Sport nutrition & the role of dairy

AN INITIATIVE BY THE CONSUMER EDUCATION PROJECT OF MILK SA

www.rediscoverdairy.co.za

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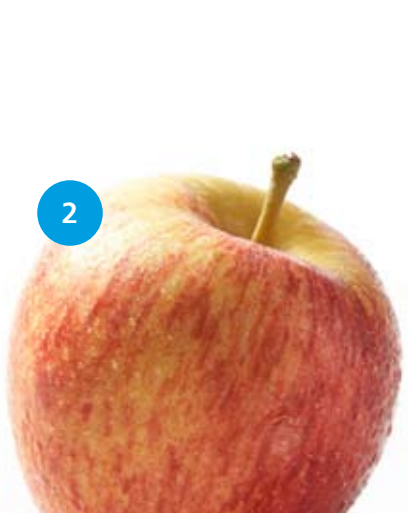


Introduction

An understanding of nutrition and how it affects sports performance is vital in order to get the most out of your sport, at every level. If you are looking to improve your performance in sport, be it rugby, swimming, netball, weight lifting, sprinting, cycling, long-distance running, motorcycling sport, etc., it is important to know how to give your body the right energy for engaging in the activity and maintaining performance.

In the past years it has become evident that sport at school level is a very serious matter. Children are pressured to perform well. The tendency to seek an easy outcome to enhance performance has become popular and the sports market is packed with loads of possibilities – some good and others not so good. Milk and other dairy products may be a good and cost-effective alternative to many of these products.

The purpose of this manual is to supply athletes across all performance levels and their coaches with sound, safe, and evidence-based information to support their training and performance on the sports field.

This manual was compiled as part of the Consumer Education Project (CEP) of Milk South Africa. The CEP would like to thank sports dietitian Nicki de Villiers for her input and sharing her years of experience in compiling this manual.

This document is a general guideline for learners and athletes. For personal needs consult a registered dietitian by visiting the website of the Association for Dietetics in Southern Africa at www.adsa.org.za

Background on the CEP

The CEP is an initiative of Milk South Africa, that was formed to communicate health and nutritional messages regarding dairy products to consumers and health professionals in South Africa. The major objectives are to address the misconceptions and lack of information regarding the nutritional and health benefits of dairy products. The project requires expert knowledge from fields such as dietetics, nutrition, dairy technology, communication and consumer behaviour. Through appropriate structures and processes the CEP successfully makes use of experts in the different fields to create an integrated, multi-faceted communication campaign.

"Good nutrition and physical activity go hand in hand."

Give young athletes a boost with milk and other dairy products

Sport is for everyone, not just elite athletes. It plays a role in the lives of many school children and teenagers. In the drive to combat childhood obesity, nutrition experts, sport scientists and government representatives are urging all young people in South Africa to become more active.

Children and adolescents should do 60 minutes (1 hour) or more of physical activity each day. These activities should be age appropriate, enjoyable and offer variety. Aerobic activity should make up most of the 60-plus minutes of physical activity each day. Muscle strengthening activities such as gymnastics or push-ups should be included at least three days per week. Bone strengthening activities, such as skipping or running, should also be included three days per week as part of the recommended 60-plus minutes per day.[1,2]

Good nutrition and physical activity go hand in hand. But there are signs that our young athletes may not be consuming the right foods and drinks to ensure optimum growth, health and sporting performance. Two main aspects of childhood sports nutrition require attention:

- intake of sufficient energy and high-quality nutrients like protein and calcium
- adequate hydration.

A balanced solution: flavoured milk

Young athletes can get all these benefits in a single product! Although there are a variety of well-known sports drinks available, many young players and their coaches are not aware of the benefits of using flavoured low-fat milk or drinking yoghurt as drinks of choice for hydration and calcium supply.

Low-fat flavoured milk and drinking yoghurt not only provide fluid but also contain calcium, protein, carbohydrates and electrolytes in an ideal combination to prevent dehydration, fatigue and brittle bones. Research has shown that young athletes find it easier to up their fluid intake when carbohydrates are supplied through drinks that come in a variety of flavours. The intake of protein together with fluids has also been identified as ideal to help muscles recover after exercise.

Calcium: vital for young athletes

At no time in a child's life is calcium more important than during the growth phase. Calcium storage in the skeleton reaches a peak around 12 and 14 years for girls and boys, respectively.

Risk factors for low bone mass

- Not enough calcium in the diet
- Strain due to hard exercise (overtraining)
- Avoiding dairy products to lose weight (especially girls)
- Strict vegetarian diets that exclude dairy products.

Consequences of low bone mass

- Stunted skeletal growth
- Fractures and injuries
- Poor athletic performance.

Active children and adolescents who take part in sport need three to four servings of dairy products a day (low-fat milk, low-fat yoghurt and/or cheese).

Low-fat flavoured milk or drinking yoghurt is the perfect sports drink because it contains:

- carbohydrates to boost energy, combat fatigue, fill up fuel stores and ensure hydration
- protein to help muscles recover
- a rich supply of easily absorbed calcium to build and maintain strong bones
- potassium, sodium and magnesium to replace electrolytes lost through sweating
- fluid to prevent heat stress and exhaustion
- it comes in a variety of flavours to encourage youngsters to drink enough fluids.

General dietary tips for the physically active

KEY MESSAGES

- **Diet affects performance**. The food that we choose in training and competition will affect how well we train and play.
- **Every athlete is different**. No single diet will meet the needs of all athletes.
- An athlete's diet may have its biggest impact during training. **A good diet will help support consistent, intensive training**, promote optimal adaptation to training and limit the risks of illness or injury.
- **Getting the right amount of energy** is key to staying healthy and performing well. Excessive energy intake will increase body fat; insufficient energy intake will hinder performance and the ability to ward off illness and injuries.
- Carbohydrates supply the muscles and the brain with the fuels needed to meet the stress of training and competition. **Athletes should know when to eat which foods to meet their carbohydrate needs**.
- **A balanced, varied diet will generally supply enough protein for building and repairing muscle**. Additional protein intake from protein supplements is seldom necessary.
- **A varied diet that meets energy needs and is based largely on nutrient-rich choices** should provide an adequate supply of vitamins and minerals. Young athletes should be sure to include vegetables, fruits, beans, legumes, cereals, lean meats, fish and dairy products in their diets.
- **Maintaining hydration is important for performance**. Appropriate fluid intake before, during and after exercise can help improve performance.
- **Athletes should refrain from indiscriminate use of dietary supplements**.(3)

"Milk and other dairy products will give athletes a cutting edge in a single product."

GENERAL DIETARY TIPS FOR THE PHYSICALLY ACTIVE

- Eat something within an hour after waking up. Children who eat breakfast on a consistent basis tend to have better nutritional profiles and a decreased risk of being overweight. **Breakfast** consumption may also improve cognitive function related to memory, test grades and school attendance.[4]
- Keep breakfast balanced: combine a carbohydrate (starch) source with some protein and add a fruit. Remember the intake of fluid with this meal.

BREAKFAST

- Porridge (e.g. maize or oats) or wholegrain cereal with low-fat or fat-free milk, plus low-fat yoghurt and a banana
- Wholewheat bread with poached eggs and freshly squeezed orange juice
- Wholewheat crackers with low-fat cottage cheese, honey and apple slices

- Eat a **snack** or a meal every two to three hours for better blood glucose control.[5,6]
- Keep snacks small and nutrient rich.[5]

SNACK

- Wholewheat crackers with cheese
- Drinking yoghurt
- Flavoured milk
- Wholewheat bread with peanut butter
- Fruit salad served with yoghurt
- Biltong and fresh fruit juice
- Almonds with raisins

- For **main meals**, include a carbohydrate source, a low-fat protein choice and a generous helping of vegetables or salad.
- Drink fluids like water, milk, fruit juice or iced tea throughout the day.

