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ADDED EXTRAS

As has been discussed already in this guide – as an athlete, if you eat a varied, well-balanced diet that meets the energy demands of your training, you do not need to supplement your diet.

In this chapter you will find out:

- Many athletes choose to use supplements
- Supplements cannot make a bad diet better, and are often ineffective
- Some supplements can do more harm than good
- Use of supplements is not advised – due to health risks, contamination issues and potential doping risks

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The role of diet in supporting athletic performance is essential when training levels – intensity, duration and frequency – are high.

Previous sections of this book have looked at the way diet can be optimised to support training levels that lead to enhanced exercise and competitive performance. Informed dietary choices can ensure fuel needs are met in order to effectively:

- adapt to training
- recover from training so that it is kept consistent and built upon
- maintain good health – preventing illness and injury

A varied, well-balanced diet with sufficient energy should provide adequate amounts of all the essential nutrients. However, in some situations, obtaining sufficient amounts from the diet is often not so straightforward. Consequently, some athletes take dietary supplements in the hope that it will compensate for poor food choices and make up for vital nutrients that they feel are lacking in their diet.

SUPPLEMENT USAGE

- Surveys have shown that nearly half of all athletes use supplements
- There are of course differences between athletes of differing ages, performance levels, and cultural backgrounds
- In some events and disciplines, supplement usage is more common than others. But that does not mean it is right!
- Most athletes would benefit from improving their diet

rather than resorting to taking an inappropriate supplement – as we have heard, taking a supplement does not make up for a bad diet!

Not only is supplement usage common, but all too often the recommended doses are exceeded. Sometimes it is simply an attempt to outdo what their opponent is taking. However, more does not necessarily mean better, and in the case of some supplements – such as the fat-soluble vitamins (A, D, E and K) and iron – more can be toxic, and so would actually be doing more harm than good.

The frequently quoted reasons for supplement use include:

- compensation for an inadequate diet
- to meet unusual demands of hard training or competition
- to produce specific benefits to exercise performance
- to keep up with team-mates or opponents
- recommended by coach, parent or other influential individuals

'Just in case' syndrome

Even when athletes are informed that their diet is sufficient or that the nutrient status of their body's stores is normal (for example iron stores) they still continue to take supplements as perhaps a form of insurance – 'just in case'.

COMMON SUPPLEMENTS

There are a huge list of supplements and ergogenic aids used within sport. The list below shows the types of commonly used sports nutrition supplements:

- Sports drinks
- Carbohydrate bars and gels
- Protein powders, drinks and bars
- Liquid meal supplements
- Vitamin and mineral supplements
- Ergogenic aids

Athletes often use energy bars and sports drinks - and this is because they have a genuine role to play in supplementing the training diet. Sometimes common protein supplements and liquid meal replacements can come in useful in various situations. In the rare case of a deficiency of an essential nutrient, supplements can be beneficial, as long as this does not exceed the nutrient requirements.

Ergogenic aids (defined as any substance, food, chemical or training method that helps the body work harder and perform better) enhance performance through effects on energy, alertness or body composition.

Athletes often look for that specific supplement which can improve performance and help them in competition, but that is not against the rules. However, even if a supplement does all that, it could still be harmful in the short or long term.

For the purposes of this resource we will look at legal supplements where there is scientific evidence to suggest there may be potential benefits in certain events and competitive situations.

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ENERGY
Several nutritional ergogenic aids help by influencing energy supply, e.g. carbohydrate supplements in the form of bars, powders, gels or sports drinks. Carbohydrates during prolonged exercise provide extra energy fuel to help prevent fatigue. Sports drinks deliver water and fuel to the body fast – so help to avoid dehydration and fatigue.

Other ergogenic aids have been shown to be beneficial for some athletes. Both creatine and bicarbonate/citrate supplements can be useful during high intensity work. However, as long term effects aren't yet known, as an athlete, you will need to work out whether it is worth the risk or the financial cost!

Creatine
Back in chapter two – Energy, we learned about ATP and found that in the first few seconds of sprint exercise, creatine phosphate is used as a fuel. Therefore, creatine supplementation can help increase muscle creatine phosphate levels which could help athletes recover quickly between repeated bouts of high intensity exercise. However, creatine supplementation can also cause an increase in muscle mass which may not be beneficial for some athletes.

