Keep Hydrated, Stay Productive.

Name

Company

Title

Signature

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WHY DO WE NEED FLUID?

Almost every bodily process requires water to carry the function out. The human body can survive for a far longer period without food than it can without water.

The body cannot produce water by itself so any fluid lost must be replaced. The amount required depends on body size, metabolism, climatic conditions, the food we eat and activity levels.

Fluid deficiencies will eventually lead to Dehydration, Heat Stress and Fatigue (DHF).

How Do We Lose Fluid?

The body may lose fluids in a variety of ways:

- Breathing
- Urinating
- Sweating
- Vomiting
- Diarrhea

The rate at which fluid is lost may be increased by intensified physical exercise, and hot or humid weather conditions.

WHAT IS DEHYDRATION (D)?

Dehydration adversely affects worker productivity, safety and morale.[1] Loss of fluids can affect cognitive abilities, reduce performance and slow reaction times.[2,3,4] This can lead to reduced output and careless work practices which may contribute to serious accidents in the workplace.

At just 1% dehydration, productivity reduces by about 12%.[1,2] At 2% dehydration, heart rate increases by 8 beats per minute (bpm) which increases perception of effort and reduces body performance by up to 30%.[1,5]

At 3% dehydration, heart rate increases by 12bpm and performance is reduced by 25-50%. Reaction time is also slowed to levels similar to that of having a .08 Blood Alcohol Content (.03 above the legal driving limit).[1,6]

At .08 BAC (Blood Alcohol Content) drivers are five times more likely to be in a car accident.[7] Similarly, the more dehydrated workers become, the more a Loss Time Incident (LTI) is likely to occur.

Dehydration occurs when fluids and nutrients are lost from the body at a faster rate than they are replaced. This results in an imbalance of the essential components of an efficiently working body.

Blood consists of 90% water and is responsible for the efficient transportation of vital nutrients around the body.

Any imbalance reduces the efficiency of our bodies.

Stages of Dehydration

Symptoms of dehydration are difficult to determine in the early stages, but can include dryness of the mouth and thirst, dry, warm skin, dizziness, or cramping in the arms and legs.

As dehydration increases, signs may include:

- Facial flushing
- Increased pulse rate
- Darker urine
- Passing less urine than normal
- Sunken eyes
- Irritability
- Drowsiness
- Irrational thinking
- Skin inelasticity

WHAT IS HEAT STRESS (H)?

Heat stress occurs when the body cannot cool itself enough to maintain a healthy temperature (37°C in a grown adult). Ordinarily, the body cools itself by sweating, however occasionally conditions may be too extreme for the body to cool itself by sweating alone which sends the body into a state of heat stress.

Overexertion in hot weather, sun or bushfire exposure, and exercising or working in hot, poorly ventilated or confined areas can increase the risk of heat stress.

Protection From Dehydration and Heat Stress

If symptoms of dehydration and heat stress are observed, Seek shaded or cooler areas indoors; Replace lost body fluids and cool down with a cool shower or sponge bath; Seek medical attention if the symptoms get worse or last for more than an hour.

Advanced symptoms such as dry, red skin, a fast pulse, confusion or delirium, or increased body temperature, indicate that person is in extreme danger and should seek immediate medical attention.

In severe cases, heat stress can result in the body going into a state of shock and can even cause death.

During hot weather it is sensible to drink fluid before the body reacts with the thirst response.

Other things you can do to avoid dehydration and heat stress during hot weather include:

- Avoid working in direct sunlight
- Arrange outdoor work either early in the morning or late in the afternoon
- Wear SPF 50+ sunscreen, a hat that shades your face, head, neck, and ears
- Wear cool, loose clothing that permits good airflow

By recognising the signs of dehydration and taking measures to prevent it, you can maximise your efficiency at home, at play or in the workplace.

WHAT IS HEAT STRESS (H)?

Hyperthermia is an elevated body temperature due to failed thermoregulation. Hyperthermia occurs when the body produces or absorbs more heat than it can dissipate. When the elevated body temperatures are sufficiently high, hyperthermia is a medical emergency and requires immediate treatment to prevent disability or death. (N.B The opposite of hyperthermia is hypothermia, which occurs when an organism's temperature drops below that required for normal metabolism.)

