

Sports Drinks

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Executive Summary

Sports drinks are a relatively recent phenomenon, yet anatomically modern humans have been running around for some 200,000 years. So why do we need them?

The producers of sports drinks are keen to emphasise that their products provide hydration before, during and after physical activity—and may even be better than water—but the evidence is tenuous.

Many issues have been raised with how and why the sports drink industry conducts its research. Experts have concluded that for the general public, water and a balanced diet is all that is required to facilitate regular exercise.

Michael Viggars

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Introduction

Sports drinks are a particular type of soft drink that are usually rich in carbohydrates (in the form of sugar), minerals, electrolytes and flavourings and are purported to optimise hydration before, during and / or after physical activity and improve athletic performance. They are not to be confused with energy drinks such as Red Bull and Monster, which contain high concentration of caffeine designed to increase alertness and fend off drowsiness.

In contrast to energy drinks, sales of sports drinks appear to be in decline in the UK,

peaking at 165 million litres sold in 2011, falling to 150 million litres in 2013—a decrease of just over 9%. This may be attributed to the aggressive marketing strategies of energy drinks targeting the same consumer group as the sports drink industry.



Emergence of the Sports Drink Industry

In 1965, Dr. Robert Cade, assistant professor in the renal division of the College of Medicine at the University of Florida, was contacted by Dewayne Douglas, assistant coach of the Florida Gators Freshman football team, after 25 American football players had been admitted to the hospital infirmary the previous weekend due to heat exhaustion and dehydration.

Douglas needed something to “negate the strain that the brutal summer heat had inflicted upon his players”. Cade supposedly *knew* that replacing fluids would be a true advantage for the team—hardly a scientific

approach—as the team’s loss of fluids through sweating led to dehydration, salt depletion and in some cases heatstroke.



They found that adding glucose to a salt-water solution increased the rate at which both sodium and water were absorbed by the small intestine. Naturally, they concluded that a drink containing glucose and sodium would be valuable to athletes requiring instant rehydration.

The physiological hunch that

their prototype, lemon-tinged, glucose-salt solution would benefit the Gators paid off. The drink was given to players in a game versus the heavily favoured Louisiana State, ranked fifth in the country. The University of Florida Gators came from behind to win 14-7. Gatorade was born.

Convergence of the Sports Drink Industry

In an interview in 2005, Dr. Robert Cade said:

“I never thought about the commercial market. The financial success of this stuff really surprised us. I am proud that Gatorade was based on research into what the body loses in exercise. The other sports drinks were created by marketing companies.” [1]

Whilst Gatorade appears to have been created with honest intentions, a quickly developing market saw several competitors enter due to the commercial potential. Gatorade currently dominates the North American sports drink market, holding a 77.2% share to Powerade’s 21.7% [2], a share they undoubtedly wish to maintain.

When considering the UK market, energy drinks such as Red Bull are often considered a type of sports drinks, and frequently claim to benefit the consumer in similar ways. To learn more about energy drinks, please see our energy drinks briefing.

Contrary to Dr. Cade’s statement, the most common UK sports drink—Lucozade Sport—began life as



Lucozade and was designed in 1927 by William Owen, a Newcastle chemist, as a source of energy for people suffering from illnesses such as the common cold and influenza.

Following a major rebrand in the 1980s, brought on in part by the commercial success of Gatorade across the pond, Lucozade shook off the 'hospital champagne' label and began targeting young people rather than 'stay-at-home mothers', tripling their sales to £75 million in the process. Their slogan changed

from "Lucozade aids recovery" to "Lucozade replaces lost energy" taking on a broader meaning and opening up new markets.

Types of Sports Drink

There are three main classifications of sports drinks containing various concentrations of fluid, electrolyte and carbohydrate.

The rationale is that different athletes competing in different sports have different energy requirements before, during and after exercise; and sports drinks can be tailored to match exact specifications.

Isotonic

These drinks containing similar concentrations of salt and sugar as in the human body. This allows replenishment of fluids lost through sweating and supplies a boost carbohydrate. Isotonic drinks are the preferred choice for the vast majority of athletes, including middle and long-distance runners and those involved in team sports. These are the most commercially available of sports drinks.

