

Tea and Caffeine

What is caffeine?

People have enjoyed caffeinated beverages for many years

Caffeine is a naturally occurring substance found in the leaves, seeds or fruits of at least 100 different species worldwide and is part of a group of compounds known as methylxanthines. The most commonly known sources of caffeine are coffee, cocoa beans, cola nuts and tea leaves. Caffeine is also added to specifically formulated 'energy drinks' and pharmaceutical products such as cold and flu remedies.

Coffee and tea also contain other dimethylxanthines; theophylline which has similar properties to caffeine and theobromine whose pharmacological actions is far less potent than caffeine and theophylline.

The amount of caffeine present in products depends on the type of the product, the serving size and the preparation method. For example a 190ml cup of tea contains 50mg of caffeine, one third less than the same amount of an instant cup of coffee (75mg). Table 1 gives an indication of the amount of caffeine found in other drinks compared to tea:

Table 1

Type of Product		Caffeine (mg/ serving)
Tea	All types	50mg/ 190ml serving ¹
Coffee	Brewed (filter or percolated)	100-115mg/ 190ml serving ¹
	Instant	75mg/ 190ml serving ¹
Cola drinks	Standard and Sugar Free	11-70mg/ 330 ml can ²
'Energy' drinks	All types	28-87mg/ 250ml serving ²
Chocolate	Bar	5.5-35.5mg/ 50g bar ²

On average we consume 3.98mg of caffeine /kg body weight per day ie 239mg/ day for a 60kg person³.

What is a safe intake of caffeine?

Up to 300mg/day (6 cups of tea) is considered moderate, with no evidence of harmful effects in the vast majority of the adult population. Some individuals are sensitive to caffeine and will feel effects at smaller doses than other individuals who are less sensitive. For this reason, these individuals may need to limit their caffeine intake.

Metabolism and Clearance

Caffeine does not accumulate in the body over a course of time and is normally excreted within several hours of consumption. The rate of caffeine elimination varies between individuals and this maybe as a result of genetic factors affecting the enzymes involved in the metabolism, or due to certain lifestyle factors eg smoking. Children also metabolise caffeine at a quicker rate. Generally caffeine absorption is complete within about one hour after ingestion and the plasma concentration peaks

after about 60-90 minutes. The half-life of caffeine in the plasma is about 2.5 – 4.5 hours in healthy adults.⁴

Caffeine Tolerance

A number of different factors affect individual tolerance to caffeine, including the amount ingested, the frequency of caffeine consumption and individual metabolism. It is widely recognised that gradual tolerance develops with prolonged caffeine use.

Physiological Effects

Caffeine is a pharmacologically active substance, and depending on the dose, has a number of actions:-

- Central Nervous System Stimulant. A moderate caffeine intake can cause mild stimulation that maybe beneficial in terms of increased alertness, concentration, improved performance and decreased fatigue.⁵⁻¹⁰ However, higher intakes may affect sleep, cause nervousness and an irregular heartbeat.
- Weak Bronchodilator. As a result, interest has been shown in its potential role as an asthma treatment. A number of studies have explored the effects of caffeine in asthma and the conclusions from a Cochrane Review suggest that caffeine appears to improve airways function modestly in people with asthma for up to four hours after consumption.¹¹
- Diuretic. The diuretic action of caffeine may be due to an increase in renal blood flow, leading to an increased glomerular filtration rate (GFR), or due to a decreased reabsorption of sodium in the renal tubules. The diuretic effect of caffeine is dependent on the amount consumed and duration of intake eg the caffeine in tea does not have a diuretic effect unless the amount of tea consumed at one sitting contains more than 250-300mg of caffeine, equivalent to between 5 and 6 cups of tea.¹²⁻¹⁷

In fact, due to the volume of fluid that is drunk whilst enjoying a cup of tea, the British Dietetic Association advises that tea can contribute towards the daily-recommended fluid intake of 1.5 to 2 litres.

- Cardiac Muscle Stimulant. Moderate caffeine consumption does not increase cardiac arrhythmias.¹⁸

If regular caffeine consumption is stopped abruptly, symptoms such as headaches, irritability and fatigue may occur. These effects are usually temporary, disappearing after a day or so and can be avoided if caffeine cessation is gradual.

Caffeine and Health

The role of caffeine in the development of certain diseases and conditions has been the subject of extensive research in recent years.

- Cancer.
A number of studies investigating the impact of caffeine in the development of cancer have failed to establish a relationship.¹⁹⁻²² In fact, tea is one of the richest sources of flavonoids, a powerful group of antioxidants. The role of antioxidants in the prevention of free radical damage has led to suggestions that tea maybe anti-

carcinogenic.²³ Despite interesting preliminary research, further work is required to prove its beneficial effect in this area.

- **Heart Disease.**
A number of studies have investigated the relationship between caffeine and heart disease and results from these and epidemiological studies have led to the conclusion that the ingestion of moderate amounts of caffeine is not associated with any increased risk of heart disease.²⁴⁻²⁸ The Committee on Medical Aspects of Food Policy concluded that 'there is little evidence that caffeine itself has any relation with CHD risk' in the 1994 Nutritional Aspects of Cardiovascular Disease report.²⁹
- **Parkinson's Disease.**
Observational studies have suggested that caffeine may play a role in protecting against Parkinson's disease,³⁰⁻³¹ although further research is required to determine the exact mechanism.
- **Relief of headaches.**
In a study of 301 regular headache sufferers, researchers found that a combination of ibuprofen and caffeine was better than either drug alone in relieving pain.³² Although a caffeine 'pill' was used in this trial, the researchers believed that caffeinated beverages would work just as well. However, they did warn that chronic headache sufferers should avoid caffeine because it might exacerbate symptoms. More work is required in this field before firm conclusions about caffeine and pain relief can be drawn.
- **Pregnancy**
Caffeine crosses the placenta and achieves blood and tissue concentrations in the foetus that are similar to maternal concentrations. For this reason recent advice published by the Food Standards Agency³³ recommends that pregnant women should limit their intake of caffeine consumption to less than 300mg/ day (equivalent to 6 cups of tea/ day). At this level there is little evidence to suggest that the health of the unborn child or mother is affected.

In Summary...

Despite recent publicity about caffeine, the fact remains that the consumption of caffeine at intakes of 300mg/ day has no adverse effects in the vast majority of the adult population. For this reason an average intake of three to four cups of tea³⁴ a day is well within the level considered safe.

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