Vegetarians will get virtually no creatine from their diet, whereas a non-vegetarian diet provides about 1g of creatine a day. This needs to be something a strength and power vegetarian athlete is aware of.

Creatine supplementation may improve athletics performance. However, a steady maintenance dose of 2-3g per day for key periods of 6-10 weeks is advised, as opposed to experimenting with high loading doses. Care must be taken not to exceed the maximum effective dosage (20g per day if loading is required) as this could actually be harmful.

Bicarbonate/Citrate
In many athletics events requiring high intensity effort for an extended period of time, e.g. 400m and 800m, the muscles produce lactic acid, which can be painful and interfere with performance. Working on the same principle as using antacids to neutralise indigestion and stomach acidity, sodium bicarbonate (baking soda) and sodium citrate can help neutralize the acidity of lactic acid in the muscles and thereby delay the onset of fatigue.
E.g. taking some sodium bicarbonate – around 0.3g per kg body weight, so that's about 24g for an 80kg athlete – over a period of 2-3 hours before exercise can improve performance in events lasting a few minutes. However, bicarbonate is generally only useful in short-term high-intensity events. Some athletes may suffer side effects such as vomiting and diarrhoea until a tolerance develops.

Other acid-neutralizing substances, such as sodium citrate, may be equally effective and generally produce fewer side-effects.

CAFFEINE AND STIMULANTS
The list of substances prohibited in athletics includes stimulants. However, caffeine is unique in that it is a central nervous system (CNS) stimulant but is commonly consumed in a wide range of food and drinks. Caffeine also has a direct effect on muscles and adipose tissue (fat). In particular, it is believed to mobilise fatty acids from adipose tissue stores, increasing the availability of fat as a fuel during exercise, which

in turn helps spare the limited glycogen (carbohydrate) stores and extend exercise time. Caffeine contained in commonly available beverages can enhance power output during the later stages of prolonged endurance exercise and may also be helpful in short-term high-intensity exercise. This benefit can be obtained with relatively small doses of caffeine – about 1.5mg/kg body weight, so that's about 100mg for a 70kg athlete – from commonly consumed drinks such as coffee and cola beverages.

Some studies have found that caffeine is performance enhancing during exercise of varying duration and intensities – so that's most events within athletics - at low doses of less than 3mg/kg body weight. This suggests that its main effect is on the CNS – the implication is that low doses of caffeine could aid performance in both training and competition. The sensitivity to caffeine varies enormously between individuals, and in high doses it may have some side effects such as insomnia, headaches, abdominal problems, muscle shakes and impaired coordination. Therefore, as with any nutritional change, you should only experiment with caffeine during training, before using it during competition. Caffeine is also a mild diuretic so it is important to stay well hydrated, particularly if consuming caffeine in a tablet form, or during prolonged endurance exercise, or when exercising in a hot and humid environment.

Prior to January 2004, a caffeine level in the urine above 12mg/l was not permitted during competition and would result in a positive drug test. In general, this level was achieved by taking about 500mg caffeine – that's about 6 cups of strong coffee in a short time. Although caffeine is indeed a mildly addictive drug, it is acceptable and almost impossible to control its use – especially since it is not impossible to have a caffeine intake level that exceeds the permissible limit just from a normal diet.

The table below shows the caffeine content of some common drinks. The World Anti-Doping Agency (WADA) removed caffeine from the list of banned substances with effect from January 2004.

Table 13 - Caffeine content of common drinks

Standard drink	Caffeine content (mg)
Instant coffee	50-70
Filter coffee	60-120
Tea	15-50
Hot chocolate	8-15
Cola	20-50

BODY COMPOSITION

Body composition can certainly be a factor affecting performance. Therefore it is an area that some supplements claim to have an effect – either by increasing muscle mass and/or reducing body fat.

Supplements include:

- protein and amino acids
- carnitine
- chromium
- hydroxymethylbutyrate (HMB)
- boron
- chrysin
- colostrum
- creatine
- ornithine
- alphaketoglutarate
- tribulus terrestris
- vanadium
- zinc

However, most have been shown to be ineffective. (See chapter four – A question of protein for further information relating to protein and amino acid supplements.)

Additionally there is no evidence that taking prohormones such as androstenedione ('andro') and norandrostenedione result in a significant increase in blood testosterone, nor are they effective at increasing muscle size or strength.

