

Fuelling Peak Performance Workbook

Module 5

Hydration and Performance
Enhancing Minerals

Hydration and Performance Enhancing Minerals

Hydration - Caffeine, energy drinks, sports drinks, calcium, iron and antioxidants

Introduction

There are many aspects of nutrition that are vital to our well-being but sometimes they can get forgotten or overlooked in our rush to manage the 'big things' in our day. This can result in poor daily performance, fatigue and less than ideal health.

This week we take a look at the importance of hydration with a spotlight on caffeine, energy drinks and sports drinks, establish calcium and iron needs and how to meet them plus the lowdown on antioxidants.

Hydration

Many people do not consume enough fluid day-to-day or during exercise. This problem is amplified in the cooler months as we don't feel like drinking cool fluids and tend to consume more tea and coffee. Caffeine containing beverages such as tea, coffee and cola drinks do act as diuretics to varying degrees and can promote the loss of fluid, although this is often minimal.

Thirst is not a good indicator of our fluid needs. It can be difficult to estimate fluid losses when there is no proof of sweat e.g. sitting in an air-conditioned room.

Taking enough fluid on board is one of the most effective ways of enhancing our daily performance. Fluids are lost in sweat and how much we sweat will depend on size, temperature on the day, clothing, and activity. Sweat rates vary a lot but when sweat loss is not matched by fluid intake, dehydration will occur.

So how does dehydration affect daily performance?

- Decrease in physical and mental performance
- Inability to make a decision
- Loss of coordination

In short, you feel exhausted, lifting your feet becomes an impossible feat, you can't make decisions and you get a headache!

If we lose more than 2% of our body weight through fluid loss, the health risks become more serious and can result in nausea, vomiting, diarrhoea and other gastrointestinal problems. And no, you can't toughen up or train your body to handle being dehydrated.

Aim for 6-8 cups of fluid each day to keep the body hydrated and refreshed.

Fluids in training

We know that staying hydrated is key to peak performance but what are some good fluid tips while training?

- Begin your exercise session hydrated, drink well before the start
- Drink at regular intervals, around every 15 minutes and try to consume between 150-250 mls each time. As a teacher and coach setting a watch timer at 15-minute intervals to remind your students to drink is a useful strategy.
- If exercising for less than 60 minutes, water is the most practical and economical fluid. Cool water is better absorbed and is more refreshing and palatable.
- Fluid recovery is essential and fluid loss by monitoring body weight before and after training. The difference between the two is fluid loss and the aim should be to replace 125-150% of this loss over the next 2-6 hours. So, if 1 kg in weight is lost, 1250-1500 ml will need to be consumed to fully rehydrate.
- Practice competition day fluid plan during training

Sports Drinks and Energy Drinks?

Sports drink can be a useful performance-enhancing fluid when exercising. Electrolytes such as sodium (salt) are lost in sweat and need to be replaced during and after prolonged exercise. Sodium improves fluid intake as it stimulates thirst and promotes carbohydrate and fluid uptake. Sports drinks contain electrolytes like sodium, carbohydrates and water, making it a complete package. Sports drinks should contain between 4 - 8% carbohydrate. These drinks are most effective for exercise sessions one hour or longer in duration but be mindful that buying sports drinks are not a substitute for actually doing exercise!

Electrolyte drinks contain no or little sugar and can be useful in hot weather when additional carbohydrate is not required but electrolytes are (for activities lasting less than 1 hour). Some well known products include Hydralyte and Carboshotz Electrolyte.

'Energy drinks' should not be confused with common 'Sports' drinks such as Gatorade, Powerade and others, which were originally developed for athletes.

Energy drinks such as Red Bull, V, Lift Plus and Black Stallion have flooded the market in the last few years and primarily appeal to weekend athletes, children and teenagers. They contain a wide range of ingredients including sugar, caffeine and/or guarana, B-group vitamins, amino acids and herbal products. Sugar is the main carbohydrate and energy source, and its concentration is often 11-15%. This level of carbohydrate is similar to cordials and soft drinks but significantly higher than sports drinks. The high sugar concentration can slow your stomach emptying and affect fluid absorption. There is little scientific evidence to prove that the addition of amino acids (such as taurine), or herbal ingredients (like ginseng) to energy drinks are beneficial.

