. Enforce**



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## 1. Conduct Heat Stress Assessments

- **American Conference of Governmental Industrial Hygienists (ACGIH). Heat Stress Guideline:**

- The heat stress guide uses a Wet Bulb Globe Thermometer
- The WBGT will read environmental factors that lead to heat stress :
  - The wet bulb provides a measure of the evaporative effects of air speed and humidity
  - The dry bulb provides a measure of the ambient temperature, which will always be higher than the wet bulb reading
  - The Vernon globe provides a measure of radiant heat load
- The WBGT is a weighted average of all three



## Heat Index

32°C - 38°

Sun stroke, heat cramps and heat exhaustion are possible with prolonged exposure and physical activity.

40° - 54°

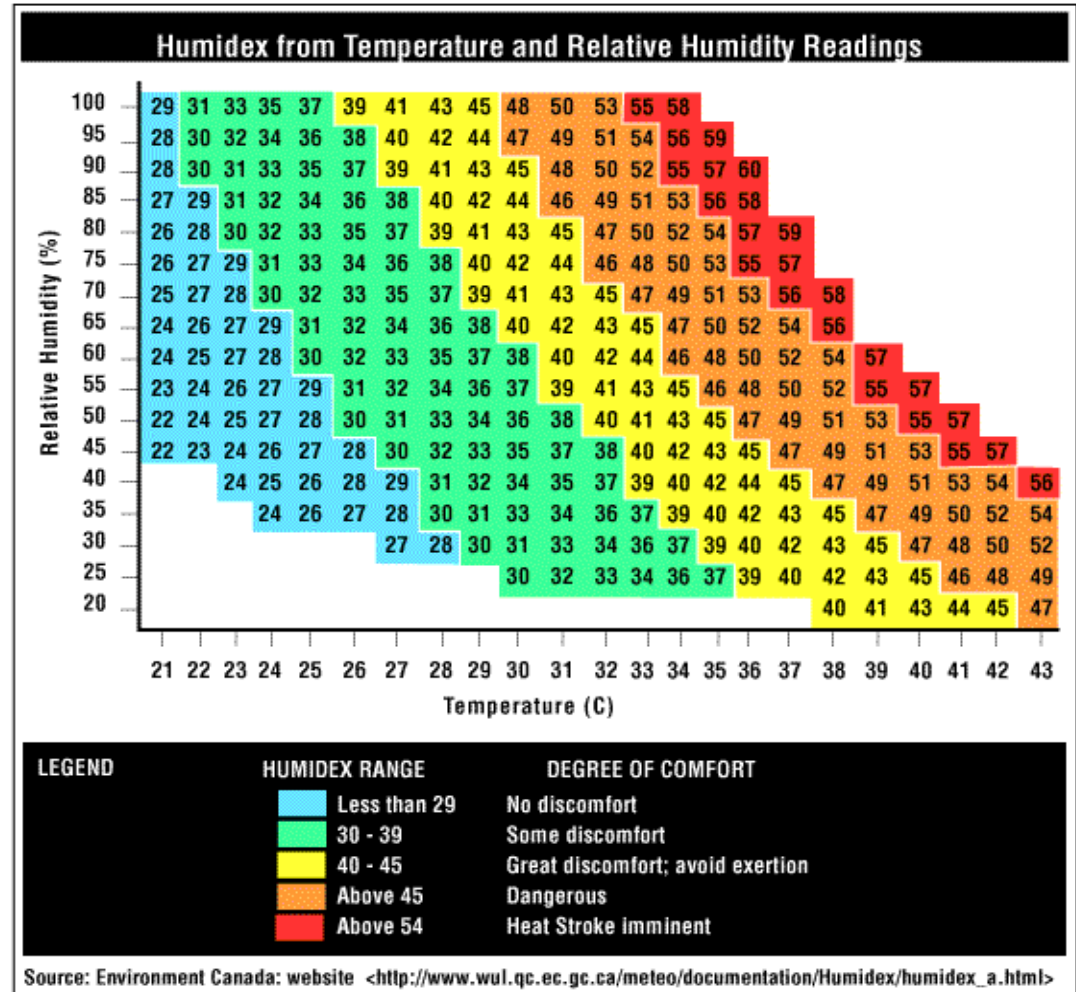
Sun stroke, heat cramps and heat exhaustion are likely. Heat stroke possible with prolonged exposure and physical activity.

54° or higher

Heat stroke or sun stroke imminent.

### How to Use the Heat Index:

1. Across the bottom (air temperature) locate today's predicted high temperature.
2. Down the left hand side (relative humidity) located today's predicted humidity.
3. Follow across and down to find "Apparent Temperature" or "What it Feels Like".