Hypertonic

Hypertonic drinks contain a higher concentration of salt and sugar than the human body and are normally consumed post-workout to supplement daily carbohydrate intake and top-up muscle glycogen stores. They are occasionally used in ultra-distance events to meet the high energy demands but most are used in conjunction with isotonic drinks to replace lost fluids.

Hypotonic

Hypotonic drinks contain a lower concentration of salt and sugar than the human body, quickly replacing fluids lost through sweating. These drinks are suitable for athletes who require rehydration without a carbohydrate boost, such as gymnasts.

Performance Enhancement

Sports drinks were initially conceived to be an aid to athletic performance and therefore it is necessary to understand their constituents and what they may offer during exercise.

Water

Water is abundant in the body, making up 60% of our body mass, and serves many vital functions, such as transportation of nutrients and oxygen and removal of waste products, lubrication of joints and serves as a medium for chemical reactions in the body. During exercise, heat is produced during the process of converting chemical energy into mechanical energy; therefore to prevent us overheating, we regulate our

body temperature through sweating. As sweat evaporates, heat is released. This can also impact the relative solute concentrations.

Sweat production as a consequence of physical activity can amount to 1–2 litres per hour (L/hr), depending on exercise intensity and duration, clothing, air movement and humidity [3]. Unless body water is replaced at appropriate



appropriate times and in appropriate amounts we may become dehydrated. Even mild dehydration (about 2% loss of body weight) can result in headaches, fatigue and reduced physical and mental performance [4].

Sugar

The human body can derive energy from a number of different sources including carbohydrates, fats and proteins. The rate at which energy can be produced from these macronutrients varies, and therefore different

energy sources are suitable for different types of exercise.

At low to moderate intensity exercise the body has enough time to break down fatty acids to produce energy. In a very lean individual there is enough adipose tissue and muscle triglycerides (fats) to sustain exercise for several hours. However, as physical exertion and energy demand increases the body switches to carbohydrate as the primary energy source as it can be metabolised much more quickly—although



availability of carbohydrate is much lower and cannot be sustained for extended periods of time.

The fact that carbohydrate can be broken down to produce energy so quickly provides the rationale for their presence in sports drinks. Ultimately, glucose is the major useable source of carbohydrate energy and can be metabolised anywhere in the body and that is why it is found in such vast quantities in sports drinks.