The following table is a list of conditions relating to heat stress, their symptoms and treatments.

CONDITION	DESCRIPTION
Heat Stroke	Heat stroke is an acute condition of hyperthermia that is caused by prolonged exposure to excessive heat or heat and humidity. The heat-regulating mechanisms of the body eventually become overwhelmed and unable to effectively deal with the heat, causing the body temperature to climb uncontrollably.
Heat Exhaustion	Is the body's response to an excessive loss of fluids, salts and essential elements, usually through sweating. The body cools itself by sweating and allowing that sweat to evaporate. This requires enough fluid in the body to make sweat, air circulating across the skin, and low air humidity to allow that sweat to evaporate. If body temperature goes above 40°C, or if coma or seizure occurs, the patient may have heat stroke. Heat stroke can quickly lead to heart attack and death if not treated.
Heat Cramps	Sweating depletes the body's salt and fluid levels and can cause muscle cramps when undertaking strenuous activities. This can be dangerous when working in certain job situations.

Avoid heavy exertion, extreme heat, sun exposure, and high humidity when possible. When these cannot be avoided, take the following preventative steps:

- Monitor your physical condition and that of your co-workers for signs or symptoms of heat illnesses.
- Wear light-coloured, loose-fitting, breathable clothing such as cotton. Avoid non-breathable synthetic clothing.
- Gradually build up to heavy work. Schedule heavy work during the coolest parts of day.
- Take more breaks when doing heavier work, and in high heat and humidity take breaks in the shade or a cool area.
- Be aware that protective clothing or personal protective equipment may increase the risk of heat-related illnesses.

SYMPTOMS	FIRST AID
▪ High core body temperature ▪ Confusion ▪ Loss of coordination ▪ Hot, dry skin or profuse sweating ▪ Throbbing headache ▪ Seizures, coma	▪ Request immediate medical assistance. ▪ Move the worker to a cool, shaded area. ▪ Remove excess clothing and apply cool water to their body.
▪ Rapid heart beat ▪ Heavy sweating ▪ Extreme weakness or fatigue ▪ Dizziness ▪ Nausea, vomiting ▪ Irritability ▪ Fast, shallow breathing ▪ Slightly elevated body temperature	▪ Request immediate medical assistance. ▪ Move the worker to a cool, shaded area. ▪ Remove excess clothing and apply cool water to their body.
▪ Muscle cramps, pain, or spasms in the abdomen, arms or legs	▪ Stop all activity, and sit in a cool place. ▪ Drink Thorzt, or drink water with food. Avoid salt tablets. ▪ Don't return to strenuous work for a few hours after the cramps subside. ▪ Seek medical attention if you have the following: heart problems, are on a low-sodium diet, or if the cramps do not subside within one hour.

WHAT IS FATIGUE?

Fatigue is a general term commonly used to include feeling “sleepy”, “tired” or “exhausted”. Fatigue is both a physiological and a psychological experience.

A person suffering from fatigue generally has slowed reflexes and reduced functional efficiency.

Symptoms of Fatigue are easy to detect and include:

- Yawning
- Sore or heavy eyes
- Slower reaction times
- Daydreaming and lack of concentration
- Inconsistent driving speeds
- Impatience
- Impaired work skills
- Stiffness and cramps

These symptoms can be the cause of serious injury for workers when operating machinery, driving to and from work, making decisions on tasks at work that should not be made when fatigued.

Workplace Fatigue

Common workplace issues that can cause fatigue include:

- **Changes to the body clock** - Most people are designed to sleep during the night, a pattern set by a brain function called the circadian clock. Shift work can confuse the circadian clock.
- **Poor workplace practices** - Including long or irregular work hours, hard physical labour, stressful work environments (such as excessive noise or temperature extremes), boredom, working with little or no interaction with others, fixed concentration on a repetitive task or poor nutrition and fluid replacement.
- **Workplace stress** - Including job dissatisfaction, heavy workload, conflicts with bosses or colleagues, bullying, constant change, or threats to job security.
- **Burnout** - Strive for a 'life balance' - 'Workaholics', for example, put all their energies into their career, which puts their family life, social life and personal interests out of balance.