The main ingredient of interest in energy drinks for most people is caffeine. Caffeine is a stimulant that affects the brain, nervous system, heart, kidneys, muscles and lungs.

Despite marketing claims to the contrary, guarana contains caffeine and acts in exactly the same way.

Energy drinks are not a good choice for fluid replacement before, during or after sport and should not replace sports drinks or water. Energy drinks are a BIG problem for adolescents and I think we need to do everything in our power to discourage kids and teenagers to not consume them.

Caffeine - the performance enhancer?

This topic has become hot over the past few years mostly due to athletes using it for performance enhancing purposes. Caffeine was a banned substance for many years until 2000 when it was delisted under IOC regulations. It has gained popularity amongst the general public since then.

You may be wondering whether caffeine will help you get through your day. Caffeine is a stimulant that speeds up parts of the body and the brain and can enhance your performance if used properly.

Although there is no recommended intake, most authorities agree that the safe daily upper limit for caffeine is 300mg for the average adult person. 300mg is equivalent to 3-4 cups of brewed coffee (cappuccino, latte, flat white etc). There is no safe limit for children or adolescents.

Caffeine Counter

| | | Caffeine (mg) |
|----------------|-------|---------------|
| Brewed coffee | 1 cup | 85 - 120 |
| Instant coffee | 1 cup | 60 |
| Brewed tea | 1 cup | 75 |
| Instant tea | 1 cup | 30 - 50 |
| Green tea | 1 cup | 50 - 80 |
| Cocoa powder | 2 tsp | 20 |
| Milo | 2 tsp | 1 |
| Energy drink | 250ml | 80 |
| Milk chocolate | 30g | 6 |

| | | Caffeine (mg) |
|-------------------------|-----------|---------------|
| Cola drink | 375ml can | 40 |
| Caffeine table (No Doz) | 1 cup | 100 |

Technically, caffeine is a diuretic but this does not necessarily mean that it will make you wee excessively. For example; a 200ml cup of tea containing 50mg of caffeine will produce 60ml of urine with the remaining 140ml being part of your fluid intake.

The scientific explanation is that antioxidants exert their protective effects by preventing damage to body cells and tissues caused by free radicals and singlet oxygen. The easier way of remembering what antioxidants do is to picture the 1980's Pacman game where your aim was to get the Pacman to gobble as many 'ghosts' as possible. Pacman is the antioxidant and the 'ghosts' are the free radicals. There you have the essential role of the antioxidant. It has been proposed that caffeine can promote the increased use of fat as an energy source during exercise and therefore spare carbohydrate (glycogen) stores, however but further research is required in this area.

Antioxidants

How do antioxidants work?

Explanation of the 1980's Pacman game in relation to antioxidants gobbling up the free radicals. Technical explanation would be that antioxidants exert their protective effects by preventing damage to body cells and tissues caused by free radicals and singlet oxygen. Just remember the 1980's Pacman game where the aim was to get the Pacman to gobble as many 'ghosts' as possible and there you have the essential role of the antioxidant.

Sources of free radicals include:

- Cigarette smoke
- Environmental pollutants
- Ultra-violet light
- Radiation
- Carcinogens
- High PUFA diet
- Exercise
- Inflammation

Research shows that antioxidants can play a role in preventing cancer, cardiovascular disease, and eye disease and slowing down ageing.

Food Sources

Red: good source of lycopene, which helps, reduce the risk of prostate cancer in males. Found in tomatoes, watermelon, guava, and ruby grapefruit.

Lycopene is among the most powerful antioxidants available. It is a carotenoid that gives tomatoes their red colour. It occurs naturally in many red foods including watermelon and pink grapefruit. Tomatoes do provide a rich source but tomato paste is the richest source as cooking and processing tomatoes further stimulates and concentrates the lycopene content. There is no current recommended dosage but suggestions range from 5-35mg per day, which equates to at least 1-2 servings of tomatoes or tomato products per day.

