# DRINK-UP: The dangers of dehydration

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## *Case Study*

Cadet Captain Jones arrived at the SAREX ready to go. A little tired from dancing late into the night the prior evening, to help wake herself up Jones started the day with a 5 K run and then downed a couple of Red Bull™ energy drinks. After getting the mission briefing she had a cup of coffee and was ready for a day in the field. A good athlete used to distance running, Jones was confident she could not only keep up with the ground team, but be in the lead. After all, she was in great shape and this would just be a walk in the woods.

It looked like it was going to be a hot August day. C/Captain Jones was wearing her BDUs, undershirt, and cap, and carrying a full pack for a possible overnight stay in the field. Jones believed in leadership by example. So, in addition to her own equipment, she decided to carry the extra equipment rather than assign the heavy lifting to someone else.

After about an hour in the field Jones started to sweat, more than she usually did when on a run. Three hours later Jones noticed that her mouth was dry and admitted to herself that she was a bit thirsty. She decided to take a few small gulps of water. After another hour, Jones started to feel dizzy and developed a headache. She drank some more water and took a couple of Tylenol.

By now the temperature had climbed to 88° F. Jones was surprised that she had stopped sweating since she felt increasingly warm. She was breathing rapidly, becoming tired and to others seemed confused. Realizing what was happening, her fellow team members stopped the mission and had Jones drink more water, but by then it was too late. Jones had become severely dehydrated. By not staying adequately hydrated, Jones had harmed herself, her team, and the mission.

## *What is dehydration?*

Dehydration comes from Greek and means without (de) water (hydra). Dehydration occurs when your body loses more fluid than you take in.

We normally lose water every day in the form of water vapor in the breath we exhale, and as water in sweat, urine, and stool. When we engage in vigorous activities we lose even more water. Water can also be lost if you have a fever, develop vomiting and diarrhea from an intestinal illness, or even from an increase in urination from caffeine and alcohol. If you do not replenish the fluid your body has lost your body will literally dry out; you will have become dehydrated.

## *How do I know if I am dehydrated?*

There are numerous symptoms of dehydration ranging from mild to severe. While thirst is the most obvious symptom of dehydration, it is actually only one of many. Thirst is also not considered to be a reliable gauge of how much water the body needs.

As CAP members we need to not only be able to recognize when we ourselves are getting dehydrated, but we also need to be able to recognize dehydration in each other.

**Symptoms of mild to moderate dehydration**

- Thirst
- Dry, sticky mouth
- Dark urine and decreased urination
- Dizziness or lightheadedness
- Tiredness or sleepiness
- Dry skin
- Headache
- Few or no tears when crying
- Constipation
- Children less active than usual

**Symptoms of severe dehydration**

- Extreme thirst
- Very dry mouth, skin, and eyes
- Lack of sweating
- Little or no urination
- No tears
- Sunken eyes
- Rapid heartbeat
- Rapid breathing
- Low blood pressure
- Fever
- Abdominal cramps
- In children—extreme fussiness or sleepiness
- In adults—irritability and/or confusion
- In extreme cases—delirium or unconsciousness

Mild and moderate dehydration is usually treated with drinking more fluid. Severe dehydration, on the other hand, is an emergency, can be life-threatening, and needs immediate medical attention.