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## 2. Develop a heat stress exposure control plan

- It's the employers responsibility to develop policies and programs to protect the worker from heat stress
- Plan should include administrative controls such as:
  - Assessing job demands and monitoring control strategies
  - Longer and more frequent rest breaks
  - Scheduling strenuous job tasks for cooler times of the day
  - Providing cool drinking water and rehydration drinks near workers and reminding them to drink a cup every 20 minutes or so (*Note: Providing workers drinkable water is required by every province*)
  - Provide cooling apparel to keep the workers core body temperature down
  - Limiting how long workers work in direct sunlight
  - Assigning additional workers or slowing down the work pace
  - Making sure everyone is properly acclimatized
  - Starting a "buddy system"
  - Implementing first aid and emergency response plans for workers with symptoms of heat stress (*another mandatory requirement*)



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## 3. Implement engineering or administrative control policies & procedures

- Consider using engineering measures to control how hot your workplace gets including:
  - Insulation and reflective heat barriers;
  - Exhausting hot air and steam;
  - Air conditioning;
  - Using fans to keep air moving (provided that the temperature is less than 35 degrees); and
  - Using machinery, such as hoists and lift tables, to make work less strenuous



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4. **Train the worker on Heat Stress, the warning signs and the PPE being used to protect them**
- It's clear that the employer has to train the worker on the key issues surrounding heat hazards in the workplace:
    - Ensure that workers are aware of the employers heat stress policy
    - When does the program come into effect
    - What temperature activates the program
    - Signs and symptoms of heat stress
    - Cooling apparel and hydration programs
    - Train on heat stress emergency response



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# What Causes Dehydration?

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- Dehydration is caused daily through means other than hot environments, including:

- Improper diet
- Caffeine
- Nicotine
- Stress
- Alcohol/drug use and abuse
- Inclement weather

To name a few...



- In today's working environment, not only do workers suffer from heat & cold stress but also from work stress
- There are fewer people in the factory or office, producing more product and doing more than one job



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## Body overview and effects of fluid imbalance.

### The body is 60-70% water

Maintaining and balancing the body's fluid levels is imperative. A healthy adult, in moderate climate is recommended to drink 13(men), 9(women) cups of water a day. In a hotter and/or strenuous activity, an increase in fluid intake is required to maintain a proper level. (\*Varying factors: age, gender, environment and conditioning.)