Electrolytes

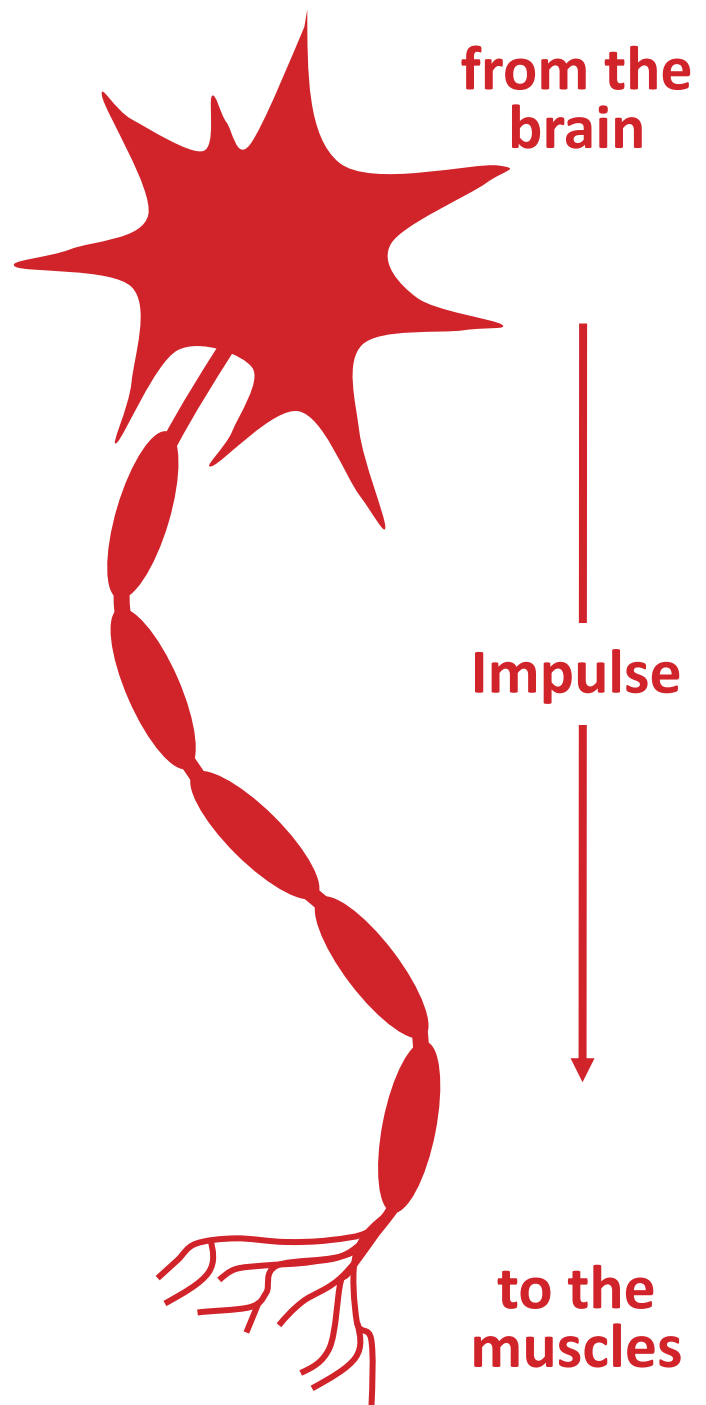
Before we can move, our brain has to send a signal via our nervous system to a muscle or a group of muscles asking it to contract; the muscle(s), which are attached to bones by tendons, then become shorter, pulling on the bone which produces movement. Critically, the stimulus from the brain must be sufficient to generate an impulse causing contraction of the muscle.

Lucozade Sport Orange contains 32g of sugar per 500ml; the government's scientific advisory committee on nutrition (SACN) has recently recommended cutting our sugar intake by 50%. This means that one bottle of Lucozade Sport will exceed recommended daily intakes of 'free sugars' for the majority of age groups.

Without sufficient levels of sodium and potassium our muscles cannot contract efficiently. When we sweat, sodium and potassium are released giving sweat its salty taste. Energy drinks contain electrolytes which include sodium and potassium, and occasionally calcium and chloride, all intended to prevent muscle fatigue.

However, sodium is secreted by the pancreas into the large intestine (where water is absorbed) and does not necessarily need to be supplemented. Cairns & Lindinger suggested that with moderate intensity exercise, the combined shifts of sodium and potassium would be insufficient to cause fatigue. In fact, the body can detect falling levels of sodium

and potassium concentrations and increase blood flow to this area, providing more of these electrolytes [5] - negating the need for sports drinks at this intensity.



Neurons transmit signals from our brains to our muscles, asking them to help us move. Electrolytes are needed to pass the message down the neuron.



Critique of the Sports Drink Industry

Ultimately, sports drinks are a variety of soft drink and the harmful effects of consumption of sugar-sweetened beverages are well documented (see our 'Facts on Sugar' briefing). However, sports drinks are alleged to perform a specific function—that is to hydrate an individual before, during and / or after exercise and improve athletic performance.

Several issues have arisen regarding the research methodologies used to support the claims made by sports drinks companies as well as the claims themselves bending the truth and misleading customers.



Interestingly, despite Lucozade's rebranding exercise in the 1980s, the constituent parts of Lucozade Sport have remained largely the same and not too dissimilar to Gatorade and Powerade. In fact, disregarding flavourings, Gatorade has changed very little in the 50 years since its inception.

According to their marketing department, Gatorade is the world's most successful, most iconic and most scientifically researched sports drink and

claims to hydrate athletes, replenish electrolytes and provide fuel for working muscles [6]. Noakes suggests it is more accurate to state that, **"Gatorade is the sports drink whose effects on the human body during exercise have been the most thoroughly studied"**.