MAIN MEAL

- Wholewheat pita bread with chicken strips and stir-fried vegetables
- Pasta with tuna and tomato-and-onion sauce
- Baked potatoes with a lean mince filling, served with a Greek salad
- Rice mixed with lentils and roasted butternut
- Pasta salad with sliced eggs and tomatoes, served with freshly squeezed fruit juice
- A green salad with tomatoes, nuts and balsamic dressing, served with wholewheat bread
- Vegetable soup served with wholewheat rolls
- Brown rice with roasted chicken breasts and mixed vegetables
- Baked sweet potato with roasted pork chops and Greek salad
- Stiff maize meal porridge with tomato stew and beetroot salad

- Be sure to eat a carbohydrate-rich snack before training.[7,8]
- For training sessions that last longer than 60–90 minutes, drink a carbohydrate-based drink during the session.[7,8]
- Eat a recovery snack as soon as possible after the training session. Include a carbohydrate and a protein source.[7,8]

Get started with the basics

Athletes' diets can make a difference to the success of their training programmes. The foods an athlete eats fulfils different functions in the body. This information sheet shows how food choices can enhance an athlete's training and strength.

The major components of food are the macro nutrients protein, carbohydrates and fat. For the athlete, protein and carbohydrates are the most important.

ENERGY

Energy is defined as the capacity to work. Food provides the body with energy. Getting the right amount of energy from food will help athletes train well and stay healthy.

CARBOHYDRATES: The main source of energy

Why should an athlete eat carbohydrates?

- Carbohydrates are a key energy source, especially during high intensity activities.

Where can an athlete find carbohydrates?

- The foods in the table below are good sources of carbohydrates. Portion sizes that equal approximately 50 g of carbohydrates are included to help with meal planning.

How much carbohydrates does an athlete need?

- Divide your weight (in kilograms) by 10. This number represents the number of carbohydrate portions you should eat daily. A portion is taken, as the portion sizes indicated below, to provide 50 g of carbohydrates.

When should an athlete eat carbohydrates?

- Include a carbohydrate food source with every meal. Try to eat five to six meals per day.
- Eat one portion of carbohydrates as soon as possible after a training session that lasted longer than an hour. Pack this food as part of your training kit.
- If you train 90 minutes or longer, include a carbohydrate source (e.g. an energy drink) during your training.

FOOD SOURCES	PORTION SIZE FOR ±50 g CARBOHYDRATES
Bread, cereals, porridge, rice, pasta	1½ cups breakfast cereal (corn, rice, oats or wheat-based) 3 thin slices of bread 1½ cups rice or pasta (size of two fists) 1 cup stiff porridge (size of one fist)
Starchy vegetables	2½ medium potatoes 1 medium sweet potato 1½ cobs of corn (mealies) 1 cup of of baked beans
Fruit	3 fruits, each the size of a tennis ball or four golf balls 2 glasses (400 ml) of fruit juice
Milk and yoghurt	500 ml flavoured milk 350 ml drinking yoghurt 2 x 175 ml (2 tubs) low-fat flavoured yoghurt 1 ℓ maas or milk
Sugar	3 heaped tablespoons jam or honey 700 ml sports drink (1 squeeze bottle) 2 glasses sweetened cold drink 15 jelly babies 20 sweets containing vitamin C

PROTEIN

Why should an athlete eat protein?

- Protein is needed to build and repair muscles.

Where can an athlete find protein?

- Protein is found in both plant and animal sources.

How much protein does an athlete need for sports training?

- Divide your weight (in kilograms) by 10.
  This is the number of protein portions you need per day.

When should an athlete eat protein?

- Eat a portion of protein after each training session.
  Pack a protein-rich food as part of your training kit.
- Distribute the rest of your protein portions throughout the day.

Protein foods and portion sizes to supply ± 10 g protein

- 1 extra-large egg
- 30 g cheese (1½ slices or 3 tablespoons grated)
- 1 cup (250 ml) milk, low-fat plain yoghurt or maas
- 35 g meat (size of your thumb)
- 40 g chicken (drumstick)
- 50 g sardines/pilchards (½ can)
- 200 g baked beans (small can)
- 1 thick slice of polony or ham
- 3 tablespoons peanut butter

An example of a balanced meal plan for an athlete of 70 kg is as follows:

NUMBER OF PORTIONS/DAY		Breakfast	Snack (After training)	Lunch	Snack	Supper
CARBO-HYDRATES	PROTEIN					
7	7	1½ cups cereal (1 portion) + 2 glasses of juice (1 portion) 1 cup milk (1 portion)	3 slices of bread (1 portion) 100 g sardines (2 portions) Tomato	2 cups stiff maize porridge (2 portions) 2 cups low-fat plain yoghurt or maas (2 portions)	3 fruits (1 portion)	1½ cups rice (1 portion) 1 large chicken thigh (2 portions) Spinach and pumpkin

Carbohydrate portions Protein portions

Add some vegetables to help fight flu or other infections!

"Athletes' diets can make a difference to the success of their training programmes."

More about protein power

Protein is powerful! Protein supplies building blocks for growth, repair and maintenance. It also plays a vital role in supporting the immune system, helps to make hormones and transports nutrients.

Myths about protein

Myth: Since muscle is made mainly of protein, the more protein you eat, the more muscle you build.

TRUTH: Piling your plate with steak and eggs or drinking protein shakes is not the secret to building muscle. Exercise – not extra protein – is the driving force behind building big, strong muscles. Taking the extra steak will not build more muscle or build it faster. Protein indeed takes a back seat to carbohydrates in providing the energy needed for muscle-building exercise. The fact is before your body can use protein to build muscle, your body needs energy from carbohydrates to fulfil basic needs to keep it going. If there are not enough carbohydrates, your body will use the protein for energy instead of building muscle tissue.(9)

Myth: You need huge amounts of protein for strength before competition.

TRUTH: With the steak and eggs usually comes fat. Because fat requires more oxygen to be broken down than carbohydrates, the body has to work hard on such a pre-competition meal and therefore 'wastes' energy that it could have spent during the competition.(9)

Protein facts

- Protein comes from the Greek word *proteios*, meaning 'of prime importance'.
- Protein contains nitrogen – something not found in carbohydrates or fats. Nitrogen makes protein unique.
- Amino acids are the building blocks of protein. Some amino acids are called 'essential', which means that you can get them only from food. 'Non-essential' amino acids, though, can be manufactured by your body and therefore they do not have to come from food sources.
- Food from animals (meat, poultry, fish, milk and eggs) contains all the essential amino acids your body needs and is therefore called 'complete protein'. Protein from plant sources (e.g. baked beans, seeds, legumes and grains) often lacks one or more essential amino acids and is therefore called 'incomplete protein'.
- Proteins have two main roles: some help to drive chemical reactions in the body (functional proteins) and others give tissues and organs their shape, strength and flexibility (structural proteins).(10)

FOOD SUPPLYING APPROXIMATELY 10 g PROTEIN(11)

	FOOD SOURCE	PORTION
LOW-FAT ANIMAL SOURCES	Fish	50 g (cooked weight)
	Lean beef or lamb	35 g (cooked weight)
	Turkey or chicken	40 g (cooked weight)
	Lean beef biltong	25 g
	Eggs	1 extra-large
	Cheese	30 g = 1½ slices
	Low-fat fruit yoghurt	200 g
	Low-fat milk	300 ml
	Liquid meal supplement	150 ml
PLANT SOURCES	Baked beans	⅘ cup / ½ tin (200 g)
	Cooked soya beans	½ cup (60 g)
	Nuts or seeds (e.g. sesame)	50 g
	Cooked lentils	⅔ cup (115 g)
	Wholewheat bread	4 slices (120 g)
	Wholegrain cereal	2 cups (80 g)
	Untoasted muesli	1 cup (100 g)
	Cooked pasta or noodles	1½ cups (200 g)
	Cooked brown rice	3 cups (400 g)

The amount of protein needed per day depends on the level of physical activity of a person.

"Protein is powerful! Protein supplies building blocks for growth, repair and maintenance."