Warning: Use of these supplements would result in positive drug test and may pose serious health risks.

Immune function

Although modest exercise is good for the immune system, very strenuous and prolonged training has been linked with a depressed immune function. An inadequate diet on top of hard training will further lower immunity.

Deficiencies of energy, carbohydrate, protein and certain micronutrients including iron, zinc and vitamins A, E, B6 and B12, will impair immune function. Although athletes can easily avoid deficiencies by adapting their diet, you must take care not to exceed requirements of both dietary fat, in particular omega-3 (Ð-3) fatty acids, and some micronutrients, especially iron, zinc and vitamin E, as this can also have a detrimental effect on immune function.

As an athlete, you will know how an illness that interrupts training or competition is pretty disastrous. So it is no surprise that some supplement manufacturers play on this fear and promote high doses of antioxidant vitamins, glutamine, zinc, probiotics and Echinacea as 'immune-boosting', despite there being no strong evidence that they work.

The best advice supports the need for a carbohydrate-rich diet, which lowers stress hormone levels, along with adequate rest periods. As discussed already in this resource, it may be beneficial to consume about 30-60g of carbohydrate per hour during prolonged exercise since this will help reduce some of the negative effects of prolonged exercise.

Joint health

Supplements claiming to be good for joint health by protecting against wear and tear are:

- antioxidants
- fatty acids
- vitamins B3, B5 and D
- calcium
- boron
- proteolytic enzymes
- glucosamine
- chondroitin
- methylsulphonylmethane (MSM)
- S-Adenosyl methionine (SaME)
- type 2 collagen
- hyaluronic acid
- soy isoflavones

However, most have been shown to be ineffective.

Healthy bones need an adequate supply of calcium and vitamin D, but these are normally supplied from a healthy balanced diet and so supplementation is generally not necessary.

There is some evidence that regular (once or twice a day) long-term (about 2-6 months) treatment with glucosamine and chondroitin sulphate can provide subjective relief in individuals with osteoarthritis. However, there is currently no evidence that this would also be beneficial to athletes with joint pain.

Contamination issues

It is worrying to note that impurities such as lead, broken glass and animal faeces have been found in some supplements and food products. Some supplements have been found not to contain the expensive ingredients listed on the label, but only inexpensive materials. But most worryingly for you as an athlete, is that some have been found to contain banned doping agents such as steroid hormones, for example nandrolone and testosterone that are not supposed to be there.

The IOC laboratory in Cologne found that at least 1 in 7, and possibly as high as 1 in 4, of the products they analysed contained steroid hormones and their precursors – these would cause an athlete to fail a drug test. Substantial numbers of positive tests were obtained from dietary supplements bought in the UK (19%), the Netherlands (26%) and the USA (19%).

There is currently an inadequate regulation of dietary supplements so athletes struggle to know what supplements actually contain or how pure the product and its ingredients are.

This is a serious problem – the principle of strict liability means that the onus is on the athlete to be sure – basically you are responsible for everything you eat and drink. Therefore all athletes should be extremely cautious about using supplements and always check with a sports doctor.

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SUPPLEMENTS – FOR AND AGAINST

In general the recommendation would be to avoid the use of dietary supplements. But it is important to make an informed choice and think through the potential benefits against detrimental costs.

If considering supplements, make sure you have considered the following:

- indiscriminate use is unwise due to the very real health and contamination risks
- what are the costs? e.g. financial, health and performance
- what are the likelihood of contamination with banned substances?
- how substantial are the perceived benefits e.g. improved performance, better health – are they really necessary or are they being taken to insure against not having the correct diet?

Remember it is impossible to conduct a thorough analysis on every supplement as it is likely that there will be some unknown factors – especially if no scientific research has been carried out on the supplement or its proposed active ingredients.

If you feel it necessary to use a supplement, make sure it can be backed up by a substantial amount of scientific evidence. The evidence for a true benefit must be very strong to outweigh all the potential risks.

Finally, avoid dietary 'assessments' that can be designed to find faults in your diet that can only be corrected by taking supplements. Supplements are a more efficient way of making a profit than encouraging you to eat a healthy, balanced diet. As to whether they will improve sports performance, is another matter! If in doubt, seek advice from a sports nutrition professional.

Don’t forget the powerful placebo effect – just because you believe taking it is making you feel good – it doesn’t mean it actually does!