A systematic assessment of the evidence underpinning sports performance products conducted by Heneghan and colleagues (2012) asked manufacturers to supply details of the studies supporting their product claims [7]. Only GlaxoSmithKline (then owner of Lucozade) complied and supplied data gathered from 1971 to 2012. Of the 176 studies supplied, only 106 could be critically reviewed.

Much of this research is conducted on highly homogenous groups of athletes with similar physiological measures. This means that whatever the outcome, the research can only be applied to individuals matching the profile of the participants in the study, and can't be generalised to a largely sedentary population. In other words, it is impossible to know whether Lucozade will affect your performance from the data collected.



Making a slight amendment to Noakes' previous comment, Heneghan and colleagues reported:

"40 years of sports drinks research does not seemingly add up to much, particularly when applying the results to the general public."

Heneghan surmised that the methodological issues identified with Lucozade's research could be applied to all other sports drinks.

The Thirst Fallacy

There is a common misconception that thirst is not a good indicator of hydration, a fallacy that has leant itself well to the marketing of sports drinks. Gatorade once said, **“Your brain may know a lot, but it doesn’t know when your body is thirsty”** [8] - leaving us all to wonder if the brain can’t figure out when we need a drink, what can?

The body needs to maintain a balance between the amount of water it has and concentrations of dissolved materials—which includes proteins, fats, hormones and electrolytes. Even small changes will trigger a response; either to increase body water content by reducing urinary output and

stimulating thirst or to excrete water as urine.

Dion *et al.* (2013) found that long-distance running performance was not improved by fluid intake above that directed by thirst sensation. Extensive research has been conducted on the dangers of overhydration, leading to a condition called hyponatraemia (low concentrations of sodium in the blood) which can be fatal [9].

A recent systematic review by Goulet (2011) of the effects of exercise induced dehydration (EID) on performance in long cycling time trials suggested that relying on thirst sensation to gauge the need for fluid replacement proves more successful than drinking more

or less frequently [10].

Urine Colour

Urine colour is sometimes proposed as a simple way to assess hydration status, with darker urine representing dehydration and lighter urine characterising good hydration status. Many sports drink manufacturers, including Lucozade, provide a colour chart to estimate your current hydration status (see appendix 1).

However, an examination of the evidence by Heneghan

and colleagues found that no study has directly investigated the correlation between urine colour and performance or the correlation between urine colour and thirst.

Urine colour should not be considered as the sole determinant of hydration status. The combination of thirst, in addition to darker coloured urine, provides a reasonable indication of dehydration.

Of those supporting the urine colour tool as a marker for hydration status, they admitted findings could be compounded by sports drinks themselves, diluting the urine through excretion of excess sugars—no doubt a happy coincidence for sports drink manufacturers.

Recommendations

Before considering evidence-based recommendations it is important to remember that sports drinks are a relatively recent phenomenon—yet anatomically modern humans have been running around for some 200,000 years. So do we really need them for their purported benefits?

Hydration

Sedentary men are advised to consume approximately 2.5 litres of water per day, rising to 3.5 litres if they are moderately active. Data on the amount of water women should drink is lacking but due to their lower body mass, it is suggested that they should consume 0.5-1 litre less than men [3].

Water is consumed from different sources, which

include bottled water, tap water, beverages and the moisture contents of foods. Fruit and vegetables contain between 80-95% water; fish (~75%), meats (~55%) and cheeses (45%).



However, there is so much variation in our shapes and sizes and the types of activity that we may or may not take part in making it very difficult to suggest a ‘one size fits all’ amount. Drinking in response to our thirst mechanism is the best way to maintain hydration.

These values apply only to conditions of moderate environmental temperature and moderate physical activity levels. Water losses incurred under extreme conditions of external temperature and physical exercise, which can be up to 8000ml/day have to be replaced with appropriate amounts. In such instances concomitant losses of electrolytes have to be replaced adequately to avoid hypo-osmolar disturbances.