### Consequences of fluid loss and neglect of fluid imbalance.

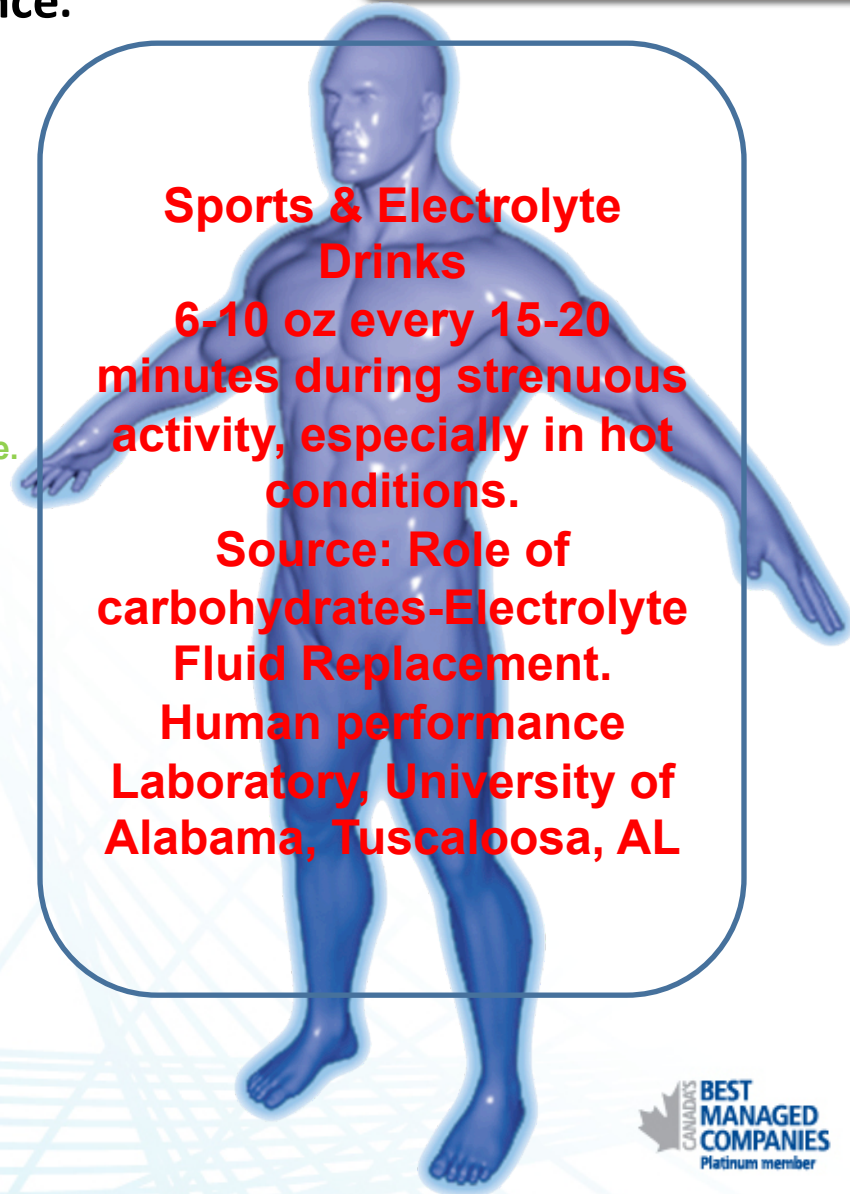
#### Fluid Loss..... Result

2% .....	Impaired performance
4% .....	Muscular Function & Capacity Declines
6% .....	Heat Exhaustion
8% .....	Hallucination
10% .....	Circulatory Collapse & Heat Stroke



Factors that contribute to elevating body temperature and rapid fluid loss:

- High temperature & Humidity
- Level of Exertion / Work Load or Strain
- Poor Airflow & Circulation
- Lack of Physical of Conditioning
- Medical Preconditioning



## Sports & Electrolyte Drinks

6-10 oz every 15-20 minutes during strenuous activity, especially in hot conditions.

Source: Role of carbohydrates-Electrolyte Fluid Replacement. Human performance Laboratory, University of Alabama, Tuscaloosa, AL



## HYDRATION LEVEL CHART

Use the color chart to identify hydration level.

### TARGET LEVEL

Maintain level



PROPERLY HYDRATED - If urine resembles or matches these colors.

### DEHYDRATED

Needs improvement



DEHYDRATED - If urine resembles or matches these colors more fluids should be consumed.

### SEVERELY DEHYDRATED

Immediate attention



SEVERELY DEHYDRATED - If urine matches these colors **SERIOUS DEHYDRATION** has occurred. It is suggested that a physician be contacted to determine the severity of dehydration.

**WARNING**



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- Many workers wait until they are thirsty to start the rehydration process
- Up to a quart (32 oz.) of body fluids can be lost during a one hour work period
- When the first sign of thirst develops a worker is approximately 3% dehydrated which can reduce their overall work performance by up to 15%
- Workers sweat out electrolytes along with fluids
- We only replace electrolytes via foods or drinks containing electrolytes



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# PROTECTING YOU FROM THE INSIDE OUT



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- Is a great tasting citrus and fruit flavored rehydration drink
- Is **scientifically formulated** to replace important body salts and fluids lost through dehydration caused by work stress and heat prostration
- Helps prevent the ill and **costly effects of dehydration**
- Provides a supplemental source of energy, and quenches thirst in a great tasting way
- Has **year round application** for the prevention of acute or chronic body fluid loss



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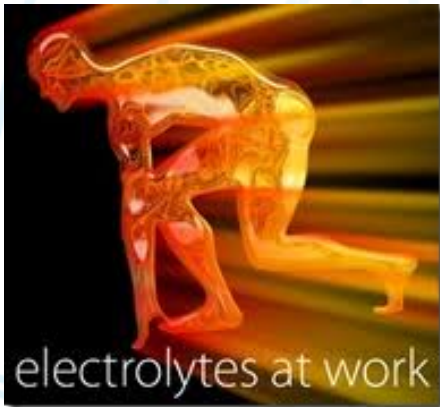
## What's In Sqwincher?

- Minerals such as potassium, sodium, magnesium and calcium that the body needs to function properly
- These minerals are lost through perspiration or other forms of dehydration
- Under ideal conditions these minerals flow through muscle cells to keep them functioning normally



## How It Works

- Perspiration depletes cells of fluids and weakens the muscle tissue
- This causes workers to be less alert, less productive, and more prone to accidents
- Within seconds of drinking Sqwincher, electrolytes and energy are put back where they belong



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## Electrolytes Have 3 Major Functions

1. Replace fluids lost through perspiration during exertion
2. Replace vital mineral salts potassium and sodium, which are needed to maintain the body's electrolyte balance
3. Glucose and fructose provide an energy boost for tired muscles



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## What Are the Functions of Major Nutrient Minerals?

