Caffeine

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What is **caffeine**?

Caffeine is a naturally occurring chemical compound found in plant constituents such as coffee and cocoa beans, tea leaves, guarana berries and the kola nut, and has a long history of human consumption. It is added to a variety of foods, such as baked pastries, ice creams, sweets, and cola drinks. Caffeine is also found in so-called energy drinks, alongside other ingredients such as taurine, and D-glucurono-γ-lactone. It is also present in combination with *p*-synephrine in a number of food supplements that are marketed for weight loss and sports performance. Some medicines and cosmetics contain caffeine.

When consumed by humans, caffeine stimulates the central nervous system, and in moderate doses increases alertness and reduces sleepiness.

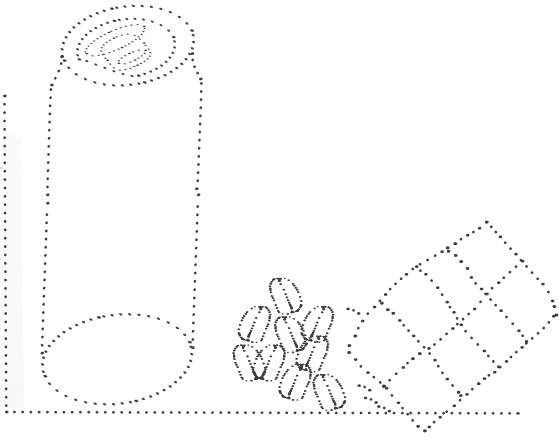
Caffeine is also found in so-called energy drinks, alongside other ingredients such as taurine, and D-glucurono-γ-lactone.

How does the **body process** caffeine?

Taken orally, caffeine is absorbed rapidly and completely by the human body. The stimulatory effects may begin 15 to 30 minutes after ingestion and last a number of hours. In adults the half-life of caffeine – the time it takes for the body to eliminate 50% of the caffeine – varies widely, depending on factors such as age, body weight, pregnancy status, medication intake and liver health. In healthy adults, the average half-life is approximately four hours, with a range of two to eight hours.

What are the **risks?**

Short-term adverse effects on adults and children can include issues related to the central nervous system such as interrupted sleep, anxiety and behavioural changes. In the longer term, excessive caffeine consumption has been linked to cardiovascular problems and, in pregnant women, stunted foetus development.



Why did EFSA carry out its **risk assessment?**

Some EU Member States raised concerns about the safety of caffeine consumption in the general population and in specific groups, such as adults performing physical activity, and individuals consuming caffeine together with alcohol or substances found in energy drinks. The European Commission responded by asking EFSA to assess the safety of caffeine.

What does the assessment **cover?**

EFSA's Scientific Opinion looks at the possible adverse health effects of caffeine consumption from all dietary sources, including food supplements:

- in the general healthy population and in sub-groups such as children, adolescents, adults, the elderly, pregnant and lactating women, and people performing physical exercise;
- in combination with other substances that are present in "energy drinks" (D-glucurono-γ-lactone and taurine), alcohol, or *p*-synephrine.

It does not consider the possible adverse effects of caffeine:

- in groups of the population affected by a disease or medical condition;
- in combination with medicines and/or drugs of abuse;
- in combination with alcohol doses which, by themselves, pose a risk to health (e.g. during pregnancy, binge drinking).

How much caffeine do we consume?

Average daily intakes vary among Member States, but are in the following ranges:

Very elderly (75 years and above):	**22-417mg**
Elderly (65-75 years):	**23-362mg**
Adults (18-65 years):	**37-319mg**
Adolescents (10-18 years):	**0.4-1.4mg/kg bw**
Children (3-10 years):	**0.2-2.0mg/kg bw**
Toddlers (12-36 months):	**0-2.1mg/kg bw**

In most surveys covered by EFSA's Food Consumption Database (see panel overleaf), coffee was the predominant source of caffeine for adults, contributing between 40% and 94% of total intake. In Ireland and the United Kingdom, tea was the main source, contributing 59% and 57% of total caffeine intake respectively.

There are large differences among countries regarding the contribution of different food sources to total caffeine intake among adolescents. Chocolate was the main contributor in six surveys, coffee in four surveys, cola beverages in three, and tea in two. In most countries chocolate (which also includes cocoa drinks) was the predominant source of caffeine for children aged 3 to 10 years, followed by tea and cola drinks.

One reason for the differences in consumption levels – other than cultural habits – is the variable concentrations of caffeine found in some food products. Concentrations in coffee beverages depend on the manufacturing process, the type of coffee beans used, and the type of preparation (e.g. drip coffee, espresso). The levels found in cocoa-based beverages depend on the amount and type of cocoa present in different brands.

How much caffeine is it **safe** to consume?

On the basis of the data available, EFSA's Panel on Dietetic Products, Nutrition and Allergies (NDA) reached the following conclusions:

Adults

- Single doses of caffeine up to 200mg – about 3mg per kilogram of body weight (mg/kg bw) from all sources do not raise safety concerns for the general healthy adult population. The same amount of caffeine does not raise safety concerns when consumed less than two hours prior to intense physical exercise under normal environmental conditions. No studies are available in pregnant women or middle aged/elderly subjects undertaking intense physical exercise.
- Single doses of 100mg (about 1.4mg/kg bw) of caffeine may affect sleep duration and patterns in some adults, particularly when consumed close to bedtime.
- Intakes up to 400mg per day (about 5.7mg/kg bw per day) consumed throughout the day do not raise safety concerns for healthy adults in the general population, except pregnant women.

