SPORTS DIETITIANS AUSTRALIA

FACT SHEET

CAFFEINE

WHAT IS CAFFEINE?

Caffeine is a substance from the methylxanthine family that occurs naturally in the leaves, nuts and seeds of approximately 60 different plants. It enjoys social acceptance and widespread use around the world. Traditionally the dietary sources of caffeine have been tea, coffee, chocolate and cola drinks. These beverages typically provide 30-120 mg of caffeine per serve but may vary considerably particularly within coffee based drinks (see table 1).

The introduction of caffeine (or guarana) to 'energy drinks', confectionery and sports foods/supplements within the past 10 years has increased the opportunities for athletes to consume caffeine, either as part of their everyday diet or for specific use as an ergogenic aid. Some non-prescriptive medications also contain 100 -200 mg of caffeine per tablet. (See table 1)

Table 1: Caffeine Content of Common Foods and Drinks

FOOD OR DRINK	SERVE	CAFFEINE CONTENT (mg)
Instant coffee	250 ml cup	60 (12-169)*
Brewed coffee	250 ml cup	80 (40-110)*
Short black coffee/espresso	1 standard serve	107 (25-214)*
Gloria Jeans® (n=6 stores)	1 espresso	113 (82-177)*
Muffin Break® (n=6 stores)	1 espresso	137 (68-186)*
Starbucks® (n=4 stores)	1 espresso	79 (63-91)*
McDonalds® (n=4 stores)	1 espresso	70 (54-83)+*
Iced Coffee	500ml	99 (33-197)*
Breaka Strong®	600ml	197
Dare Double Espresso®	500ml	177
Ice Break Loaded®	500ml	172
Ice Break®	500ml	141
Farmers Union®	600ml	115
Tea	250 ml cup	27 (9-51)*
Hot chocolate	250 ml cup	5-10
Chocolate -milk	60 g	5-15
Chocolate - dark	60 g	10-50
Viking chocolate bar	60 g	58
Coca Cola	375 ml can	49
Pepsi Cola	375 ml can	40
Musashi E Shot Cola	300 ml	95
Jolt soft drink	375 ml can	75
Red Bull energy drink	250 ml can	80
Red Eye Power energy drink	250 ml can	50
V Energy drink	250 ml can	50
V Energy drink	250 ml can	50
Rockstar Energy Drink	473ml can	151
PowerBar caffeinated sports gel	40 g sachet	50
GU (Plain Orange, Vanilla, Chocolate and Triberry) sports gels	32 g sachet	20
GU (Blackberry and Espresso) sports gels	32 g sachet	40
High 5 EnergyGel+	38g sachet	30
Hammer Gel	33g sachet	50 Espresso/25 Tropical
Endura Gel	35g sachet	8.5

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** The caffeine content of hot tea, coffee and iced coffee varies widely, depending on the brand, the way that the individual makes their beverage, and the size of their mug or cup. Espresso samples have been reported as they represent the likely caffeine content for most beverages prepared in store. It should be noted that some retailers sell special brews that come in extra large containers with extra strong varieties of coffee. Some of these brews can provide 500-1000 mg of caffeine per serve.*
+ does not include McCafe outlets.

WHY TAKE CAFFEINE?

In 2004 caffeine was withdrawn from the World Anti-Doping Agency Prohibited List, allowing athletes who compete in sports that are compliant with the WADA code to consume caffeine, within their usual diets without fear of sanctions.
Caffeine has numerous actions on different body tissues. The actions may vary between individuals and include both positive and negative responses. Early scientific studies suggested that caffeine could improve endurance exercise performance by increasing the mobilisation of fats from adipose tissue and the muscle cell and 'sparing' muscle glycogen. Follow-up studies now show that the effect of caffeine on muscle glycogen during sub-maximal exercise is short-lived and inconsistent. That is, not all athletes respond in this way. Therefore, it is unlikely to explain the enhancement of exercise capacity and performance seen in prolonged continuous events and exercise protocols.
The mechanism underpinning performance benefits remain unclear, but the most popular current theory involves caffeine capacity to bind to adenosine receptors which are located throughout the body. Adenosine receptors help regulate many physiological, neurological and immunological processes which may lead to alterations to the perception of effort or fatigue, as well as direct effects on the circulatory system and skeletal muscle. There are ~100 studies in the scientific literature looking at caffeine and performance various forms of exercise.