GUIDELINES FOR PROTEIN INTAKES FOR ATHLETES AND PHYSICALLY ACTIVE PEOPLE [7]	
Population	**Maximum protein needed (g/kg body weight/day)**
Sedentary people	0.8 – 1.0
Recreational exercisers	0.8 – 1.0
Serious athletes: early phase of training	1.5 – 1.7
Serious resistance-training athletes: established training programme	1.0 – 1.2
Serious endurance athletes	1.2 – 1.6
Adolescent athletes	1.5 – 2.0
Female athletes	15% less than male athletes

EXAMPLE

Someone who weighs 70 kg and does recreational exercise needs 0.8 – 1.0 g protein per kilogram body weight per day, which is 56 – 70 g protein in total. The above meal plan shows how to obtain this amount of protein easily from a balanced diet.

MEAL		AMOUNT OF PROTEIN
BREAKFAST	1 cup muesli 1 cup milk 1 egg 1 slice of toast	10 g 8 g 10 g 2 g
LUNCH	1 cup pasta 1 chicken breast (80 g) Mixed salad	4 g 20 g -
SUPPER	2 slices of bread 1 slice roast beef	5 g 10 g
TOTAL		69 g

"Protein supplies building blocks for growth, repair and maintenance."

Hype about hydration

Water is essential to life. Not only does it serve as the medium in which all chemical reactions in the body take place, but it also makes up an essential part of the cell fluid, helps control the electrolyte balance in the body, provides protection to key tissues, serves as a transport medium and is crucial for proper functioning of the special senses.

Water also constitutes the major part of sweat and so helps to regulate body temperature. The evaporation of sweat from the skin's surface is a powerful cooling mechanism that allows the release of the heat produced by working muscles. However, together with water, some electrolytes are also lost through sweat. To prevent dehydration it is therefore important to replace both fluid and electrolytes, and athletes have long been advised to consume 'as much fluid as possible' to ward off the demons of dehydration.(10)

More recently, though, athletes and medical staff at sporting events have been told to limit hydration owing to the potential dangers associated with overhydrating* during long periods of physical activity.

The advice may seem contradictory: drink enough fluids during activity to prevent performance-limiting dehydration, yet do not consume so much fluid that hyponatremia (low salt level in blood) develops. This may leave the athlete confused, because how much is then just right?

DEHYDRATION

Dehydration is defined as the sudden drop of fluid stores below the level that is required to support a steady-state condition of normal body water levels. If such low body water stores persist for an extended period of time, hypohydration can arise, which is a steady-state condition of decreased body water.

RISK FACTORS FOR DEHYDRATION

Dehydration sets in when the amount of fluid lost through sweat, urine and respiration is not matched by sufficient intake. The risk for dehydration increases when the sweat rate increases, for example in hot conditions, during high-intensity activity or when participating in multiple training sessions on the same day. Inadequate access to fluids or food, poor compliance to an individualised hydration plan or failure to attain proper hydration at the start of the activity can also increase the risk for dehydration. Individual factors such as sweat rate, body weight, personal preference for flavour or temperature of a drink, fluid tolerance and illness also need to be considered as possible contributors to dehydration.(10)

*To read more about overhydration please refer to page 13.

COMPLICATIONS OF DEHYDRATION

Dehydration can cause the core body temperature to rise; in short, the body overheats. It also puts extra strain on the heart because the loss of water thickens the blood, which requires the heart rate to increase to sustain a specific workload. When dehydrated, the athlete's perceived effort increases greatly, and concentration and mental functioning diminish. To regain a proper fluid balance may prove difficult following dehydration owing to gastrointestinal discomfort and upsets that are often experienced.(10,12)

OVERHYDRATION OR HYPONATREMIA

Overhydration refers not only to excessive fluid intake during exercise but also to the resulting low blood sodium levels. Overhydration is therefore also known as hyponatremia.

RISK FACTORS FOR OVERHYDRATION

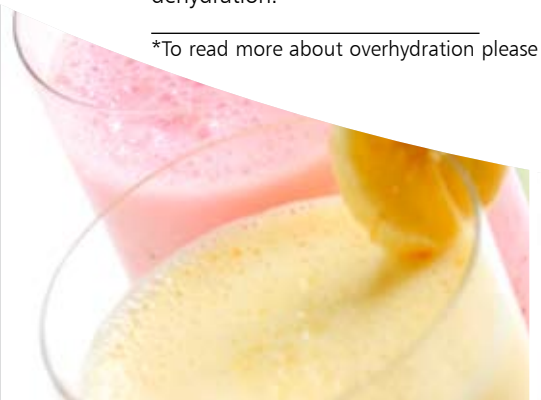
Athletes participating in events of more than four hours are at risk of overhydrating. Prolonged sweating encourages fluid intake over a long period, yet large amounts of sodium are lost. This is especially applicable to athletes who drink large volumes of water but without replenishing sodium, or slower athletes who are over-zealous about fluid consumption. Athletes participating in lower-intensity endurance activities are also at risk, because more fluid may be consumed over the duration of the event than is lost through sweating.

SIGNS OF OVERHYDRATION

Visible signs of overhydration include:

- dizziness
- nausea
- extreme fatigue
- respiratory distress
- confusion and/or disorientation
- swollen hands or feet (oedema); rings, watches and shoes may feel too tight

Overhydration left untreated can have serious consequences, such as seizures, coma and even death.



PREVENTING OVERHYDRATION

Athletes should be sensitive to onset of thirst as the signal to drink, rather than 'staying ahead of thirst'. It is also important to ensure that the fluids consumed include adequate amounts of salt (sodium), and during continuous days of exercise in hot weather to consume a little extra salt with meals and snacks. Body weight can be used to gauge hydration status. Weighing more after training than before is a sign of developing water overload. Non-steroid, anti-inflammatory drugs and pain relievers can contribute to developing a water overload.(13)

MONITORING DEHYDRATION

A change in body weight is a good indication of an athlete's hydration status following exercise. The percentage change in body weight can be calculated as follows:

$$\text{Body weight change (\%)} = \left(\frac{\text{body weight before} - \text{body weight after}}{\text{body weight before}} \right) \times 100$$

HYDRATION STATUS	BODY WEIGHT CHANGE (%)	PRE-EXERCISE WEIGHT	EXAMPLE	
			POST-EXERCISE WEIGHT	WEIGHT CHANGE IN AN INDIVIDUAL WEIGHING 60 KG
Well hydrated	Between 1% gain and 1% loss	60 kg	60.6 – 59.4 kg	Gain or loss of 0.6 kg
Minimal dehydration	Loss of 1 to 3%	60 kg	59.3 – 58.2 kg	Loss of 0.7 – 1.8 kg
Significant dehydration	Loss of 3 to 5%	60 kg	58.1 – 57 kg	Loss of 1.9 – 3 kg
Serious dehydration	Loss of > 5%	60 kg	< 57 kg	Loss of more than 3 kg

Early visible signs of dehydration include:(12)

- headache
- fatigue and muscle cramps
- loss of appetite
- flushed skin
- heat intolerance
- dizziness
- dry mouth and eyes
- dark urine and infrequent urination

Advanced visible signs of dehydration include:

- difficulty swallowing
- clumsiness
- shrivelled skin
- sunken eyes and dim vision
- painful urination
- numb skin
- muscle spasms
- delirium(10)

Fluid balance and sweat loss calculation

Any weight loss reflects a mismatch between fluid intake and fluid loss during exercise. A deficit of 1 kg indicates failure to replace approximately 1 ℓ of fluid during exercise.

STEP 1: Change in body mass: Measure body mass before exercise in minimum clothing and immediately after exercise in the same clothing, towel dried.

STEP 2: Fluid intake: Measure mass or volume of drink bottle/s before exercise and immediately after exercise.

STEP 3: Urine or toilet losses: Measure difference in mass before and after going to the toilet.

