

A QUICK GUIDE TO **Drugs & Alcohol**

THIRD EDITION

by the National Drug and Alcohol Research Centre (NDARC)

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Health



NEW SOUTH WALES

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CAFFEINE & ENERGY DRINKS

What is caffeine?

Caffeine is a naturally-occurring substance that can be found in the seeds, nuts and leaves of various plants, including coffee beans, tea leaves, cocoa beans, kola nuts and guarana seeds. It is a central nervous system stimulant (see definition on page 3), increasing mental alertness and reducing drowsiness and fatigue.

Human consumption of caffeine has a long history. Recognition of the stimulant properties of caffeine is thought to date back to the Stone Age, with people of that era using the seeds, bark and leaves of caffeine-containing plants to increase alertness and ward off drowsiness. The use of caffeine became more widespread in the late 17th century, through the increased production and availability of popular sources of caffeine, such as coffee, tea and chocolate. Today, caffeine is the most widely consumed psychoactive drug worldwide.

What are energy drinks and energy 'shots'?

Formulated energy drinks are non-alcoholic beverages containing caffeine ('caffeinated'). They are designed to increase energy and enhance mental performance. Since the debut of Red Bull® onto the global beverage market in 1997, the popularity and consumption of energy drinks has increased dramatically. In Australia, energy drinks are the fastest growing segment of the soft drink market. As their name implies, energy drinks promise a 'boost' of energy. They are marketed primarily to young adults, athletes, students and people in occupations that require sustained alertness in particular, although a significant proportion of the consumer market are children and adolescents.

Energy drinks typically contain the following ingredients in varying amounts:

- caffeine
- taurine – an amino acid naturally present in meat, fish and milk
- glucuronolactone – a natural substance produced by the metabolism of glucose in the human liver
- herbal extracts (eg, guarana, ginseng)
- water-soluble vitamins (eg, vitamins B3, B5, B6, and B12)
- sweetening agents (eg, glucose, sucrose).



Energy shots are a concentrated form of energy drink, which contain caffeine and other substances similar to energy drinks, but in small volumes (typically 50-60 mL).

Caffeine and the law

It is legal to consume and sell caffeine in Australia, although adding it to foods and beverages is strictly regulated by the Food Standards Code of Australia and New Zealand.

Caffeine content

In cola-type beverages containing caffeine as a food additive, the total caffeine content must not exceed 145 mg/L (36 mg/250 mL serve).

The Food Standards Code stipulates that formulated caffeinated beverages must contain no less than 145 mg/L and no more than 320 mg/L of caffeine (from all sources, including guarana). As such, the legal caffeine limit for a standard 250 mL energy drink in Australia is 80 mg, the equivalent of an average cup of instant coffee. Despite regulation of the level of caffeine in energy drinks, there are no regulations on the volume (pack size) of retail units and therefore, the dose of caffeine consumed per retail unit can vary greatly. The volume of cans sold in Australia range from 250-550 mL, with the stated level of caffeine in the large cans equivalent to two cups of coffee (176 mg).

Energy shots have been found to contain caffeine and other substances at concentrations that exceed the 320 mg/L caffeine limit and, therefore, do not meet the requirements of the Food Standards Code legislating caffeinated beverages. Although energy shots cannot be manufactured in Australia, they can be imported from New Zealand, where they are regulated by the Supplemented Food Standard, and legally sold in Australia. The Industry Code for the Manufacturing and Marketing of Energy Shots specifies that adults are the target market for these products, and requires that energy shots do not exceed 160 mg caffeine per shot.

Labelling

In addition to limiting their caffeine content, foods containing added caffeine must also have a statement on the label that the product contains caffeine. Foods containing guarana must also be labeled as containing caffeine.

The label of a formulated caffeinated beverage is required to state the quantity of caffeine in mg/100 mL and mg per serving size. Energy shots that are marketed as dietary supplements must state the level of caffeine if greater than 145 mg/L. The regulatory standards for energy drinks (Food Standards Code) and energy shots (Supplemented Food Standard) include additional labelling requirements whereby labels advise that the products are not recommended for children, pregnant or lactating women, and individuals sensitive to caffeine; and, subject to containing certain substances beyond caffeine (for example, taurine, glucuronolactone), no more than a certain amount should be consumed per day.

How is caffeine used?

