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caffeine and health

Caffeine is the most common functional ingredient in the world. While it is present naturally in many different plants products, the majority of people in Western countries consume caffeine on a daily basis from tea, coffee, cocoa or cola drinks.

Per cup, ground coffee has one of the highest caffeine contents, i.e. 100 milligrams (mg) on average. Tea, on the other hand, is much lower in caffeine at around 50 mg per cup, similar to a chocolate bar. Energy drinks provide 80 mg per can on average, higher than that provided by cola drinks (40 mg).

The popularity of caffeinated foods and drinks has led to certain health myths. For example, it is claimed that caffeine causes sleep problems, dehydration, anxiety and high blood pressure. Newspapers, magazines and even some health professionals suggest that people should cut out tea and coffee completely. However, the scientific evidence doesn't back this up and, indeed, gives many examples where a moderate caffeine intake is beneficial to health

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caffeine and hydration

One of the most prevailing myths is that caffeine-containing drinks, such as tea, cause dehydration. Certainly, some studies find that high doses of caffeine stimulate kidney function, resulting in a higher urine output. However, this effect tends to be seen when caffeine is given as high dose pill, rather than as ordinary drinks of tea, coffee or cocoa.

A recent review[1] pulled together studies which tested the impact of caffeine on hydration. Of the eight studies found, five showed no effect whatsoever on urine output or hydration, while a longer term study found an effect on day 1 only. In these studies, daily caffeine levels ranged from 98-420 mg/d, which would equate to a maximum of four cups of coffee, or 8 cups of tea. Two studies did find some evidence of dehydration but the caffeine intakes were in excess of 600 mg per day – the equivalent of 12 cups of tea. This far exceeds the 4 cups of tea suggested for health, or the 2 cups of tea drunk each day by the average Brit!

Taken as a whole, the evidence shows clearly that moderate amounts of caffeinated drinks have no adverse effect on hydration. Indeed, some caffeinated drinks appear to promote hydration by supplying a valuable source of fluid. According to a national survey, tea contributed 85% of all the fluid drunk by elderly people in the UK[2].

caffeine and performance

There is no doubt that caffeine stimulates brain activity by altering levels of certain neurotransmitters. However, in contrast to the myths about anxiety and sleep disorders, moderate caffeine consumption seems to have beneficial effects.

Many studies have looked at how caffeine affects mood, sleep and mental performance. These tend to involve supplementing subjects in the short-term with either a caffeine pill, providing 38-450mg per dose, or a dummy pill (containing no caffeine). The results generally show improvements in terms of alertness, reaction time, fatigue and short-term memory following caffeine consumption. Very few studies report sleep problems in subjects and, when found, these tend to occur at the upper end of caffeine intake (e.g. above 400mg per day). One study found that coffee consumption affected sleep onset and duration, while tea did not[3].

Caffeine not only improves mental performance but appears to have an effect on physical performance. Interestingly, until 2004, the International Olympic Committee banned the use of caffeine pills in case these gave a sporting advantage. A review of 40 studies found that caffeine improved exercise performance by 12%, particularly for endurance sports[4]. Caffeine also seems to delay feelings of tiredness in athletes, and drivers of cars!

caffeine and heart health

It is sometimes claimed that caffeine increases blood pressure. Certainly, in short-term studies, where 200-250mg caffeine has been given as pills, blood pressure can rise by a modest amount. However, in longer trials, particularly where coffee has been given rather than pills, insignificant rises in blood pressure occur. It is believed that the beneficial plant compounds found in some caffeinated drinks, called flavonoids, offset any small negative effect that caffeine may have on blood pressure.

Indeed, this is backed up by large studies were researchers have found less heart disease in people who drink tea on a regular basis. Tea is known to be rich in flavonoids, which act as antioxidants to protect cells from damage, and help to relax blood vessels. A review of 17 studies[5] found that the risk of a heart attack was 11% lower in people who drank 3-4 cups of tea a day compared with non-tea drinkers.

caffeine recommendations

The only UK recommendation for caffeine relates to pregnant women. This is because a study in 2008 found a small reduction in birth weight when women consumed more than 200mg caffeine per day. This equates to 2 cups of coffee per day or 4 cups of tea. Apart from pregnancy, there are no other instances where caffeine is limited by government recommendations.

optimal intakes of caffeine

For those who are not pregnant, a moderate intake of caffeine on a regular basis can enhance mood, brain function and sports performance. Benefits are seen for caffeine intakes in the range of 38-450mg per day, although it is better for hydration if caffeine doesn't exceed 400mg per day. This equates to a maximum of 4 cups of coffee or 8 cups of tea per day.

Studies show that getting caffeine from natural sources, e.g. tea, is better than taking it as pills. This is because tea provides fluid and antioxidant flavonoids, which are known to be beneficial to heart and circulatory health.

So, scientific research tells a different story from the out-of-date health myths about caffeine. Those who enjoy a regular cuppa or a can of cola can relax in the knowledge that a moderate amount of caffeine is beneficial, not harmful.

[1] Ruxton CHS (2008). The impact of caffeine on mood, cognitive function, performance and hydration: a review of benefits and risks. Nutrition Bulletin, 33, 15-25.

[2] Taylor Nelson Sofres (2007) The National Drinks Survey. London: Taylor Nelson Sofres Ltd.

[3] Hindmarch et al. (2000) A naturalistic investigation of the effects of day-long consumption of tea, coffee and water on alertness, sleep onset and sleep quality. Psychopharmacology 149, 203-16.

[4] Doherty & Smith (2004) Effects of caffeine ingestion on exercise testing: a meta-analysis. International Journal of Sports Nutrition & Exercise Metabolism 14, 626-46.

[5] Peters et al (2001) Does tea affect cardiovascular disease? A meta-analysis. American Journal of Epidemiology 154, 495-503.