CALCULATIONS:

- Fluid deficit (ml) = Change in body mass after exercise x 1 000
- Fluid intake (ml) = Change in mass of fluid bottle after exercise
- Urine losses = Change in body mass before and after toileting x 1 000
- Total sweat loss = Fluid deficit + Fluid intake – Urine losses
- Hourly sweat rate = Divide total sweat loss during exercise by the duration of the exercise
- Percentage dehydration = Total fluid deficit (kg) divided by pre-exercise mass (kg) x 100

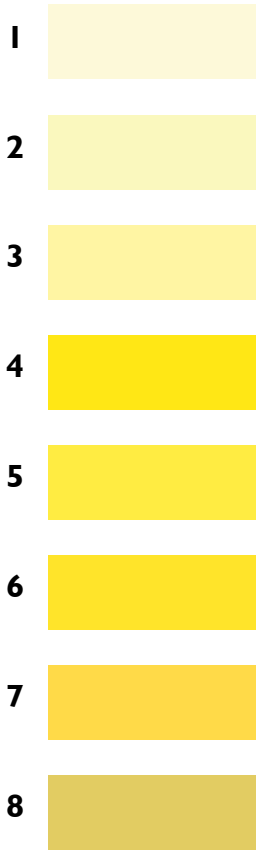
PREVENTING DEHYDRATION

The main principle for preventing dehydration is that fluid intake should match fluid losses. Also remember that the sweat rate generally increases after 10 – 14 days of heat exposure, which means that a greater fluid intake will be required for a similar bout of exercise.[10,12]

GENERAL GUIDELINES AND TIPS FOR FLUID INTAKE

- Athletes should drink enough before exercising, so that they can start training in a well-hydrated condition. With the help of a structured plan, athletes can learn to tolerate up to 5 ml fluid per kilogram of body weight in the warm-up before an event. This equates to 350 ml for an athlete weighing 70 kg.
- Use the same fluid replacement plan during a competition as during training sessions. Drink as much as is practical and comfortable in attempting to match sweat losses. Note that sweating occurs even when exercising in water or in air-conditioned venues. Start fluid replacement early and top up frequently as this will maintain gastric volume and increase fluid absorption.
- Make the most of opportunities to drink fluids (intervals or injury time in team sports).
- Adopt a pattern of drinking small amounts of fluid at regular intervals during exercise rather than trying to drink large volumes all at once.
- Drinks should be cool (not cold), palatable and contain the optimal amount of carbohydrates applicable for the specific event. Sports drinks (5 – 7% carbohydrates) are good options since they empty from the stomach faster than soft drinks (which generally contain 10% carbohydrates), while also helping to replace sodium losses. Drinks with carbohydrate concentrations greater than 10% may promote gastric cramps.
- Make sure that drinks are easily accessible. They should be in a container that allows easy drinking with minimal interruption of exercise.
- Replace fluid losses as completely as possible between competition sessions. Sweating continues for some time after exercise and replacement fluids should therefore also include adequate amounts of electrolytes (sodium and potassium).
- Active cooling should be part of the recovery plan. Avoid long, hot baths or prolonged sauna or spa sessions. If such activities are necessary, drink extra fluid.
- For fluid deficits of more than 1.5 – 2 ℓ and short recovery time, rehydration solutions with a sodium content of 60 – 80 mmol/ℓ (see label information) can be used. Pretzels, soup or potatoes dipped in salt, taken with water, are also good sources of sodium.[7]

MONITORING HYDRATION WITH AN URINE COLOUR CHART



- Urine that is plentiful, odourless and pale in colour (pale straw) generally indicates that a person is well hydrated.
- Dark strong-smelling urine (like the colour of apple juice), in small amounts could be a sign of dyhydration.
- Certain foods, medications and vitamin supplements may cause the colour of urine to change even though you are hydrated.

For the serious athlete: the art of recovery after sport

General nutrition guidelines

An increase in training load is associated with an increase in fitness level, but it is often overlooked that the real gains in exercise capacity occurs when the body is at rest. Although the workout acts as the important stimulus for the adaptation process, metabolic recovery and rebuilding occur at rest.

One of the key components to support the body for optimal recovery is the timely intake of nutrients, i.e. eating at the right time. Carbohydrates are the primary fuel source during training. The body uses blood sugar and glycogen stored in the muscles as its carbohydrate sources. Owing to relatively little glycogen being available, it is important to replace carbohydrates regularly to avoid running out of fuel. When glycogen stores are depleted, the body resorts to muscle protein as its emergency high-intensity fuel source. Repeatedly failing to replenish glycogen stores will cause additional tissue breakdown.

Poor nutritional recovery can lead to complaints of "lead legs" or a feeling that you cannot keep up. The body will also react by an increasing resting heart rate. If an athlete does not recover between events in multi-day competitions, it can lead to poor performance and increased feelings of fatigue.

> **"One of the key components to support the body for optimal recovery is the timely intake of nutrients."**

Optimal nutritional recovery maintains energy levels and limits tissue breakdown, especially during high training loads. Glycogen stores are optimally replenished within one to two hours after exercise has stopped.

The following guidelines can help to ensure effective glycogen recovery

- Start the replenishment process during practice if the session is longer than an hour.
- Eat immediately after the training session if recovery time is less than 24 hours prior to the next training session. This snack should contain a substantial amount of carbohydrate (1.2 – 1.5 g carbohydrate/kg body weight) and some protein (0.25 – 0.4 g protein/kg body weight). Refer to carbohydrate and protein lists (p7 - 9).
- Follow up with a post-training snack an hour later.
- Eat a main meal within two hours after a workout.
- Include a variety of carbohydrate sources such as fruit, fruit juices, milk, low-fat flavoured yoghurt, drinking yoghurt, bread or cereal as snack options.
- Add protein sources such as meat, peanut butter, cheese, milk, yoghurt, legumes.
- Rehydrate properly by including liquids to replenish lost fluids. Drink a volume equal to 125 – 150% of the post-exercise fluid deficit (weight loss) to compensate for ongoing losses and ensure that fluid balance is restored over the first 4 to 6 hours of recovery.[7,14]

Your road map to recovery:

DAILY RECOVERY MEAL PLAN

Early morning training
05:30 – 06:30

Before or during training
Carbohydrate intake

Before 07:00:
Flavoured milk
OR
Yoghurt and fruit
OR
Meal replacement
OR
Cereal and milk

10:00
Repeat snack
Drinking yoghurt
OR
Fruit and yoghurt
OR
Provitas and cheese

12:00
Meal
Rice, chicken and salad
OR
Sandwich with ham, cheese and tomato
and
Water

14:30
Before-training snack
Fruit or fruit juice and yoghurt
OR
Sports snack bar
OR
Sandwich
and
Water

Late afternoon training
15:30 – 17:00

During training
Carbohydrate intake

Before 17:30
Meal replacement
OR
Flavoured milk
OR
Cereal with milk

19:30
Supper
Meat, potatoes and vegetables
and
Water or cold drink

21:00
Optional late-night snack
OR
Tea and rusks

REMEMBER

If training only in the afternoon, the morning's snack (before or during training) will fall away.

When you are training only in the morning, the afternoon snack will move a bit later, the snacks during training and recovery will fall away with normal supper and late-night snack.

Practical guide to eating right for training and competition

TWO TO THREE DAYS BEFORE THE EVENT

- Eat regular meals and snacks (every two to three hours).
- Include a carbohydrate (starch or fruit) with every meal, e.g. bread, pasta, rice, potatoes, cereal, porridge or wholewheat crackers.
- Lower your fat intake by avoiding salad dressings, excessive butter or margarine or fried foods such as potato chips, crisps, vetkoek, russians, sausages, polony, samoosas, or deep-fried chicken.
- Eat five to six portions of fruit and/or vegetables per day.
- Hydrate well. Drink 2.5 – 3 ℓ fluid per day and approximately 500 ml fluid per hour of training. These can include sport drinks, fruit juice and water. Try not to drink carbonated cold drinks during this time.
  - Carry a bottle of water with you throughout the day.
  - Drink small amounts regularly throughout the day.
  - Keep note of your fluid intake throughout the day to achieve your goals.
- Use salt sparingly.