Orange and Yellow: good source of beta-carotene, which can protect against a range of cancers. Found in pumpkin, sweet potato, carrots, mango, paw-paw, apricots and rock melon.

Green: good source of lutein and zeaxanthin, two compounds related to beta-carotene that can protect our eyes as we age. Found in broccoli, spinach, silver beet, capsicum, chilli, parsley and dark lettuces.

Blue and Purple: good source of anthocyanins for anti-oxidant and anti-bacterial properties. Found in grapes, blueberries, cranberries, beetroot and radicchio lettuce

Brown: good source of catechins for blood vessel health. Found in tea, chocolate and red wine.

Recommended Intakes

There are no recommended intakes as yet. We do know that it is preferable to consume antioxidants through food rather than supplements as there are other nutrients in food that enhance their absorption. Average Australian intake of fruit and vegetables at present is too low and we need to remember the recommended intake of fruit and vegetables, which is two serves of fruit and 5 serves of vegetables daily.

Pumping Iron

Iron deficiency is a condition in which the number of red blood cells or their capacity to carry oxygen is limited. This can result in tiredness and fatigue, behavioural problems in kids and adolescents, breathlessness, repeat infections and failure to grow. It can occur in males and females. Groups at high risk of iron deficiency include teenage girls and athletes, but can occur in anyone.

| | Mg iron / day |
|-----------------------------|---------------|
| Girls and boys 1 - 3 years | 9 mg |
| Girls and boys 4 - 8 years | 10 mg |
| Girls and boys 9 - 13 years | 8 mg |
| Boys 14 - 18 years | 11 mg |
| Girls 14 - 18 years | 15mg |
| Men | 7mg |
| Women (19 - 54 years) | 12 - 16mg |
| Women (54 +) | 5 - 7mg |
| Pregnancy (Trimester 2 & 3) | 22 - 36mg |

Dietary iron can be difficult to obtain and is found in two different forms - 'haem' iron which is found in animal foods and 'non-haem' which is found in non-animal food.

'Haem' foods usually contain more iron, which is well absorbed compared to non-haem iron, which is not well absorbed.

Certain foods and drinks reduce the body's ability to absorb iron, including:

- ★ Tannins from tea, coffee and wine reduce iron absorption by binding to the iron and carrying it out of the body
- ★ The phytates and fibres in wholegrains such as bran can reduce the absorption of iron and other minerals (but needs to be in excess of 2 tablespoons)
- ★ Soy proteins can reduce absorption from plant sources

- ★ Vitamin A helps to release stored iron, so not enough Vitamin A in the diet could lead to iron deficiency
- ★ Calcium and phosphorus reduce the absorption of plant-sourced iron.

Therefore, if your diet is based mainly on vegetables you may find your iron intake to be quite poor and also unavailable. With planning and consistency this can be resolved.

Dietary factors that boost iron absorption:

- ★ Vitamin C
- ★ Animal protein boost iron absorption from plant sources (think chilli con carne with beef mince and red kidney beans)
- ★ In most cases cooking increases the amount of available non-haem iron in vegetables. For example; the body absorbs six percent of the iron from raw broccoli compared to 30% from cooked broccoli.

Where do we find iron?

Haem Foods

| Food | Serve | mg Iron |
|---------------------|----------------------|-----------|
| Liver | 100g (cooked weight) | 11.0 |
| Liver pate | 40g (2 tbsp) | 2 - 3 |
| Lean steak | 100g (cooked weight) | 4.0 |
| Chicken (dark meat) | 100g (cooked weight) | 1.2 |
| Fish | 100g (cooked weight) | 0.6 - 1.4 |
| Oysters | 1 dozen | 4.7 |
| Salmon | 100g (small tin) | 1.4 |

Non - haem foods

| Food | Serve | mg Iron |
|---------------------------------|----------------|---------|
| Eggs | 100g (2) | 2.0 |
| Breakfast cereal (fortified) | 30g (1 cup) | 2.5 |
| Wholemeal bread | 60g (2 slices) | 1.4 |
| Spinach (cooked) | 90g (2/3 cup) | 3.6 |
| Lentils / kidney beans (cooked) | 100g | 2.5 |
| Tofu | 100g | 1.9 |
| Almonds | 50g | 2.1 |
| Sultanas | 50g | 0.9 |
| Dried apricots | 50g | 2.0 |

Keeping iron levels at a healthy level in your students is exceptionally important to their academic and sporting success.

