KEY TIPS ON HYDRATION

MEASURING HYDRATION STATUS

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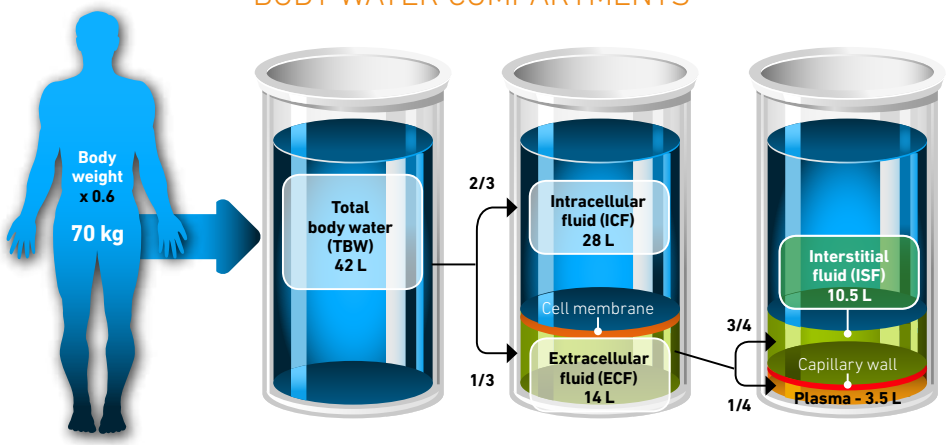
Normal hydration status is the presumed condition of healthy individuals who maintain water balance[1]. Evaluation of hydration status is not easy, as during daily activities or exercise, fluid compartments are constantly fluctuating and therefore the evaluation of a single body fluid compartment volume is insufficient to provide valid information about total body water (TBW)[2].

BODY WATER COMPARTMENTS*



There are many hydration assessment techniques. The following are some of the methods used[1-3]:

Hydration status can be assessed by:

- Urine indicators:
  - Volume and colour
  - Specific gravity/osmolality
- Thirst
- Plasma osmolality
- Plasma sodium concentration
- Blood urea nitrogen
- Saliva specific gravity
- Bioelectrical impedance spectroscopy

An acute change in hydration status over a period of a few hours can be assessed by:

- Body weight differences

We will focus on some techniques that are **simple, easy to perform, and inexpensive, but also reliable**, so that they can be used to evaluate hydration status during daily activities.

* Adapted from: Elsevier, Inc. Netterimages.com. http://www.netterimages.com/images/vpv/000/000/021/21248-0550x0475.jpg

The following information relates to healthy young and adult people. For healthy children and healthy elderly people, or those with pathological conditions, the responses indicating normal hydration (euhydration) may be different from those indicated below.

URINE INDICATORS

Colour

Urine colour correlates quite well with hydration status as assessed by plasma osmolality and other markers especially when measured on the first sample of the day, but it can be influenced by dietary factors and medications[3]. Nevertheless, it provides a useful estimate of hydration state during everyday activities[2]. The chart to the right shows that darker coloured urine is associated with an increased likelihood of dehydration.

EXAMPLE OF HOW URINE COLOUR MIGHT VARY WITH HYDRATION STATUS

Probably adequately hydrated

Possibly dehydrated

Probably dehydrated

Note: colour reproduction may not be accurate, do not use this chart for diagnostic purposes.

Volume

In a healthy adult a urine output of 1-2 litres per day may indicate good hydration while outputs of less than about 500 mL per day can indicate deficient hydration status. An output of more than about 300 ml per hour suggests excessive fluid intake[1]. Frequency of passing urine is a related parameter that might also give a rough guide. Physical activity and heat exposure can reduce urine output because of the loss of water in sweat, while cold stress can increase it[2].

Specific gravity

Normal (euhydrated) values range from about 1,010 to 1,020 and slightly over after overnight dehydration[4]. When serious hypohydration exists, urine specific gravity may exceed 1,030[5].

Other urine indicators, including urine osmolality may also be used as indicators of hydration status[6], but are less easy to measure.

THIRST

Thirst is triggered by both perceptual (taste, colour, flavour, temperature of beverages) and physiological mechanisms (increases in plasma (ECF) sodium concentration and osmolarity, reductions in plasma volume) at water deficits which correspond to a body weight loss of about 3% or more[1]. Several scales have been developed to quantify the feeling of thirst[7]. Individuals can learn to recognise their own thirst responses to various levels of dehydration.

BODY WEIGHT DIFFERENCE MEASUREMENT

is a sensitive, accurate and easily measured indicator of change in hydration status when measured regularly and under standard conditions[1]. This technique is especially appropriate for measuring dehydration that occurs over a period of 1 to 4 hours. The base is simple: body weight loss is approximately equal to sweat loss (corrected for the weight of fluid and food consumed and urine and faecal losses)[2]. Other factors influencing body weight should be carefully controlled. For example, carbohydrate loading in athletes will increase body weight by retaining water with glycogen stored in muscle[1].

1. EFSA Panel on Dietetic Products, Nutrition, and Allergies (NDA); Scientific Opinion on Dietary reference values for water. EFSA Journal 2010; 8(3):1459. [48 pp.]. Available online: www.efsa.europa.eu/en/efsajournal/pub/1459.htm **2**. Kolasa KM, Lackey CJ, Grandjean AC. Hydration and Health promotion. Nutrition Today 2009;44:190-201. **3**. Panel on Dietary Reference Intakes for Electrolytes and Water (2005) Dietary reference intakes for water, potassium, sodium, chloride, and sulphate. National Academy Press: Washington DC. **4**. Casa DJ, Armstrong LE, Hillman SK, Montain SJ, Reiff RV, Rich BSE, et al. National Athletic Trainers' Association position statement: fluid replacement for athletes. J. Athletic Training 2000;35(2):212-224. **5**. Armstrong LE. Assessing hydration status: the elusive gold standard. J Am Coll Nutr. 2007;26(5S):575SY584S. **6**. Shirreffs SM, RJ Maughan. Urine osmolality and conductivity as markers of hydration status. Med Sci Sports Ex (1998) 30: 1598-1602. **7**. Farrell MJ, Egan GF, Zamarripa F, Shade R, Blair-West J, Fox P, et al. Unique, common, and interacting cortical correlates of thirst and pain. Proc Natl Acad Sci U S A. 2006;103(7):2416–21.