PRE-EVENT MEAL: GENERAL RECOMMENDATIONS[7]

- Eat three to four hours before the event. If this is not possible, eat a snack two hours before the event.
- Compose a carbohydrate-rich, low-fat meal. Good carbohydrate choices are cereal, porridge, bread, potatoes, pasta, muffins, scones, etc. Avoid adding any fat such as butter, margarine, mayonnaise or oil.
- Plan your meal for when you have to travel. Take cereal, yoghurt and fruit along, or make sure what the on-board menu has to offer beforehand.
- Hydration is important. Drink 500 ml water two hours before the event and another 300 – 500 ml water 15 – 30 minutes before the start.
- Avoid high-bulk meals (too much fibre-rich foods). Rather use oats, mealie meal, rice, potatoes or brown bread. The option of muesli with added nuts and dried fruit, wholewheat products or muffins should be considered with caution.
- Stick to familiar foods. Try different combinations some time before the competition and if a meal is not tolerated well then, try a liquid meal such as a meal replacement or a fruit smoothie.

NOTE: For any individual differences or needs required by a specific sport, it is recommended to contact a professional dietitian to assist you with your personal meal plan

"An athlete should ideally wake up at least four hours before a competition. For example, if the first item or match is at 08:00, the participant should wake up at 04:00 and have a pre-event meal not later than 05:00. If this is not possible, rather take the pre-event meal the night before and then a liquid meal or snacks early the next morning."



Meal choices for the serious athlete

CARBOHYDRATE INTAKE BEFORE EVENT		
WHEN	**WHAT**	**EXAMPLE OF CHOICES**
2 – 4 hours before the event	200 – 300 g carbohydrate	• Crumpets with jam or honey and flavoured milk • Baked potato with cottage cheese and a glass of milk • Toast with baked beans • Breakfast cereal with milk • Bread roll with cheese or meat filling, and a banana • Fruit salad with flavoured and sweetened yoghurt • Pasta or rice with a lean meat sauce
1 – 2 hours before the event	100 – 200 g carbohydrate (snack)	• Liquid meal supplement • Milkshake or fruit smoothie • Sport snack bar • Breakfast cereal with milk • Cereal bar • Fruit-flavoured yoghurt • Fruit
Less than 1 hour before the event	At least 50 g carbohydrate	• Sports drink • Carbohydrate gel • Cordial • Sport snack bar • Jelly lollies
250 – 500 ml fluid with every meal		• Milk • Water • Fruit juice • Cold drink • Sports drink

NOTES:
- **Keep the meal low in fat**
- **Moderate intake of protein is acceptable**

INTAKE DURING EVENT		
WHEN	**WHAT**	**EXAMPLE OF CHOICES**
Every hour	400 – 1 000 ml fluid, according to individual need	• Water • Diluted fruit juice • Sports drinks
	30 – 50 g carbohydrate	• Sports drinks • Water and carbohydrate-containing snacks, e.g. jelly sweets, energy bars, nougat, banana, etc.

NOTES:
- **Drink small amounts when you have the opportunity to do so!**
- **Drink fluids at half time**

INTAKE AFTER EVENT		
WHEN	**WHAT**	**EXAMPLE OF CHOICES**
Within 1 hour after event	Carbohydrates (1–1.5 g/kg body weight)	• Milkshake, drinking yoghurt or fruit smoothie • Low-fat flavoured milk or low-fat flavoured yoghurt • Energy bar and sports drink
	10–20 g protein	• Breakfast cereal with low-fat milk • Sandwich with lean meat, cheese or chicken filling and a fruit • Fruit salad and low-fat fruit yoghurt • Low-fat fruit yoghurt or flavoured milk and a cereal bar
	Fluids (equal to weight loss)	• Water, sports drinks, fruit juice or milk/flavoured milk
	Salt	• Salty snacks such as biltong • Added salt on first meal after event

NOTES:

- **Limit fat intake on the day of competition.**
- **A litre of water-based fluid weighs about 1 kg. So, if 1 kg of weight was lost during the event, 1 – 1.5 ℓ of fluid should be consumed afterwards.**

"Eat small meals or snacks every three to four hours."

Examples of food combinations for pre-event meals

TIME: FOUR HOURS BEFORE THE EVENT (High in carbohydrate, low in fat, low in fibre)	
A pre-event BREAKFAST	**Choices for a pre-event LUNCH or DINNER**
Cereal (corn, rice, oats or wheat-based) with low-fat milk + Fresh or tinned fruit with fruit-flavoured low-fat yoghurt + Bread rolls or slices with jam and/or honey + Boiled/poached eggs or ham or lean mince + Fruit juice Water	Rice or pasta or potatoes or stiff porridge + Grilled chicken or lean mince or fish or lean steak with vegetables/salad or Bread rolls or slices with jam/honey and cheese or lean ham or peanut butter + Fresh fruit + Milk, flavoured milk or fruit juice Water

TIME: TWO HOURS BEFORE THE EVENT (High in carbohydrate, low in fat, low in fibre)						
Sandwich + fruit juice	Energy bar + sports drink	Fruit smoothie	Cereal with milk and fruit	Drinking yoghurt + fruit	Cereal bar + banana	Low-fat muffin + fruit juice

LESS THAN AN HOUR BEFORE THE EVENT
• Sports drink • Carbohydrate gel • Cordial • Sport snack bar or energy bar • Jelly lollies

"Hydration is important. Drink 500 ml water two hours before the event and another 300 – 500 ml water 15 – 30 minutes before the start."

Examples of food combinations for recovery meals

THE FOLLOWING COMBINATIONS PROVIDE ±60 g CARBOHYDRATES AND ±10 g PROTEIN

- 300 ml milkshake or fruit smoothie
- 500 ml flavoured milk or drinking yoghurt
- 500 ml low-fat milk + 2 bananas
- 1 sandwich or roll with lean meat, cheese or chicken filling + a piece of fruit
- 1 cup fruit salad + tub (200 g) of low-fat yoghurt
- 700 ml sports drink + energy bar

EXAMPLES OF TOP-UP SNACKS FOR IN-BETWEEN EVENTS

- Sandwiches with cheese, ham, chicken, boiled egg, tuna, jam or peanut butter
- Muffins
- Fresh fruit and low-fat yoghurt
- Fruit smoothies
- Sport snack bars or energy bar
- Sports drinks
- Breakfast cereal with milk
- Drinking yoghurt

"Plan your meals when you have to travel."

Frequently asked questions and answers for athletes

How will diet enhance an athlete's performance?

A balanced diet consisting of the following components will enhance sport performance.

• CARBOHYDRATES GIVE ENERGY

During times of high-intensity training, an athlete needs adequate energy intake to maintain body weight, minimise training effects and maintain good overall health. Low energy intakes can result in fatigue and a decreased performance level.

Carbohydrates are the main fuel source for athletes and are generally needed in larger amounts than applicable for the general population. However, factors such as total daily energy expenditure, type of sport, sex and age of the athlete, and environmental conditions need to be considered in estimating specific carbohydrate needs.

Good sources of carbohydrates are fruit (fresh and dried), fruit juice, bread, rice, pasta, couscous, potato, sweet potato, maize meal porridge, cereals, sport drinks and jelly sweets. Although vegetables are a source of carbohydrates, they contain very little and do not really contribute to the high carbohydrate needs of the athlete. It is important though not to exclude vegetables from the diet of the athlete.

Milk, flavoured milk and low-fat flavoured yoghurt are also a good source of carbohydrates and at the same time they contribute to the athlete's protein needs.[10,15]

• PROTEIN HELPS MUSCLE RECOVER

Protein requirements are slightly increased in highly active people and children. The requirement can generally be met through diet alone, without the use of protein supplements. Protein intake will help muscle to recover from damage incurred during training.[10,15]

• SOME FAT IS BENEFICIAL

Fat is important in an athlete's diet as it provides energy, fat-soluble vitamins and essential fatty acids. It should therefore constitute no less than 20 – 30% of an athlete's total daily dietary intake. (For an athlete weighing 70 kg, this amounts to approximately 80 g of fat a day.)

