

Dehydration

In physiology, **dehydration** is a deficit of total body water,^[1] with an accompanying disruption of metabolic processes. It occurs when free water loss exceeds free water intake, usually due to exercise, disease, or high environmental temperature. Mild dehydration can also be caused by immersion diuresis, which may increase risk of decompression sickness in divers.

Most people can tolerate a three to four percent decrease in total body water without difficulty or adverse health effects. A five to eight percent decrease can cause fatigue and dizziness. Loss of over ten percent of total body water can cause physical and mental deterioration, accompanied by severe thirst. Death occurs at a loss of between fifteen and twenty-five percent of the body water.^[2] Mild dehydration is characterized by thirst and general discomfort and is usually resolved with oral rehydration.

Dehydration can cause hypernatremia (high levels of sodium ions in the blood) and is distinct from hypovolemia (loss of blood volume, particularly blood plasma).

Dehydration



Nurses encourage a patient to drink an oral rehydration solution to reduce the combination of dehydration and hypovolemia he acquired from cholera. Cholera leads to GI loss of both excess free water (dehydration) and sodium (hence ECF volume depletion—hypovolemia).

Specialty Critical care medicine

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Signs and symptoms

The hallmarks of dehydration include thirst and neurological changes such as headaches, general discomfort, loss of appetite, decreased urine volume (unless polyuria is the cause of dehydration), confusion, unexplained tiredness, purple fingernails and seizures. The symptoms of dehydration become increasingly severe with greater total body water loss. A body water loss of 1-2%, considered mild dehydration, is shown to impair cognitive performance.^[4] In people over age 50, the body's thirst sensation diminishes and continues diminishing with age. Many senior citizens suffer symptoms of dehydration. Dehydration contributes to morbidity in the elderly especially during conditions that promote insensible free water losses such as hot weather. A Cochrane review on this subject defined water-loss dehydration as "people with serum osmolality of 295 mOsm/kg or more" and found that the main symptoms in the elderly were expressing fatigue, missing drinks between meals and bioelectrical impedance analysis.^[5]



Play media

Ultrasound of the blood vessels of the neck that supports the diagnosis of severe dehydration^[3]

Cause

Risk factors for dehydration include but are not limited to: exerting oneself in hot and humid weather, habitation at high altitudes, endurance athletics, elderly adults, infants, children and people living with chronic illnesses.^[6]

Dehydration can also come as a side effect from many different types of drugs and medications.^[7]

In the elderly, blunted response to thirst and/or inadequate ability to access free water in the face of excess free water losses (especially hyperglycemia related) seem to be the main causes of dehydration.^[8] Excess free water or hypotonic water can leave the body in two ways - *sensible* loss such as osmotic diuresis, sweating, vomiting and diarrhea, and *insensible* water loss, occurring mainly through the skin and respiratory tract. In humans, dehydration can be caused by a wide range of diseases and states that impair water homeostasis in the body. These occur primarily through either impaired thirst/water access or sodium excess.^[9]

Diagnosis

Definition

Dehydration occurs when water intake is not enough to replace free water lost due to normal physiologic processes, including breathing, urination, and perspiration, or other causes, including diarrhea and vomiting. Dehydration can be life-threatening when severe and lead to seizures or respiratory arrest, and also carries the risk of osmotic cerebral edema if rehydration is overly rapid.^[10]

The term "dehydration" itself has sometimes been used incorrectly as a proxy for the separate, related condition hypovolemia, which specifically refers to a decrease in volume of blood plasma.^[1] The two are regulated through independent mechanisms in humans;^[1] the distinction is important in guiding treatment.^[11]

Prevention

For routine activities, thirst is normally an adequate guide to maintain proper hydration.^[12] Minimum water intake will vary individually depending on weight, environment, diet and genetics.^[13] With exercise, exposure to hot environments, or a decreased thirst response, additional water may be required. In athletes in competition drinking to thirst optimizes performance and safety, despite weight loss, and as of 2010, there was no scientific study showing that it is beneficial to stay ahead of thirst and maintain weight during exercise.^[14]

In warm or humid weather or during heavy exertion, water loss can increase markedly, because humans have a large and widely variable capacity for the active secretion of sweat. Whole-body sweat losses in men can exceed 2 L/h during competitive sport, with rates of 3–4 L/h observed during short-duration, high-intensity exercise in the heat.^[15] When such large amounts of water are being lost through perspiration, electrolytes, especially sodium, are also being lost.

In most athletes, exercising and sweating for 4–5 hours with a sweat sodium concentration of less than 50 mmol/L, the total sodium lost is less than 10% of total body stores (total stores are approximately 2,500 mmol, or 58 g for a 70-kg person).^[16] These losses appear to be well tolerated by most people. The inclusion of some sodium in fluid replacement drinks has some theoretical benefits^[16] and poses little or no risk, so long as these fluids are hypotonic (since the mainstay of dehydration prevention is the replacement of free water losses).

Treatment

The treatment for minor dehydration that is often considered the most effective is drinking water and stopping fluid loss. Plain water restores only the volume of the blood plasma, inhibiting the thirst mechanism before solute levels can be replenished.^[17] Solid foods can contribute to fluid loss from vomiting and diarrhea.^[18] Urine concentration and frequency will customarily return to normal as dehydration resolves.^[19]

In some cases, correction of a dehydrated state is accomplished by the replenishment of necessary water and electrolytes (through oral rehydration therapy or fluid replacement by intravenous therapy). As oral rehydration is less painful, less invasive, less expensive, and easier to provide, it is the treatment of choice for mild dehydration. Solutions used for intravenous rehydration must be isotonic or hypertonic. Pure water injected into the veins will cause the breakdown (lysis) of red blood cells (erythrocytes).

When fresh water is unavailable (e.g. at sea or in a desert), seawater and ethanol will worsen the condition. Urine contains a lower solute concentration than seawater, and numerous guides advise against its consumption in survival situations.^[20] If somebody is dehydrated and is taken to a hospital, IVs are also used.^{[21][22][23][24]}

For severe cases of dehydration where fainting, unconsciousness, or other severely inhibiting symptom is present (the patient is incapable of standing or thinking clearly), emergency attention is required. Fluids containing a proper balance of replacement electrolytes are given orally or intravenously with continuing assessment of electrolyte status; complete resolution is the norm in all but the most extreme cases.^[25]

See also

- Hydrational fluids
- Terminal dehydration

- Dryness (medical)
- Oral Rehydration Therapy

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Further reading

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External links

Classification ICD-10: E86 (http://apps.who.int/cla)
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- Definition of dehydration by the U.S. National Institutes of Health's MedlinePlus medical encyclopedia (<https://www.nlm.nih.gov/medlineplus/ency/article/000982.htm#visualContent>)

ssifications/icd10/browse/2016/en#/E86) • **ICD-9-CM:** 276.51 (<http://www.icd9data.com/getICD9Code.ashx?icd9=276.51>) • **MeSH:** D003681 (https://www.nlm.nih.gov/cgi/mesh/2015/MB_cgi?field=uid&term=D003681) • **DiseasesDB:** 3520 (<http://www.diseasesdatabase.com/ddb3520.htm>)

External resources

MedlinePlus: 000982 (<https://www.nlm.nih.gov/medlineplus/ency/article/000982.htm>) • **eMedicine:** article/801012 (<http://emedicine.medscape.com/article/801012-overview>)

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