Caffeine is typically consumed orally. Naturally occurring caffeine is found in a variety of foods and beverages (such as coffee, tea, cocoa, cola-type drinks, chocolate), as well as dietary supplements (eg, guarana). Caffeine, from either synthetic or natural sources, is also added as an ingredient or food additive to a number of products, such as various soft drinks, sports foods and energy drinks. Caffeine is available in tablet form (eg, No-Doz®) and may also be present in prescription and over-the-counter medications, including some cough medicines, weight-loss products and pain relievers.

Common caffeine-containing foods and beverages

Food	Caffeine content
instant coffee (1 teaspoon/cup)	60-80 mg/250 mL cup
percolated coffee	60-120 mg/250 mL cup
brewed coffee	80-350 mg/250 mL cup
tea	10-50 mg/250 mL cup
formulated caffeinated beverages (energy drinks)	80 mg/250 mL can
Coca Cola	48.75 mg/375 mL can
milk chocolate	20 mg/100 g bar

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Effects of caffeine

The effects of caffeine are due to its action as both a stimulant and a diuretic (a substance that increases the production of urine) and can vary according to a number of factors:

- amount consumed
- person's height, weight and general health
- genetic factors
- whether the person is used to having caffeine
- whether food or other drugs (including alcohol) are taken around the same time
- pregnancy or breastfeeding
- mood.

Short-term effects

The effects of caffeine are typically experienced within 30 minutes after consuming and can last up to six hours, although there may be individual variations in the onset and duration of effects. For example, caffeine stays active in the body for a longer duration in babies, pregnant women and the elderly.

For small doses of caffeine (for example, 100-200 mg; approximately one to two cups of coffee) the short-term effects include:

- feeling more alert and active
- needing to urinate more often
- higher body temperature
- faster breathing and heart rate
- increased production of stomach acid.

Children and young people who consume energy drinks containing caffeine may also suffer from sleep problems, bed-wetting and anxiety.

Long-term effects

Regular, heavy use of caffeine (more than 600 mg per day — approximately four cups of coffee/strong tea per day) may eventually lead to:

- bone loss (osteoporosis) in post-menopausal women
- cardiovascular problems
- heartburn
- ulcers
- difficulty sleeping (insomnia)
- anxiety
- depression.

Caffeine and driving

There is no evidence to suggest that caffeine has an adverse impact on the ability to drive and there are several studies that have shown that caffeine may even improve driving performance by increasing driver alertness and attention.

Some people may use caffeine, such as drinking coffee or energy drinks, to try and counteract the effects of alcohol on driving. Research has shown, however, that caffeine has no effect on the metabolism of alcohol by the liver and does not reduce breath alcohol concentration (as measured by a breathalyser).

Caffeine and pregnancy

Caffeine passes across the placenta to the fetus and can enter the mother's breast milk, exposing babies to its stimulatory effects both during pregnancy and after birth. Babies are less able to break down caffeine than adults and, as such, may be more sensitive to the effects of the mother's caffeine consumption. Significant amounts of caffeine consumed by the mother can, for example, lead to wakefulness and agitation in the baby.

Although some studies have shown that caffeine intake of greater than 300mg per day has been associated with decreased fertility (i.e. delayed conception), miscarriage, low birth weight and delayed fetal growth, there is insufficient evidence to conclude that low to moderate caffeine consumption (one to two cups of coffee per day) has an adverse effect on fertility and pregnancy outcomes. Nevertheless, it is recommended that women who are pregnant, or planning to become pregnant, not exceed this level in order to exclude any increased risk of pregnancy complications.

Guidelines as to the recommended caffeine levels in pregnancy vary, although

Australian and international food and health authorities generally advise that pregnant and breastfeeding women should limit their caffeine intake to a maximum of 200 mg per day (about two cups of coffee or four cups of tea).

Energy drinks are not recommended for pregnant and breastfeeding women.

Using caffeine with other drugs

Caffeine may interact with other drugs, including over-the-counter and prescribed medications, and may increase the effects of other psychoactive substances. Conversely, other drugs can prolong the time that caffeine is active in the body and increase its stimulatory effects. The effects of using caffeine with other substances, however, are unpredictable and potentially dangerous. If you are taking other drugs or medications, consult your health care provider for advice on potential interactions with caffeine.

Caffeine (a central nervous system stimulant) when consumed with alcohol (a central nervous system depressant) may mask the sedative effects of alcohol (drowsiness, falling asleep); however, caffeine does not reduce the level of alcohol intoxication or alcohol-induced impairment in cognitive and motor functioning.