Too much fatty or fried food on the day of a competition might lead to sluggishness. Fat decreases the transit time of food through the gut, which means that in the presence of a lot of fat, carbohydrates would not be readily available. Therefore, limit the use of fatty or fried foods on competition days.[10,15]

• FLUID HELPS THE BODY STAY COOL

Dehydration decreases exercise performance. It is important for athletes to consume adequate fluid before, during and after exercise.[10,15]

Dairy products as an aid help muscle recovery after sport

If you are an athlete or a gym fanatic, consider using dairy products like low-fat milk and low-fat yoghurt to improve your performance and ensure that your muscles recover after a strenuous workout. Athletes require additional protein after exercise to replace muscle protein that was broken down during exercise and to promote muscle repair and growth. Because dairy products are packed with high-quality protein, they are ideal for post-exercise muscle repair.

HOW MUCH PROTEIN SHOULD YOU EAT AFTER EXERCISE?

Most athletes know that they need to restore carbohydrates after exercise. However, research shows that if you add some protein (0.2 – 0.4 g/kg bodyweight) to your carbohydrates (0.8 – 1 g/kg bodyweight) immediately after exercise you will improve your body protein balance and boost glycogen storage. For example, a 70 kg athlete should have 14 – 28 g protein and 57 – 70 g carbohydrate after exercise. Practically, this equates to a meal of approximately 350 ml flavoured milk and two slices of bread with 30 g cheese.

Which protein foods can you eat after exercise?

Dairy is an excellent source of high-quality protein, which includes all the essential amino acids needed for muscle recovery. Low-fat dairy products like milk, flavoured milk, drinking yoghurt or cottage cheese are good choices and are often recommended as post-exercise snacks. Other sources of low-fat, high-quality protein are skimmed milk, whey or casein (ready prepared retail products on the market), skinless chicken (white meat), fish and egg white.

Muscle damage

So-called Exercise-Induced Muscle Damage (EIMD) can cause sore muscles and decrease muscle performance. By including protein in a post-exercise meal, you will provide your body with critical amino acids, which will improve muscle protein repair and muscle growth. This will not only help you build that "six-pack" but also speed up recovery and lower the risk of injury.

Supporting scientific evidence[7,9,14]

Recent scientific research demonstrates the positive impact of dairy products on muscle recovery and muscle gain:

- Milk (low-fat) consumed 20 to 30 minutes after resistance exercise, which damages muscles, was found to reduce EIMD. In this study, the athletes improved their subsequent training performance and recovered faster.
- Yoghurt was found to decrease muscle damage and inflammation and increase antioxidant capacity after prolonged exercise.
- Chocolate milk was identified as an effective alternative to commercial sports drinks, because it helps to sustain performance in subsequent exercise sessions. The high carbohydrate, protein and mineral contents of chocolate milk are regarded as "critical recovery factors".
- Eating a bowl of cereal with low-fat milk or drinking a flavoured milk drink is as good at helping muscles recover after exercise as commercially available sports drinks, but with the added benefit of providing protein.

Practical diet tips for athletes

Try the following to recover after exercise:

- Low-fat/fat-free milk
- Flavoured milk
- Drinking yoghurt
- Low-fat flavoured yoghurt
- Dairy fruit smoothie
- Cheese sandwich or a potato with cottage cheese
- Cereal with low-fat milk

"Dairy and exercise – a winning combination!"

What if an athlete needs to lose weight while training?

Changes to body weight or composition should never compromise energy intake required to sustain performance. Severe energy restrictions or weight loss practices in which one or more food groups are eliminated may put an athlete at risk for micronutrient (vitamins and minerals) deficiencies. Athletes should strive to consume foods from all the food groups to provide at least the recommended daily allowances for all micronutrients from food.(15)

Athletes who need to lose weight to improve their performance should consult a dietitian for advice.

How can sports drinks support training or performance?

The intake of sports drinks – whether homemade or commercial – should be limited to during activity as they are specifically formulated to supply the fluid, carbohydrates and electrolytes that the active body needs.

• FLUID

Fluid intake during exercise is important to prevent dehydration and help keep the body cool. Flavourants encourage regular drinking. Diluted fruit juice (two cups of water for every cup of juice) can be used for fluid replacement, although it may not eliminate thirst to the same extent as a sports drink.(15)

• CARBOHYDRATES

A 6% carbohydrate solution (6 g carbohydrate per 100 ml drink) strikes the optimal balance in taste, rapid fluid absorption and energy supply to fuel working muscles. Undiluted juice or carbonated soda should be avoided because they typically contain too much carbohydrate (10–12%) and may cause gastric discomfort and delay gastric emptying. Multiple carbohydrate sources are preferred because this helps stimulate fluid absorption.(15)

• ELECTROLYTES

The electrolyte content of a sports drink should attempt to replace both the potassium (30 mg/250 ml) and sodium lost through sweat. A potassium concentration of 30 mg/250 ml should be adequate. Sodium intake of approximately 100 mg/250 ml enhances the taste of a sports drink, facilitates the absorption of fluid and helps to maintain body fluids. Sodium may also stimulate voluntary drinking.(15)

Which ingredients are unnecessary in sports drinks?

Ingredients other than fluid, carbohydrates and electrolytes are unnecessary in sports drinks because the body cannot use them during exercise.

- Caffeine (found in beverages such as iced tea and certain soft drinks) should be avoided because it promotes fluid loss (diuresis) and can have side-effects that can influence performance negatively.
- Herbs, e.g. guarana, gingko biloba, ephedra and ginseng, are often added to sports drinks, but research shows no conclusive performance benefits of these substances. Experts question the safety and benefits of these herbal ingredients.(15)

Homemade sports drink recipe 1

10 tablespoons sugar (120 g)
¾ teaspoon salt (4.2 g)
1 package unsweetened powdered cold drink
Water to make up to a final volume of 2 ℓ

Per cup, the drink provides:
14.8 g carbohydrate (6%)
230 kJ energy
102 mg sodium
121 mg potassium

Homemade sports drink recipe 2

½ cup orange or berry juice (125 ml)
9 tablespoons sugar (110 g or 133 ml)
⅜ teaspoon salt (2.1 g or 2.1 ml)
1 package unsweetened powdered cold drink
Water to make up to a final volume of 2 ℓ

Comparison of the typical composition of water, commercial sports drink, fat-free milk and low-fat milk

Nutrients per Litre (L)	WATER	SPORTS DRINK	FAT-FREE MILK	LOW-FAT MILK
Carbohydrates (g/L)	0	60	48.5	46.8
Fat (g/L)	0	0	1.8	20.1
Protein (g/L)	0	0	34	33
Energy density (kJ/L)	0	1 020	1 460	2 080
Sodium (mmol/L)	0.3	23.0 ± 0.7	38.6 ± 1.7	20.2 ± 1.7
Potassium (mmol/L)	0.5	2.0 ± 0.0	45.2 ± 1.7	39 ± 1.7
Chloride (mmol/L)	0.0	1 ± 0	35 ± 1	32 ± 1
Osmolality (mosmol/kg)	0.0	283 ± 2	299 ± 3	271 ± 3



What practical advice can athletes follow to ensure optimal benefit from sports drinks?

- Choose a sports drink with a 6% carbohydrate solution.
- Avoid unnecessary substances, e.g. herbs, vitamins, minerals and caffeine in sports drinks.
- Drink small amounts regularly during training (according to schedule or in all drink breaks provided).
- Avoid the intake of sports drinks outside activity periods.
- Monitor drinking hygiene. Athletes should each use their own water bottles and wash and rinse them thoroughly after use.
- Pack a favourite sports drink for training sessions and competitions.

Drink flavoured fluids through a straw to limit the amount of contact between the sports drink and teeth. This can reduce the risk of dental decay.[15,16]

How should an athlete start a competition day?

- Eating on the day of a competition is important to prevent hunger before or during activity and helps supply fuel to muscles. Complex carbohydrates such as bread, pasta and crackers are good choices; avoid excessive amounts of simple carbohydrates such as sweets and soft drinks before exercise.
- **BREAKFAST** is a day's most important meal, also on the day of a competition. Try to eat your normal breakfast before leaving home. Remember to drink at least two cups of fluid with the meal.