Reference Intake (RI) of water ml/day		
	Children	
	Male	Female
6—12 months	800—1000	
13—24 months	1100—1200	
2—3 years	1300	
4—8 years	1600	
9—13 years	2100	1900
14+ years	2500	2000

Pregnant women should consume an extra 300mL/day
Lactating women should consume an extra 700mL/day

Energy

On a physiological level, after consuming a high-carbohydrate sports drink blood glucose levels rise, insulin levels are elevated and fatty acid availability is reduced [11]. For sedentary individuals who do not have a high demand for energy, the spike in blood sugar levels causes a cascade of reactions eventually resulting in the conversion of glucose into fats. Long-term consumption in inactive individuals can cause weight gain and lead to obesity, type 2 diabetes and cardiovascular disease.

For individuals wanting to lose weight, drinking sports drinks may lead to extra hours in the gym as the body is being fuelled by the carbohydrate present in the

drink rather than existing energy stores. Low to moderate intensity physical activity is recommended for those wanting to lose weight or for individuals starting a programme of exercise after an extended period of physical inactivity and should be accompanied by water.

Recovery

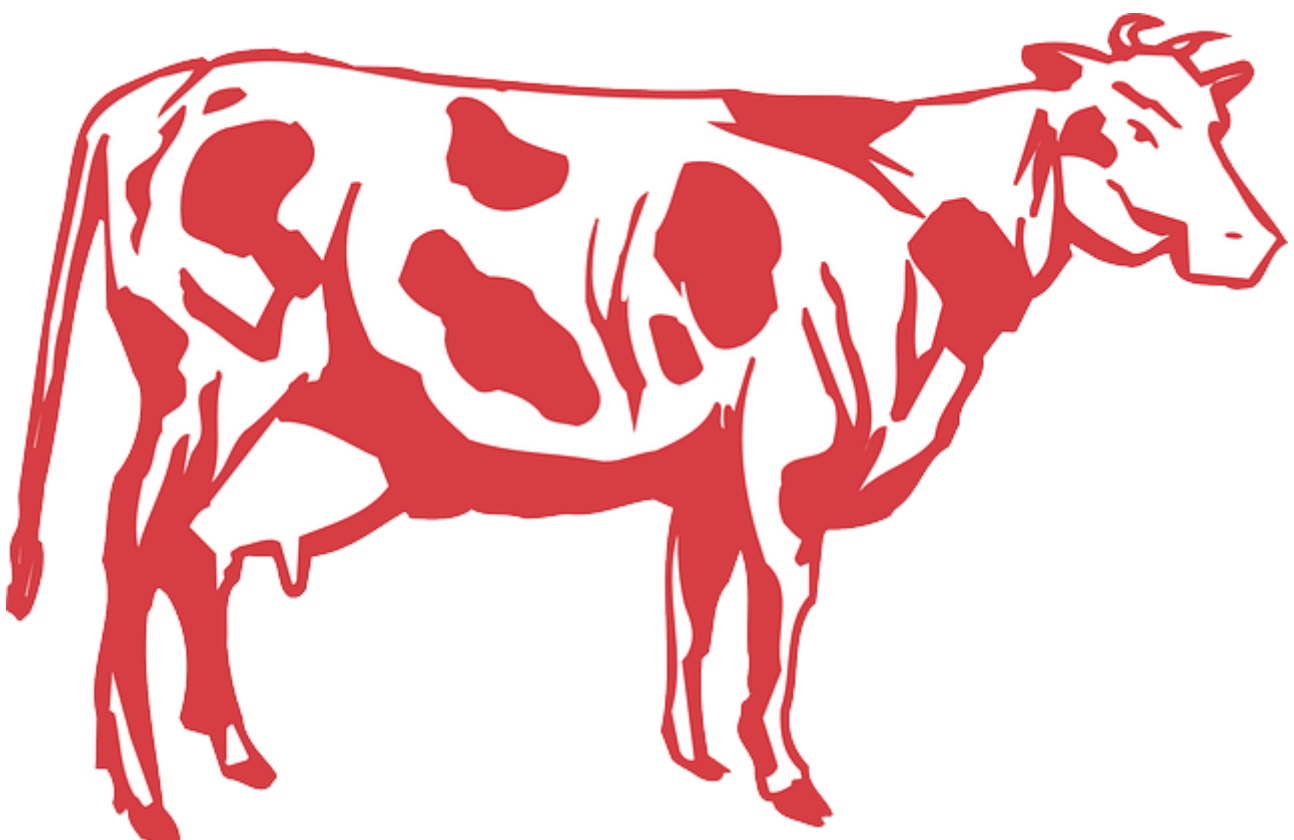
It is important to provide the body with the right nutrients to refuel and recover after exercise. If we don't, our muscles may ache for extended periods and we may feel lethargic and lack motivation.