How to Beat Fatigue

There are many ways to reduce fatigue in the workplace, including:

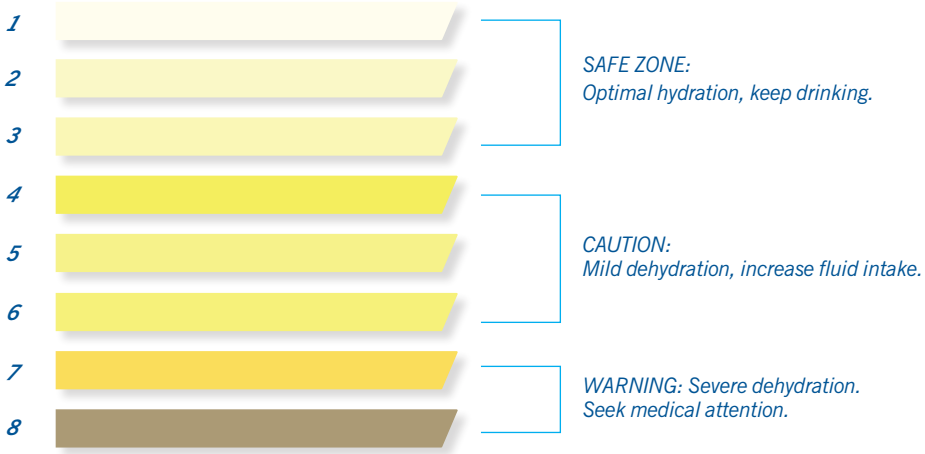
- A regular, adequate sleep pattern.
- Sharing the work load with a colleague where possible
- Avoid alcohol before work or driving.
- Ensure a regular, balanced intake of nutrients and fluids.

HYDRATION GUIDE

The following chart is a guide that outlines when to hydrate based on the colour of your urine.

If your urine matches the colours numbered 1, 2, or 3 you are hydrated, but keep drinking fluid.

If your urine matches the colours numbered 4 through 8 you are dehydrated and need to drink far more fluid.



Disclaimer: This chart is designed to be a guide only. Consider seeking medical advise if urine colour falls within 7 - 8 range. Vitamin supplements, alcohol and certain diets may affect urine colour.

Fluid requirements vary remarkably between workers and the actual task at hand. Fluid losses are affected by:

- **Genetics** - some people innately sweat more than others
- **Body size** - larger people tend to sweat more than smaller people
- **Fitness** - fitter people sweat earlier in exercise and in larger volumes
- **Environment** - sweat losses are higher in hot, humid conditions
- **Work intensity** - sweat losses increase as work intensity increases Lifestyle Factors- diet, alcohol consumption

Each kilogram (kg) of weight lost is equivalent to approximately one litre (L) of fluid. During hot weather we should be drinking fluid constantly, even if we are not thirsty.

Be Aware

Hypernatremia is a condition caused by the body being under hydrated or the body's salt levels being too concentrated. This condition should not be confused with Hyponatremia which is caused by either too much water, not enough salt, or a combination of the two.

FLUID REPLACEMENT

Drinking water replaces lost fluids but not essential salts, minerals, carbohydrates and amino acids needed to maintain optimum performance and productivity.

Sweat contains water, and essential salts known as electrolytes. In a thermally stressful environment like a mine site where workers can sweat anywhere from 1L-2.5L per hour,[6,8,9] a specially formulated mixture of electrolyte salts is required to replace fluid losses and re-establish the correct fluid-electrolyte balance.[1,10]

Electrolyte drinks increase water retention by 25%-40% compared with drinking water, assisting workers to avoid dehydration.[11] The addition of other ingredients such as Amino Acids will help the body to maintain stamina during prolonged physical activity.

WHAT ARE ELECTROLYTES?

Electrolytes are naturally occurring essential minerals that control osmosis or movement of water within the body. Electrolytes also help maintain the acid-base balance required for normal cellular activities.

Common electrolytes include Potassium, Calcium, Sodium, Chloride and Magnesium. The body depends on electrolytes to perform vital functions by sending electrical signals from the brain to nerves that activate your muscles to perform mechanical functions. Maintaining this electrical capability and voltage output of cellular communication is dependent on electrolytes.

Most bodily functions require electrolytes, especially during neuromuscular processes. When the body loses fluid and electrolytes, both must be replaced for the body to rehydrate, retain fluid and return to efficient functioning before heat illness sets in.