> **"Breakfast is the most important meal of the day, also on the day of a competition."**

Breakfast options

- Cereal with milk, fruit and yoghurt and a glass of juice
- Toast with peanut butter or low-fat cheese and tomato and a glass of milk
- Toast fingers with boiled eggs
- Tinned spaghetti on toast and flavoured milk
- Banana and peanut butter on toast and a glass of milk
- Scrambled eggs with creamed corn on toast and a glass of juice
- Crumpets with honey, a tub of yoghurt and a glass of juice

If you have to travel long distances or need to make an early start before a game, pack an on-the-run breakfast.

On-the-run breakfast options

- Ready-to-eat drinkable cereals
- Cereal mixed with a lot of milk as a drink
- Drinking yoghurt, flavoured milk
- A smoothie (fresh fruit, e.g. banana, yoghurt, milk and a tablespoon of honey) prepared the night before
- Wholewheat pancakes (baked and frozen in advance) with banana and a tablespoon of honey as a filling
- Snackwiches prepared the night before

In situations where nervousness or excitement decreases appetite, use meal replacements or flavoured milk as a liquid meal.

Is the food supplied at sports events recommended for athletes?

Food available from vendors at sports events (e.g. boerewors rolls, potato chips, chip sticks, meat pies, etc.) is not ideal for athletes on competition days, as they are often high in fat and protein. Such foods take longer to digest than carbohydrates and therefore can cause indigestion and nausea.

If food has to be bought at the event, choose healthy options:

SWAP THIS		FOR THIS	
Hamburger with salad, cheese, egg and bacon + small chips + can of soft drink	4 535 kJ 56 g fat	Hamburger with one meat patty and salad + can of diet soft drink	1 675 kJ 17 g fat
Half a medium pizza	2 510 kJ 26 g fat	Barbecued chicken wrap	906 kJ 7 g fat
Meat pie	1 880 kJ 24 g fat	Hot dog	1 170 kJ 18 g fat
50 g bag of chips + 55 g chocolate bar + can of soft drink	2 860 kJ 30 g fat	Pasta salad and milk	1 945 kJ 20 g fat
Sausage roll and a can of soft drink	2 215 kJ 28 g fat	Ham sandwich and fruit juice	1 913 kJ 17 g fat

But the best solution is to plan and pack!

COOLER BOX MEAL IDEAS

- An extra cereal or energy bar with fruit juice
- Crackers with cheese wedges and cordial
- A packet of popcorn or pretzels with a few biltong sticks and cordial
- A bread roll with peanut butter and a fruit
- Jaffles with lean mince
- Chicken wraps
- Homemade burgers
- Frozen fruit lollies made from blended ripe leftover fruits and 100% fruit juice
- Trail mix – a blend of unsalted nuts, seeds and dried fruits
- Melba toast with dips, e.g. avocado or low-fat cottage cheese
- Corn on the cob or tinned sweetcorn

COOLER BOX SNACK IDEAS

- Flavoured milk
- Drinking yoghurt
- Low-fat flavoured yoghurt
- Liquid meal replacement
- Drinking cereal
- Sports drinks or cordial
- Jelly sweets
- Water
- Sandwiches with jam or honey
- Fruit juice
- Fresh fruit
- Raisins
- A bread roll with banana
- Cereal bars
- Banana or date loaf or muffins

All you need to know about supplementation

WHY DO ATHLETES TAKE SUPPLEMENTS?

As training programmes become more demanding, the role of nutrition becomes ever more important to sustain good performance. A varied diet that meets the energy needs of a training athlete should provide all the essential nutrients in adequate amounts to ensure optimal adaptation to training and performance. **Athletes should therefore indeed ensure that they have a good diet before contemplating supplement use.**

However, over the years a culture has developed that supplements can in some way compensate for poor food choices and the increased stresses of modern life. Supplements are often used:

- to compensate for an inadequate diet
- to meet abnormal demands of hard training or frequent competition
- to benefit performance
- to keep up with teammates or opponents
- on recommendation of a coach, parent or other influential individuals

The benefit of most supplements is still inconclusive and often not scientifically proven. Individuals respond and tolerate supplements differently and effects are often due to a placebo effect.

ARE SUPPLEMENTS REGULATED IN SOUTH AFRICA?

There is no governing body to control or regulate the production, distribution or marketing of sports supplements in South Africa. Therefore there is no way to ensure their safety or efficacy and products can be marketed with very little control over the claims and messages they provide – a situation of which many companies take full advantage.

According to the World Anti-Doping Agency (WADA), "most supplement manufacturers make claims about their products that are not backed by valid scientific research, and they rarely advise the consumer about potential adverse effects. The supplement industry is a money-making venture and athletes should get proper help to distinguish marketing strategies from reality."

Supplements are big business. Athletes are often drawn by the images of picture-perfect bodies and the promise of enhanced performance or recovery by a certain product. Yet, there are many potential risks and little to no benefits.[17]

BEFORE USING SUPPLEMENTS

- Ensure that athletes are eating a healthy, varied, balanced and sport specific diet.
- Consider all available SCIENTIFIC evidence
- Compare the RISKS and BENEFITS of supplementation.[20]

WHAT ARE THE RISKS OF USING SPORTS SUPPLEMENTS?

Contaminants, particularly anabolic steroids and other prohibited stimulants, have been found in various supplements. This means that an athlete's use of a sports supplement may lead to a positive doping test.[18]

WHAT SHOULD ATHLETES KNOW ABOUT DIFFERENT SUPPLEMENTS?

Sports Drinks – Carbohydrate-rich Solutions

Sports drinks are aimed at fluid and fuel delivery during exercise. In general, a sports drink that is used during exercise should contain carbohydrates (6-8%), sodium (20-30 mmol/L) and potassium (3-5 mmol/L). The recommendation for intake should consider the climate situation (cold or hot environment), the individual carbohydrate and fluid need of the athlete and the athlete's tolerance of the drink. Sports drinks may be beneficial to athletes doing high intensity exercise, endurance events, prolonged intermittent exercise or weight class sports for quick recovery.

Sport Gels and Sport Bars – Carbohydrate-rich Sport Food

Sport gels and sport bars are a compact way of ingesting a variety of nutrients and can be very useful to busy athletes. Solid bars are better as they provide more nutrients than energy drinks. It is important to consume these products with adequate fluid to meet hydration needs and to reduce the risk of gastrointestinal intolerance.[20]

Protein and Protein Components

Athletes with a high protein need can fulfil the need with protein-rich food sources such as dairy products, meat, fish, eggs and soy. The intake of supplemental protein when the diet is already sufficient in protein will probably pose no additional benefit for the athlete. There is also little evidence to support the benefit of supplementing with individual amino acids when athletes are consuming an adequate diet. Some athletes although find it difficult to consume protein food sources at the ideal time and a protein supplement may add some convenience. Athletes should although be aware of protein supplements that contain extra ingredients and impurities.

Amino acids are individual components of protein molecules and are sold as individual amino acids with promises of superior functions. But most amino acids are although found in abundance in food sources as illustrated in the table on the following page, making supplementation unneccessary and expensive .

"Vitamins and minerals are essential for good health. Athletes may well require more vitamins and minerals than sedentary people, but it is important to optimise food intake first before turning to supplements."

AMINO ACID CONTENT COMPARISON

AMINO ACIDS		AVERAGE SUPPLEMENT*	2 BOILED EGGS** EXAMPLE (1 suggested serving)	1 CUP (250 ml) MILK**
L-Alanine	mg	630	670	295
L-Arginine	mg	330	800	308
L-Aspartic Acid	mg	1 300	1 030	615
L-Cysteine	mg	320	480	94
L-Glutamic Acid	mg	2 100	1 520	1 740
L-Glycine	mg	240	420	176
L-Histidine	mg	250	290	233
L-Isoleucine	mg	640	510	433
L-Leucine	mg	1 420	990	763
L-Lysine	mg	1 120	780	658
L-Methionine	mg	300	490	219
L-Phenylalanine	mg	420	630	420
L-Proline	mg	630	510	763
L-Serine	mg	640	960	468
L-Threonine	mg	790	560	390
L-Tryptophan	mg	240	220	94
L-Tyrosine	mg	390	460	383
L-Valine	mg	610	680	495

* Specific product nutrition information
** Wolmarans P. *et al*. 2010. *Condensed Food Composition Tables for South Africa.* Medical Research Council. Cape Town.