HOW TO TAKE CAFFEINE?

Caffeine is rapidly absorbed by most individuals. Peak blood caffeine levels occur usually 45-90 mins following ingestion (but can take as long as 3hrs). The half-life of caffeine (an indication of its duration of action) is approximately 6-7hrs. Caffeine can also be readily absorbed in the mouth in the case of caffeine containing chewing gums etc.
Most studies of caffeine and performance have been undertaken in laboratories using purified forms of caffeine. Studies that investigate performance effects in elite athletes under field conditions or during real-life sports events using caffeine from common food sources are scarce. This is important to remember as caffeine sourced in the general population may vary both in terms of the amount of ingested and other included ingredients.

Traditional protocols for the use of caffeine involved the intake of caffeine one hour prior to the event, in doses equivalent to ~6 mg/kg (e.g. 300-500 mg for a typical athlete). More recently, evidence from studies involving prolonged exercise lasting 60 minutes or longer, suggest beneficial effects from caffeine intake occur at small-moderate levels of intake (1-3 mg/kg BM or 70-200 mg caffeine), when caffeine is taken at a variety of times (before and/or throughout exercise, or towards the end of exercise when the athlete is becoming fatigued).
A period of caffeine withdrawal does not appear to influence the performance enhancing effects of caffeine on endurance exercise tasks. Furthermore, there is no evidence of a dose-response relationship to caffeine - that is, performance benefits do not seem to increase with increases in the caffeine dose. It is therefore advisable that athletes use lower caffeine doses to both maximise performance potential whilst minimising possible side-effects.

WHICH ATHLETES BENEFIT FROM CAFFEINE SUPPLEMENTATION?

Sound evidence exists that caffeine enhances endurance and provides a small but worthwhile enhancement of performance over a range of exercise protocols. These include short duration high intensity events (1-5 min), prolonged high intensity events (20-60 min), endurance events (90 min + continuous exercise), ultra-endurance events (4 hours +), and prolonged intermittent high intensity protocols (team and racquet sports). The effect on strength/power and brief sprints (10-20 sec) is unclear.

Some individuals may benefit from caffeine when used during prolonged endurance or intermittent sports, including team sports, as a training aid or competition aid, and prior to high-intensity events, as a training aid or competition aid.

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ARE THERE ANY SIDE EFFECTS?

Although evidence of specific health problems is equivocal, long-term intake of large amounts of caffeine (>500 mg per day) are generally discouraged by health authorities.

We are aware that current caffeine intake practices of athletes are often ad hoc and unsystematic. Combined with the large variances in caffeine from coffee based beverages there is potential for side-effects or negative outcomes from caffeine use.

Short-term increases in caffeine intake can cause a mild increase in urine production at rest but caffeine-containing drinks are unlikely to cause an exercising individual to become dehydrated. Habitual caffeine consumption does not cause any sustained alteration in fluid balance. Moreover, caffeine-containing drinks such as tea and coffee may provide a significant source of fluid in the everyday diets of many people. In fact, restricting intakes of these beverages due to concerns over caffeine induced urine losses is likely to have a far greater negative impact on fluid balance.

At higher levels of intake, caffeine has the potential to cause increases in heart rate, impairments or alterations of fine motor control and technique, and over-arousal (interfering with recovery and sleep patterns). Impairment of technique may affect the performance of a number of sports, and over-arousal may interfere with the ability to recover between training sessions, or multi-day competitions. These concerns add to the importance of finding the lowest effective dose of caffeine that can be used to achieve a performance enhancement.

There may be interactions between caffeine and other supplements/nutrients used by athletes (e.g. bicarbonate, creatine) that need to be explored in terms of performance outcomes and potential side-effects.

The use of caffeine by children and adolescents participating in sport is not advised, particularly in hot environments.

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