The use of energy drinks with alcohol has become an increasingly popular phenomenon. People typically use energy drinks with alcohol to intensify and prolong the effects of alcohol and to remain awake and alert in order to keep drinking and socialising. People who consume energy drinks with alcohol report increased stimulation and alertness, reduced fatigue, and the ability to consume more alcohol, particularly over long periods of time. Research has found that the consumption of energy drinks with alcohol is associated with greater alcohol consumption and an increased likelihood of alcohol-related harm. Moreover, as people drink more alcohol and become intoxicated, they may lose track of the number of energy drinks (and caffeine) they consume, increasing the risk of adverse reactions to caffeine (see **Overdose** on page 35).

Using caffeine with other central nervous system stimulants, such as cocaine and methamphetamine, can increase the toxic effects of each drug. In particular, the risk of adverse effects on the cardiovascular system (for example, abnormal heart rate and rhythm) may be increased, causing serious harm to the user.

Dependence

Although some people report that they are unable to reduce their caffeine consumption, despite negative physical or psychological consequences associated with continued use, the extent to which ‘caffeine dependence’ is a clinically significant disorder is unclear. Due to insufficient clinical evidence for a dependence syndrome for caffeine, caffeine dependence



is not formally recognised in the same way as dependence on other drugs of abuse. Further research in this area has been recommended.

Withdrawal

For people who consume caffeine on a regular (daily) basis, ceasing consumption can induce a caffeine withdrawal syndrome. Withdrawal symptoms usually start within 12-24 hours after the last dose, but can start within six hours for people who consume a lot of caffeine regularly and as late as 36 hours. The duration of symptoms is typically between two and seven days; occasionally even longer for people who consume large amounts of caffeine.

These symptoms can include:

- headache
- fatigue (tiredness, lethargy)
- drowsiness (sleepiness, yawning)
- nausea
- depression
- difficulty concentrating
- inability to think clearly
- irritability
- anxiety
- sweating
- muscle pains and weakness.

Overdose

Although caffeine has positive effects, such as increasing alertness, energy and concentration, and healthy people can tolerate caffeine in moderation, consuming large amounts of caffeine can have a range of adverse effects that are collectively known as ‘caffeine toxicity’.

Caffeine toxicity is usually associated with high doses (greater than 500 mg) of caffeine. It is important to note, however, that there are individual differences in how people respond to a particular dose of caffeine. A person with high sensitivity and low tolerance to caffeine might show signs and symptoms of caffeine toxicity in response to doses of caffeine much lower than a regular user.

The symptoms of caffeine toxicity vary in their severity, and how commonly they occur, and include:

- nervousness
- anxiety
- irritability
- agitation
- insomnia
- headache
- rapid and/or irregular heart rate
- rapid breathing
- gastrointestinal disturbances (abdominal pain, diarrhoea, nausea/vomiting)
- muscle tremors/twitches
- delirium (confusion, hallucinations, excitability)
- headaches.

Seizures associated with caffeine toxicity have also been reported. For people who already have heart problems or anxiety disorders, large amounts of caffeine may make these problems worse.

Caffeine toxicity is rarely fatal, although very high doses of caffeine (for example 5-10 g in adults) can be lethal, and sudden death due to caffeine toxicity, while uncommon, has been reported.

How much caffeine is safe?

There is currently no uniformly recognised safe level of caffeine consumption, although a moderate intake of caffeine of up to 400 mg per day for healthy adults – equivalent to about 4 cups of coffee – is generally considered safe.

People with existing medical conditions (for example, high blood pressure, heart disease, liver disease) may have an increased susceptibility to the adverse effects of caffeine consumption, making a typically consumed amount of caffeine potentially more dangerous. For these people, a lower daily limit or no caffeine ingestion should be considered.

Children and adolescents should limit their intake of caffeinated drinks. The caffeine intake for children should not exceed 100 mg per day and, for adolescents, should not exceed 2.5 mg/kg per day.

Adverse reactions following the consumption of energy drinks stem primarily from their caffeine content. Food Standards Australia New Zealand recommends a ratio of 3 mg to each kilogram of an average adult (210 mg per day for an adult who weighs approximately 70 kg). Based on this, the recommended consumption limit for energy drinks is two cans per day.

Treatment

Research suggests that some caffeine users are sufficiently distressed by their caffeine use to seek assistance to reduce or cease caffeine consumption. There is little research on treatment for problems related to caffeine use and limited treatment options currently available. Of the few studies that have investigated such treatment, the primary forms of treatment are psychological therapies designed to change consumption behaviour. More research is needed to determine the best methods to promote caffeine reduction and cessation.