

School of Physiology



Thirst to last: The physiological consequences of a disastrous loss of water supply

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The impact site

Deneysville, Free State

26°53'55.7"S 28°04'58.8"E

on 28th December 2024



"Water is life's matter and matrix, mother and medium. There is no life without water." – Albert Szent-Gyorgyi, Discoverer of Vitamin C

So, what properties of water make it uniquely important for life?

- It is a liquid at most terrestrial temperatures.
- It is a 'universal' solvent for salts, minerals and organic molecules.
- It has a high specific heat capacity.
- It has surface tension through hydrogen bonding.

What is the physiological consequence of a person not having sufficient water intake?



Dehydration



A prune

Physiologically, dehydration is defined as a decrease in total body water.

What is total body water?



Body fluid compartments



Total Body Water = 42L





- <u>Isotonic</u> means the overall solute concentration of the ECF and ICF are the same
- <u>Hypertonic</u> means ECF has a <u>higher</u> overall solute concentration than the ICF
- <u>Hypotonic</u> means the ECF has a <u>lower</u> solute concentration than the ICF



A red blood cell

Place cell in a hypertonic solution



When does hypertonic dehydration occur?



With sweating!

Sweat has a lower solute concentration than ECF





When does isotonic dehydration occur?

1. With diarrhoea

Diarrhoea in children under five years of age in South Africa (1997-2014)

Oluwatoyin F. Awotiwon¹, Victoria Pillay-van Wyk¹, Ali Dhansay^{1,2,3}, Candy Day⁴ and Debbie Bradshaw¹

RESEARCH ARTICLE | AUGUST 29 2022

Determinants of diarrhoeal infections among users of shared sanitation in informal settlements in Durban, South Africa **3**

Preshod Sewnand Ramlal; J. Lin; C. A. Buckley; T. A. Stenström; I. D. Amoah

Check for updates

J Water Health (2022) 20 (10): 1517-1533.

South Africa cholera update: 23 deaths in Hammanskraal

by NEWS DESK

EWN, May 2023

2. With blood loss from injury



Normal hydration

Practical approaches to rehydration

Oral rehydration therapy

Recipe:

- 8 teaspoons of sugar (sucrose)
- ¹/₂ teaspoon of table salt

Dissolved in

• 1 litre of clean water (boiled or treated with purification tablets)

Don't look up!