Protein is essential for proper recovery, immune function and the growth and maintenance of lean body mass. In sedentary individuals, 0.8—1.0g per kg

bodyweight per day is sufficient but in exercising individuals more is required.

Those in endurance exercise need 1.2—1.4g per kg bodyweight and strength athletes may need up to 2.0g per kg bodyweight per day in order to see noticeable improvements in the short term. Ideally protein should be ingested within 1—2 hours after exercise to maximise the benefits [13].

Milk has been put forward as a healthy post-exercise drink, providing protein, vitamins and mineral and also hydration. A 200ml glass of semi-skimmed milk contains as much calcium as 63 brussel sprouts, which contributes to the growth and maintenance of teeth and bones and normal muscle and nerve function [14].



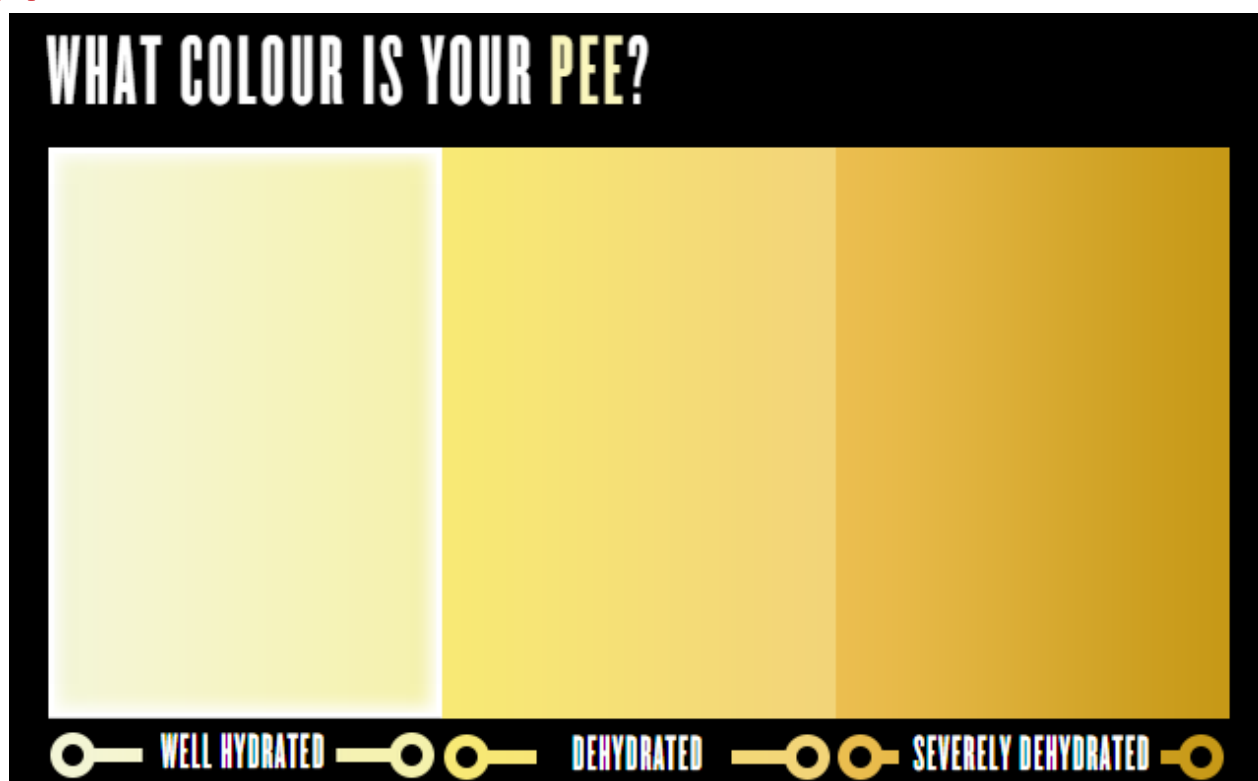
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References