### SODIUM

- Body salt that retains water around the muscle cell thus keeping it hydrated.
- Deficiency results in muscular weakness, lethargy, and loss of appetite

### PHOSPHATES

- Components of high energy compounds manufactured by the body. They are component parts of a buffer system that helps to maintain normal acid balance and are important in the mineralization of bones and teeth

### POTASSIUM

- The mineral that keeps the muscles functioning.
- The chief features of deficiency are muscular weakness and mental apathy

### CALCIUM & MAGNESIUM

- The nutrient minerals that facilitate the passage of the primary electrolytes, potassium and sodium, to the muscle cell



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# Sqwincher Vs. Water

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- Water can quench mouth thirst, but it cannot immediately restore body thirst which requires the replacement of Electrolytes that water does not contain
- Water is absorbed slowly from the stomach and cannot be retained in the extra-cellular cavity where dehydration has occurred.
- Sqwincher is isotonicly formulated, goes to work faster than pure water.
- Restores important body salts to the muscle cells within seconds of drinking, restoring energy levels



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- **Sqwincher should not be used to replace water!**
- The body needs water to function properly
- The body also needs minerals and important body salts to function properly and water can not supply those
- A proper hydration program consists of the regular use of water replacing the fluid levels in the body, complimented with...
- Sqwincher...which re-hydrates the body's mineral requirements



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# Sqwincher Vs. The Competition

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- Sqwincher has **50% less sodium** than most competitive activity drinks
- Sqwincher has **80% more potassium** than most competitive activity drinks

PRODUCT COMPARISON					
PRODUCT	SODIUM	POTASSIUM	MAGNESIUM	CARBOHYDRATES	CALORIES
SQWINCHER <sup>®</sup>	55 mg	45 mg	.47 mg	17 g	60
SQWINCHER <sup>®</sup> LITE	55 mg	45 mg	.47 mg	0 g	0 g
GATORADE <sup>®</sup>	110 mg	30 mg	not shown	14 g	50
POWERADE <sup>®</sup>	100 mg	25 mg	not shown	14 g	50
AVG. SOFT DRINK	16 mg	13 mg	not shown	26.8 g	107

Gatorade and Powerade are registered trademarks. Product comparison based on an 8 oz. serving.



## AND IT TASTES BETTER!

In a recent blind taste test of the five leading rehydration drinks Sqwincher was chosen to be the best tasting, most overall accepted drink available to industry



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# Why Is Taste Important?

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- If they like the taste, they will drink the product rehydrating their body with important body salts and minerals
- If they replenish these minerals, they will be protected against heat, cold & work stress related injuries, be more alert and more productive
- When employees are more alert and productive, the company is more profitable



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# Two Great Tasting Formulas

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- Standard formula contains potassium, sodium, magnesium
- Carbohydrates, calories
- Sugars source - fructose & glucose.
- Great taste!



- The zero carbs, zero calorie solution formulated for diabetics or consumers watching their daily carbohydrate intake
- Contains the same levels of sodium and potassium as standard Squwincher without the sugars
- And it tastes great!



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# Sqwincher Options

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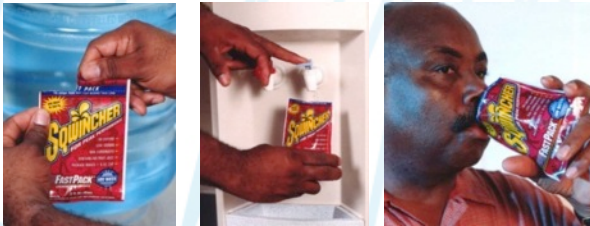
## Liquid Concentrate

- 2.5 & 5 Gallon Yield
- Available in standard and lite formulas



## Fast Packs

- 6 oz. Yield
- Available in standard formula



## Qwik Stiks

- 20 oz. Yield
- Available in lite formula



## Qwik Stik Kwik Pak

- Contains 16 Qwik Stiks (4 x 4 flavours)
- Convenient pack fits easily into pockets, first aid kits, etc.



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# Sqwincher Options

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## Powder Pack

- 5 Gallon Yield
- Available in standard formula



## Squeeze Freezer Pops

- 3 oz. servings
- Available in standard formula

## Ready-to-Drink (RTD)

- 20 oz. bottle available in standard formula
- 12 oz. bottle available in lite formula



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# Thank you

For regulations summary and other resources: [www.tenaquip.com/heatstress](http://www.tenaquip.com/heatstress)

**Questions?**