Vitamins and Minerals

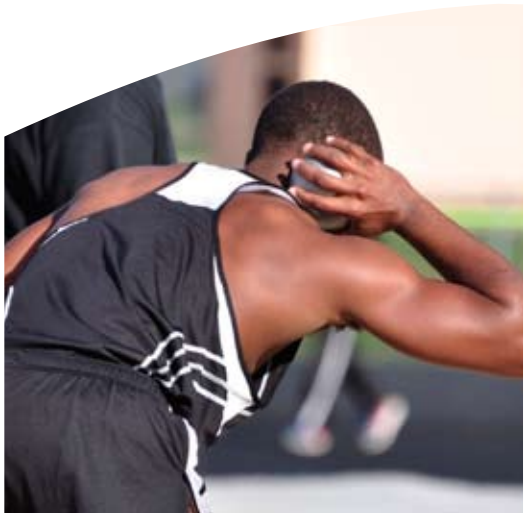
Official recommendations for the vitamin and mineral intake for athletes do not exist, but it is generally accepted that athletes need more than the sedentary population. These nutrients are best supplied through a varied diet based largely on nutrient-rich food. In athletes that restrict energy intake or when there is a limited food supply, a multivitamin-mineral supplement might be helpful. There is no justification for taking lots of extra vitamin supplements and very little evidence exist for the benefit of extra vitamins and minerals for athletes that do not present with a deficiency.[20]

Caffeine

Caffeine is a legal and known stimulant. Athletes have used caffeine to enhance performance for decades. Known side-effects include irritability, nervousness, increased heart rate, headaches and loss of sleep. If you are not a regular caffeine user it would be wise not to start, as it can be very addictive.[15]

Androstenedione

Also known as "andro", it is a precursor to the natural hormones testosterone and oestrogen, both of which are important for growth and repair. However, studies fail to show any benefit from taking this supplement to enhance performance. Bottom line: don't buy it!


What you should know about creatine supplements

Creatine is found naturally in skeletal muscle tissue and liberates energy (adenosine triphosphate) ATP for brief high-intensity exercise. The human body can make creatine from amino acids that come available after the digestion of protein. Creatine is also found in food sources with meat and fish being the richest natural sources of creatine. As a supplement, creatine is available in powder, liquid and capsule form.

Creatine supplements have become popular amongst competitive athletes in an attempt to enhance energy production, increase the body's ability to maintain force and delay fatigue. However, products containing creatine do not work by themselves; instead, they help athletes maximise their training or performance only because of the improvement in recovery time. Strength and muscle mass changes associated with creatine use therefore occur because athletes are able to do more work but with less fatigue in a specific period in time.

Creatine supplementation has been shown to be most beneficial in exercise involving repeated sprints or bouts of high-intensity exercise, separated by short recovery intervals. However, not all human studies have shown that creatine improves athletic performance nor that everyone responds the same way to creatine supplements. People who tend to have naturally high stores of creatine in their muscles don't get an energy-boosting effect from extra creatine.

At present creatine seems relatively safe for use with minimal to no side-effects if taken as directed. Failure to do so may negate its proposed benefit or even lead to decreased performance because of intestinal distress.[15,18]

Why is the use of creatine supplements controversial then?

Creatine as a supplement has been studied for short-term use only. Although creatine is not banned by the International Olympic Committee (IOC), using it for athletic performance is controversial, because:

- the long-term consequences of creatine use or the effect of overdosing is unknown
- there have been anecdotal reports of an increased risk of muscle cramps, strains and tears
- there is concern over kidney complications
- there are no data on the effects of creatine supplementation on other organs that store creatine (i.e. heart, liver, brain)
- supplements have a high risk of being mislabelled or contaminated with banned substances.[15,18,19]

Are creatine supplements safe for young athletes?

There is concern over the marketing of creatine-containing supplements to teens seeing that neither safety nor effectiveness in persons younger than 18 has yet been tested. The efficacy of creatine supplementation in children and adolescents is questioned for the following reasons:

- Children and adolescents rely more on aerobic than anaerobic metabolism. The goal of creatine supplementation is to enhance anaerobic metabolism. Supplementation in children and adolescents would therefore have a limited effect.
- Adolescents appear to be able to regenerate high-energy phosphate during high-intensity exercise and improve performance in short-term, high-intensity exercise through training. The need for supplementation is therefore reduced. Performance during growth tends to be limited by mechanical factors rather than by the relative contribution of the aerobic and anaerobic energy systems.

Creatine supplements are therefore not recommended for children or teens. Factors such as optimal training, sufficient rest and sleep, good nutrition, the right equipment, and the correct mental attitude will produce much larger performance gains than any supplement. Any athlete will improve their performance by focussing on these basics, rather than relying on a 'quick fix' that most probably doesn't work or has potential adverse effects.[15]

Can sport supplements benefit young athletes?

Providing children with supplements creates a false sense of security and may encourage faulty eating habits. Another disadvantage of supplement use is that young athletes may erroneously associate improvements in performance with whatever supplements they may be taking. They may be less likely to attribute progress to training, hard work and a balanced diet. This type of false reinforcement may also encourage children to try other types of supplements and substances and lead to a snowball effect with undesired consequences.[15]

> **"For the young athlete, the key to health and performance cannot be found in any one food or supplement, but in a proper combination of foods that provide many different nutrients that the body requires. Variety and moderation are the best strategy to achieve balance."**

Sport nutrition programming checklist for coaches

NUTRITION AREA FOR EVALUATION	NUTRITION INTERVENTION TO CONSIDER WITH DIETITIAN
Basic cooking, shopping and planning skills	• Grocery shopping tour including label reading skills. • Basic meal preparation and planning workshop.
Optimising daily training and recovery	• Athlete nutrition and hydration protocol for before, during and after training and recovery after training. • Regular hydration testing in different temperatures and environments. • Food and fluid station at training and competitive venue.
Supplements	• Athlete supplement inventory to assess team use. • On-going evaluation, communication and education about supplements.
High nutrition risk when travelling	• Evaluate potential risks and nutritional issues. • Work out meal planning and logistics ahead of time. • Consider taking a sport nutritional professional with the team on long haul or high nutrition risk trips.
Individuals with specific physique goals	• Athlete will work individually with nutrition professional coach to communicate the desired outcomes and allow a healthy and realistic time frame for these changes.

Glossary

For the purpose of this document:

Yoghurt refers to low-fat, flavoured and sweetened yoghurt.

Drinking yoghurt refers to low-fat, flavoured and sweetened drinking yoghurt.

Flavoured milk refers to low-fat flavoured and sweetened milk.

Maas is always full-cream, typically containing 3.66 g fat per 100 g.

Sports drinks refers to flavoured and sweetened commercial drinks with a typical 6 – 8% carbohydrate concentration.

Cereal bars is a snack made of breakfast cereal and other sticky ingredients into a chewy bar; also called breakfast bar.

Energy bars are bar-shaped food intended to boost physical energy, typically containing a combination of carbohydrates, proteins and fat, and fortified with vitamins and minerals.

Sport snack bars or **liquid meal** supplements are specially designed convenience bars or liquid, that help an athlete address the special nutritional needs for their specific sport, in situations where everyday foods are not practical to eat.

Meal replacements are defined, formulated food that by itself, can replace one or more daily meals. It supplies the necessary macro nutrients as well as vitamins and minerals of a typical meal. It comes in a powdered form that has to be reconstituted with either milk or water.

Nutritional supplements: are defined as concentrated sources of nutrients or other substances with a nutritional or physiological effect that supplement the normal diet and can be in a tablet, capsule, syrup or powder form.

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