## *What are the common causes of fluid loss leading to dehydration?*

- **Increased activity -** Vigorous activity promotes water loss from sweating, which, in turn, can lead to dehydration. Why do we sweat? Sweating is the mechanism our body uses to cool ourselves. When we perspire sweat glands on the skin release water that layers on top of the skin. When the sweat evaporates it makes us feel cool. This is why we feel hotter on a humid day. When the air is dry it is easy for the water on our skin to evaporate since the water is going from an area of high saturation (our skin coated with water) to an area of low saturation (dry air). On the other hand, humid air is already filled with water so on a humid day the water on our skin has no place to go. Athletes are at risk for dehydration since they engage in intense physical activity often on hot and humid days and may not take the time to properly hydrate. A good coach knows this and rotates players off the field so they can cool-off and take-in some fluid. CAP members, especially ground teams, are also at risk for dehydration from increased activity, carrying heavy packs, and not taking the time to hydrate. A good team leader knows the importance of resting her people and making sure they are well hydrated.
- **Gastroenteritis -** Vomiting and diarrhea can occur abruptly in someone who has picked-up an intestinal bug. The vomiting and diarrhea can be voluminous and can rapidly cause severe dehydration. Infants, young children, and the elderly are especially at risk.
- **Fever -** A fever from any cause can lead to dehydration both from evaporation and from our body working to fight off an illness.
- **Increased urination -** Increased urination is commonly caused by medications. Antihistamines, which are drugs often taken when we have a cold to "dry up" watery eyes and a runny nose, can lead to dehydration. Diuretics, which are used by doctors to get rid of excess fluid in patients who are fluid overloaded, can easily cause dehydration if the patient is given too much. Increased urination can also be seen in poorly controlled diabetes. In fact, increased thirst and having to urinate frequently are the two most common symptoms diabetics experience when their diabetes in not under optimal control.
- **Caffeine and alcohol** - Caffeine and alcohol have a diuretic effect and can lead to dehydration from increased urination.

## *Are there any serious complications from dehydration?*

If left untreated, dehydration can lead to a number of serious complications.

- **Heat injury** Heat exhaustion and heat stroke can result from dehydration.
    - **Heat exhaustion** can occur when a person is performing strenuous physical activity on a hot day. The body gets dehydrated and overheats. As a result, the person develops a fever, although usually not higher than 104° F.
    - **Heat stroke** is a life-threatening medical condition. The body's cooling system shuts down and the core temperature can rise to

105° F or greater. Such a high temperature can cause damage to internal organs.

- **Seizures** can occur due to an electrolyte imbalance. Electrolytes, such as sodium and potassium, help carry electronic signals between cells and throughout the body. When there is an electrolyte imbalance, which can occur both as a result of dehydration as well as re-hydration, the normal electrical signals can become disordered and lead to seizures.
- **Shock**, which is when a person's blood pressure becomes dangerously low, can occur as a result of dehydration. The main purpose of blood is to deliver oxygen throughout our body. When a person is in shock the blood pressure is not high enough to pump enough oxygen-rich blood for the body to properly function. As a result, our body is then deprived of oxygen, which can lead to organ damage.
- **Kidney failure** can occur due to severe dehydration. The kidneys function to remove excess water and waste from our bodies. Therefore, when the kidneys fail, both fluid and waste can build up and damage our internal organs.
- **Coma and death** can occur if severe dehydration is left untreated.

## *What can you do to prevent dehydration?*

There are a number of common sense things you can do to prevent dehydration.

- Avoid excess exercise in hot and humid weather.
- Avoid excess exercise in any weather if you are planning to shortly thereafter engage in any type of strenuous activity, such as participating in a SAREX.
- Avoid or at least minimize caffeine and alcohol before and immediately after any vigorous activity.
- Stay hydrated—drink plenty of fluids before, during, and after strenuous activity. Ideally you should start increasing your fluid intake the day before and continue until the day after. Especially in hot and humid weather, most people underestimate their fluid requirements and have to play catch-up when they should be staying ahead.
- If possible stay in an air-conditioned setting. Even if only for short breaks, cooling-off with an air-conditioner will help prevent dehydration.
- DO NOT ENGAGE IN STRENOUS ACTIVITY IF YOU ARE ILL. In addition to placing yourself at risk of dehydration you will expose and potentially infect your entire team. Stay home and get well.