1. Transcript of interview with Dr. Robert Cade (Accessed 01/09/2015 from: <http://www.huffingtonpost.com/huff-wires/20071127/obit-cade/>)
2. Pepsi suing Coca-Cola over Powerade Ads (accessed 01/09/2015 from: http://www.huffingtonpost.com/2009/04/14/pepsi-suing-cocacola_n_186709.html)
3. EFSA. (2010). Scientific Opinion on Dietary Reference Values for Water.
4. SACN. (2015). Carbohydrates and Health.
5. Cairns, S. P., & Lindinger, M. I. (2008). Do multiple ionic interactions contribute to skeletal muscle fatigue? *Journal of Physiology*, 4039-4054.
6. Noakes, T. (2012). Waterlogged: The Serious Problem of Overhydration in Endurance Sports.
7. Heneghan, C., et al. (2012). The evidence underpinning sports performance products: a systematic assessment. *BMJ Open*, 2.
8. Heneghan, C., et al. (2012). Mythbusting sports and exercise products. (Accessed 01.09/2015 from: <http://www.bmj.com/content/345/bmj.e4848>)
9. Dion et al. (2013). Half-marathon running performance is not improved by a rate of fluid intake above that dictated by thirst sensation in trained distance runners. *European Journal of Applied Physiology*.
10. Goulet, E. D. B. (2011). Effect of exercise-induced dehydration on time0trial exercise performance: a meta-analysis. *British Journal of Sports Medicine*, 45 (14), 1149-1156.
11. Horowitz, J. F., et al. (1997). Lipolytic suppression following carbohydrate ingestion limits fat oxidation during exercise. *American Journal of Physiology*, 273, 768-775.
12. Benelam, B., & Wyness, L. (2010). Hydration and health: a review. *Nutrition Bulletin*, 36, 3-25.
13. BDA. (2014). Food Fact Sheet-Sport.
14. The Dairy Council. (2015). Milk Factsheet.

Appendix 1



This urine chart provides an estimate of your hydration status only. This site is not a substitute for professional advice and does not provide and medical services. You should always promptly seek professional care if you have any concerns about your health.

Well Hydrated

Well-hydrated—you're on the right track

Your pee is lighter in colour and not too dark, you're in the target zone.

Fluids can be sipped little and often according to your individual needs, but do not over-drinks. Continue to monitor pee colour.

Dehydrated

Dehydrated—Your pee is deeper / darker in colour, you're in the dehydration zone. Dehydration of > 2% body mass can affect your physical performance.

Top up your fluids by sipping little and often and continue to monitor your pee colour over the next 4-7 hours.

Consume a hypotonic or isotonic sports drink which contains sodium to help aid fluid absorption.

Aim to move back into the 'Target Zone'.

Severely Dehydrated

Severe dehydration—Urine is dark, brown and concentrated.

Severe dehydration may limit your body's ability to function normally.

Exercising under these conditions will affect your motivation and performance, especially during warm/hot condition. This could have a negative impact on your health.

Slowly rehydrate by consuming a hypotonic or isotonic sports drink which contains sodium to help aid fluid absorption.

Avoid consuming large volumes of fluid in one go, instead sip little and often. If water is consumed, it is best accompanied by a salty snack or main meal.

Aim to slowly restore pee colour to the 'Target Zone'.

Accessed from:

<https://www.lucozadesport.com/products/pee-chart/>



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