Magnesium – The Forgotten Electrolyte

A common result of strenuous physical work or exercise is magnesium loss. According to research a deficiency in magnesium may reduce physical performance and capacity as well as contribute to muscle cramps and weakness.

AMINO ACIDS

Branch Chain Amino Acids (isoleucine, leucine and valine) play an essential role in protein synthesis and muscle building as well as recovery, accounting for over a third of Essential Amino Acids.

The addition of amino acids to carbohydrate-electrolyte drinks has been shown to increase fluid retention 15% greater than carbohydrate-electrolyte-only drinks, and 40% greater than water.[11]

During extended shifts, or demanding work, adequate levels of Branch Chain Amino Acids prevent excess serotonin from collecting in the brain. This can lead to drowsiness, clouding judgement and increasing the risk of a Loss Time Incident (LTI).

Glutamine, a non-essential amino acid, is the most abundant amino acid (building block of protein) in the body. When the body's physiology is altered by factors, such as physical stress, its demands for extra glutamine can change drastically.

During extended periods of physical strain, glutamine is required by body organs in response to the increased stress levels. As a result, the body's glutamine levels begin to plummet and additional glutamine is essential to maintain performance.

CLIMATE AND WORK

Australia is an extreme climate that is only becoming more extreme. According to the Bureau of Meteorology, there is an upward trend in the mean temperature of the hottest day of the year, increasing by around 1° over the last 100 years.

In Australia and surrounding regions, a workplace heat stress management programme is an essential part of a safe workplace at all times of the year. Studies have shown that workers do not become dehydrated when they are well informed and follow a programmed drinking regime.

The average industrial worker sweats at a rate of over 1L per hour working in a thermally stressfully environment, which can rapidly lead to large fluid deficits.[6] A programme that involves regular, controlled fluid intake (Recommendation: 250ml every 15-20 minutes when working in warm environments [1,6,12]) of both water and electrolytes for the retention of fluid, as well as amino acids for endurance and recovery makes occupational health and safety sense in extreme working conditions.

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PERSONAL HEAT STRESS MANAGEMENT DAILY CHECKLIST

Ensure each point is understood and has been checked off prior to work commencing. If you are unsure please ask your supervisor/employer or simply call THORZT on 1800 THORZT (846 798).

- ☑ Come to work adequately hydrated. Ensure fluid has been consumed well before work starts.
- ☑ Maintain hydration state during work (urine colour and volume). **Refer to page 10.**
- ☑ Carry drink bottle at all times and drink while commuting to and from worksite.
- ☑ Understand the effects of pre-existing medical conditions and personal habits (e.g. overweight, excessive alcohol consumption) on susceptibility to heat stress/heat illness.
- ☑ Drink fluid consistently throughout the day. Recommended volume is 250ml every 20 minutes.[1,6,12]
- ☑ Consume food at regular meal breaks in order to maintain energy and replace electrolytes.
- ☑ Reduce consumption of caffeinated drinks before or during work due to dehydrating effects.
- ☑ Know the importance of adequate sleep and rest. Fatigue can be fatal. **Refer to pages 8 and 9**.

FLUID MANAGEMENT FORM

Name: _____ **Role/Activities:** _____

Weigh In: _____ **Weight Out:** _____

Fluid Consumed on Shift:

Hour 1: _____ mls	**Hour 5:** _____ mls	**Hour 9:** _____ mls
Hour 2: _____ mls	**Hour 6:** _____ mls	**Hour 10:** _____ mls
Hour 3: _____ mls	**Hour 7:** _____ mls	**Hour 11:** _____ mls
Hour 4: _____ mls	**Hour 8:** _____ mls	**Hour 12:** _____ mls

Dehydration is calculated as Percentage Body Weight Loss (BWL), such that 1%BWL = 1% Dehydration.

FIG 1 (right) shows calculations based on an 80kg adult male.

BWL	% DEHYDRATION	FLUID DEFICIT
0.8kg	1%	0.8L
1.6kg	2%	1.6L
2.4kg	3%	2.4L
3.2kg	4%	3.2L

Fig.1 Percentage Dehydration calculated based on an 80kg Male

For More Information Please Contact THORZT

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