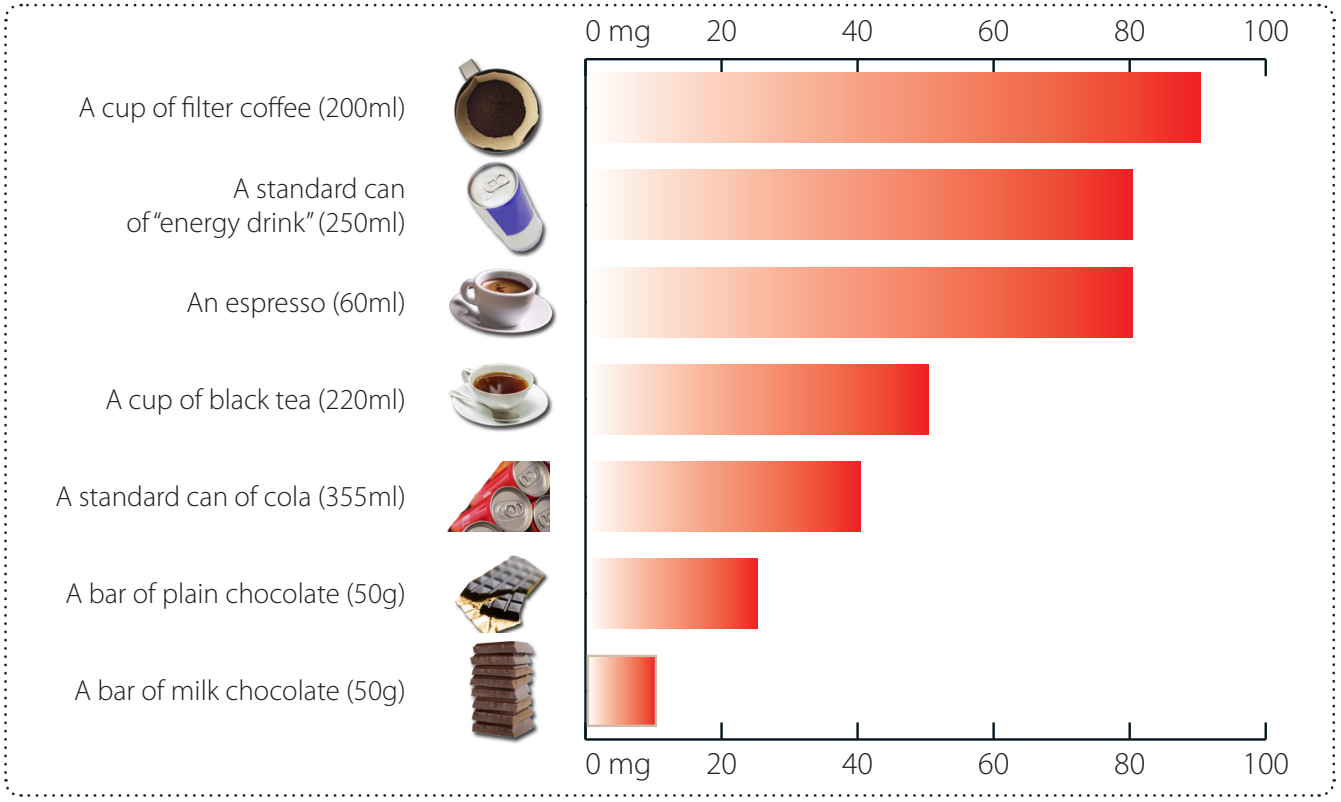
Pregnant/lactating women

Caffeine intakes from all sources up to 200mg per day consumed throughout the day do not raise safety concerns for the foetus.

Children and adolescents

The single doses of caffeine considered to be of no concern for adults (3mg/kg bw per day) may also be applied to children, because the rate at which children and adolescents process caffeine is at least that of adults, and the studies available on the acute effects of caffeine on anxiety and behaviour in children and adolescents support this level. A safety level of 3mg/kg bw per day is also proposed for habitual caffeine consumption by children and adolescents.

How much caffeine is there in…



All figures are approximate as caffeine content and portion sizes vary within and between countries

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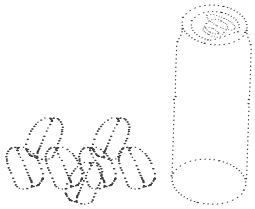
Does caffeine have an **adverse effect** when consumed with other constituents of "energy drinks" and/or with alcohol?

- Consumption of other constituents of "energy drinks" at concentrations commonly present in such beverages would not affect the safety of single doses of caffeine up to 200mg.
- Alcohol consumption at doses up to about 0.65g/kg bw, leading to a blood alcohol content of about 0.08% – the level at which you are considered unfit to drive in many countries – would not affect the safety of single doses of caffeine up to 200mg. Up to these levels of intake, caffeine is unlikely to mask the subjective perception of alcohol intoxication.



How did EFSA calculate consumption levels?

First, EFSA used a survey conducted in the UK to calculate caffeine levels in different food products. This survey contained information on caffeine concentrations from 400 samples of teas – loose leaves, bags, vending machines, and instant tea – and coffees – filter coffee, vending machines, espresso, and instant coffee – prepared at home, in workplaces or bought in cafes and other retail outlets. For foods for which the UK survey did not report caffeine levels, an average of mean values reported in other representative surveys was used, except for "energy drinks", for which the caffeine concentration (320mg per litre) of the most popular brand was chosen.

The EFSA Food Consumption Database was then used to calculate caffeine intake from food and beverages. The database contains data from 39 surveys in 22 European countries covering 66,531 participants. These surveys do not provide information about the consumption of caffeine-containing food supplements. A 2013 EFSA report was used to calculate acute caffeine intakes from "energy drinks" in adults.

You can read the full EFSA Scientific Opinion on the safety of Caffeine at http://www.efsa.europa.eu/en/publications/efsajournal.htm

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