## *Is it possible to drink too much water and become "overhydrated"?*

**Water intoxication** can occur from drinking too much water. This is a rare condition and does not usually occur in healthy individuals. It is mostly seen in water drinking contests in which individuals force themselves to drink huge quantities of water well beyond what is necessary for adequate hydration. It can

also be seen after a long bout of intensive and vigorous exercise during which a large quantity of water is consumed without replenishing the electrolytes (mostly salt) lost in sweat. Physiologically, water intoxication causes a rapid drop in the body's sodium level, which is known as hyponatremia. Sudden and prolonged hyponatremia can cause cells to swell, especially brain cells (called neurons). Swelling of brain cells (called cerebral edema) can cause a multitude of symptoms including headache, confusion, and irritability. Left untreated swelling of the brain can lead to seizures, brain damage, coma, and death. Again, this is a rare condition.

How do you know if you are drinking too much water? If you are drinking so much water that you start to get bloated and feel uncomfortable, it is probably time to slow down so as not to overhydrate.

## *Are there any particular medical conditions in which drinking too much fluid can be harmful?*

There are three medical conditions in which drinking too much fluid can cause an individual to become overhydrated.

- **Congestive heart failure (CHF) -** In congestive heart failure the heart has become weak and is not able to pump blood with the same vigor as with a normal heart. If an individual with CHF takes in more fluid than the heart can handle, the fluid can back up into the lungs, which is called pulmonary edema, or into the legs, which is called peripheral edema.
- **Cirrhosis of the liver** - Cirrhosis is when the liver has become fibrotic and scarred. Cirrhosis can cause fluid to back-up into the abdominal cavity, which is called ascites.
- **Kidney disease** - Certain types of kidney disease, particularly nephrotic syndrome, can cause the entire body to become swollen from retained fluid. This condition is called anasarca.

Individuals with any of these conditions must maintain a delicate fluid balance and should avoid hot and humid weather, overexertion, excess salt, and drinking too much fluid.

## *How do you treat dehydration?*

Most cases of mild to moderate dehydration can be treated with oral fluids alone and without the need for intravenous (IV) hydration. When we sweat we lose both water and electrolytes (mostly salt). **Oral rehydration therapy** replaces both, and the best oral rehydration therapy uses a combination of water, salt, and sugar. Why sugar? Sugar aids in the absorption of salt and water in the intestine. Pedialyte™ and Gatorade™ are two commercially available forms of oral rehydration therapy and are very effective. There are many others as well.

You can also make your own oral rehydration solution—take 1 liter of water and add 3 grams (one teaspoon) of table salt and 18 grams (3 tablespoons) of sugar. Oral hydration therapy has proven so effective that worldwide it saves the lives of millions of children a year from death due to infectious diarrhea. The World Health Organization (WHO) developed a solution, called the WHO Solution, to treat the most severe form of infectious diarrhea seen in developing countries—cholera.

**Cholera** is a severe type of infectious diarrhea caused by the bacterium Vibrio cholera. It affects 3-5 million people worldwide and causes >100,000 deaths each year. A person infected with cholera can produce 3-5 gallons of diarrhea per day. If untreated cholera has a mortality (death rate) of 50-60%. But when quickly treated with oral rehydration therapy, along with antibiotics, the mortality from cholera drops to < 1%.

Even though oral rehydration therapy is extremely effective, in the developed world severe dehydration is usually treated with intravenous fluids.

## *When should you seek medical attention?*

If you have symptoms of mild to moderate dehydration and respond quickly to oral rehydration therapy you probably do not need to seek medical attention. However, if you do not respond quickly to oral fluids, or if you have symptoms of severe dehydration you should immediately seek medical attention.

## *Do aircrews have to worry about dehydration?*

Adequate hydration is important for aircrews to stay sharp and focused. But since CAP aircraft have neither beverage carts nor bathrooms, aircrews should be hydrated but not too hydrated. So, drink-up and empty-out prior to the flight, abstain from alcohol, minimize caffeine consumption, bring along a bottle or two of water, and hope that nature is on your side.