Calcium

Dairy products are the foundation for our bones and keep your nerves and muscles firing.

Clinical studies have shown that those people with higher intakes of calcium and dairy foods also have lower body weight and less body fat. These protein foods are more satisfying and keep you fuller for longer.

It is true that dairy products are not the only sources of calcium. Calcium can be found in many other foods besides milk, cheese and yoghurt. The question is, who is prepared to eat 45 tablespoons of sesame seeds to obtain the same amount of calcium that is found in 250 ml of milk?

People often ask me if they can use sesame seeds, green leafy vegetables or nuts as an alternate calcium source to dairy products. This table gives an indication of the quantities of some common foods that contain the same amount of calcium as 250ml of milk.

Compare the amount of non-dairy food that needs to be consumed to be equivalent to one serve of dairy.

| Food | Quantity |
|---------------------------|-----------|
| Almonds | 120g |
| Apples | 7.5kg |
| Apricots, dried | 430g |
| Baked beans | 900g |
| Bread, wholemeal | 20 slices |
| Broccoli | 1kg |
| Eggs, boiled | 18 |
| Salmon, canned with bones | 140g |
| Sesame seeds | 45tbsp |
| Spinach | 600g |

The other factor to consider is that the calcium in dairy foods is absorbed more efficiently than from other sources. This means that although you might be feeling REALLY hungry and manage to munch your way through 7.5 kg of apples, you still won't absorb the same amount of calcium found in 1 cup of milk.

Most people will be able to obtain their average daily requirement of calcium by eating three serves of dairy every day. One serve of dairy is equal to:

- 1 glass (250ml) of milk
- 1 tub (200g) of yoghurt
- 2 slices (40g) of cheese

Calcium requirements per day

| | | mg Iron |
|----------------|---------------|---------|
| Girls and boys | 9 - 11 years | 1000 mg |
| Teenagers | 12 - 18 years | 1300 mg |
| Men and women | 19+ years | 1000 mg |
| Women | 50+ years | 1300 mg |
| Men | 70+ years | 1300 mg |

If you neglect to charge a battery, it dies. And if you run full speed ahead without stopping for water, you lose momentum to finish the race.

- Oprah Winfrey

Questions to ask your students and athletes for this week are:

- How many cups of fluid are you drinking each day?

| Fluid | Number of Cups |
|--------------|----------------|
| Water | |
| Tea / Coffee | |
| Other | |
| TOTAL | |

- How much fluid and what type are you consuming per hour of training and competition?

- How many cups of caffeine containing beverages are you consuming each day and are you exceeding the limit?
- Are you getting enough iron each day?
- How many serves of calcium are you consuming each day and how can you improve it if needed?

Resources

- Some useful fact sheets on Fluids in Sport and Sports Drinks can be found at <https://www.sportsdietitians.com.au/factsheets/fuelling-recovery/fluids-in-sport/> and <http://www.sportsdietitians.com.au/resources/upload/110616%20Sports%20Drinks.pdf>
- Recipe ideas for vegetarians to ensure an adequate iron intake can be found at <http://www.sanitarium.com.au>
- For red meat lovers go see <http://www.beefandlamb.com.au> for some tasty recipes
- **Quench** - Recovery hydration app
- Check out Osteoporosis Australia at <http://www.osteoporosis.org.au/calcium>
- Healthy Bones Action Week is held in August each year and some school based resources can be found at <http://www.healthybones.com.au/get-involved/schools>