What is caffeine? Caffeine is a molecular compound that acts as a central nervous system stimulant. It is used in coffee, tea, energy drink, and chocolate bars. It is also available in medication for headache relief, prevention of Parkinson's disease, type 2 diabetes, improving the airway functions in cases of asthma, and many more. Caffeine was discovered as early as the ninth century in Ethiopia. Many stories follow a similar plotline, but the basic idea is that men first notice the effects of caffeine on their animals, which are fed from coffee beans and berries. However, it was not discovered till much later that the effects could be increased by steeping the plants that contained caffeine. Much later, caffeine was first isolated in 1819 by Friedrich Ferdinand Runge, a German chemist.

Caffeine is formed naturally from ripening berries of coffee plants or artificially. Caffeine is chemically made up of 84 percent Paraxanthine, which is a psychoactive central nervous stimulant. Caffeine is also made of 12 percent of Theobromine which gives a bitter taste to caffeine. Finally, caffeine is made of 4 percent of Theophylline, a bitter crystalline compound similar to the theobromine molecular compound.

*Caffeine* is a plant alkaloid found in numerous types of plant species. There are ways to synthesize Caffeine; the chemical synthesis of urea mainly produces synthetic Caffeine as the primary raw material. Its chemical formula is C8H10N4O2, as seen below. [1] Caffeine can be found everywhere in our daily life. We can find it in various food and drink for all age groups, and it is very, very popular now in days due to social media.

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Figure[1] Britannica, The Editors of Encyclopaedia. "Caffeine". Encyclopedia Britannica, 17 Dec. 2020, https://www.britannica.com/science/caffeine. Accessed 28 April 2021.

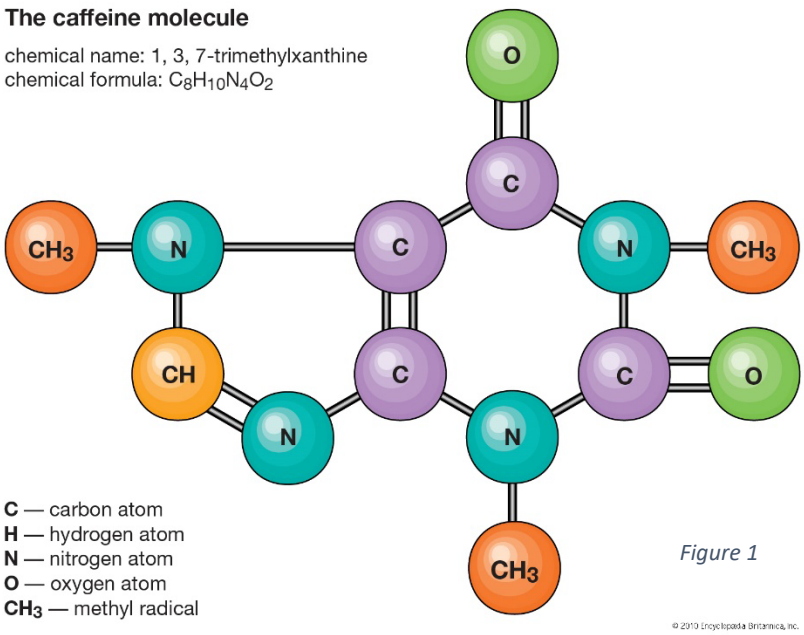


*Figure 1*

Studying for an exam? Having to a pull an all-nighter? Consumption of caffeine allows us to restore mental alertness or wakefulness during fatigue or drowsiness. Many consume caffeine as it releases dopamine which makes us feel happy. It can treat and prevent premature infant breathing disorder. Caffeine is also included in several pain killer medications. Using caffeine to stay awake and alert has been a longstanding habit.

Some levels of caffeine intake are nearly universal in modern society, and it is estimated that 90% of adults in the United States consume caffeine on a daily basis, the average amount being 200 mg per day. However, despite its large-scale use, there is no evidence that regular caffeine consumption or coffee has any adverse effects on the liver. Epidemiological studies suggest that regular consumption of coffee may have modest protective effects against the progression of chronic liver disease and the development of liver cancer. In high and toxic doses, caffeine can have severe effects on brain, heart, and muscle function but has not been linked to clinically apparent liver damage. In contrast, there have been several reports of liver damage associated with the use of caffeine-rich energy drinks. These reports have not been persuasive, and most are not well documented.

In some cases, liver damage resembles acute liver necrosis or ischemic hepatitis (case 1). In other cases, other diagnoses were more likely than liver damage. And energy drinks (case 2). In addition, it is not clear whether the liver effects were caused by caffeine itself or by other components of typical energy drinks such as vitamins, herbs, or other herbal substances. In cases with autopsies, liver damage was not found or was not mentioned. Therefore, caffeine is unlikely to cause liver damage, but the various caffeine-rich energy drinks widely available can cause liver damage if overused.[2]

Coffee is the most popular drink after water and is consumed worldwide in approximately 1.6 billion cups per day, which is an impressive number—the etymology of the word "cafe". The botanical name for the plant from which coffee is made is Coffea Arabica: It originated in Ethiopia and is an exceptionally robust self-pollinating plant. The Persian doctor Rhazes was the first to mention this, as Yemen was the first country to grow coffee plants while Turkey was the first to roast green coffee beans. Therefore, it is not surprising that the word "coffee" has its roots in Arabia, where it was called "Qahwah". While there is no doubt about the origin of the word, researchers disagree on how the language process led to the English word "café". Of, the Italian word "caffé", derived in turn from the word "kahveh," which was the Turkish way of pronouncing "qahwah".Over the centuries, the custom of drinking coffee spread from Arabia all over the world. Caffeine is found in more than sixty plants, which is a remarkable number, which is why it was believed that caffeine was initially a minor, non-essential nutrient for the plant. But extremely useful as a pesticide. Caffeine is toxic to various

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[2] "Caffeine." *National Center for Biotechnology Information. PubChem Compound Database*, U.S. National Library of Medicine, pubchem.ncbi.nlm.nih.gov/compound/Caffeine#section=Taste.

insects and animals, especially herbivores. Caffeine allows the plant to defend itself and has a better chance of survival: Caffeine can be viewed as an "evolutionary protective co-agent" from this point of view. Caffeine is a beautiful model compound for understanding medication of abuse/dependence. The results of self-administration and selection studies in humans demonstrate the reinforcing effects of low and moderate doses of caffeine.

Caffeine reinforcement has been incontestable during about 45% of traditional subjects with moderate and heavy caffeine use histories.[3] Recent studies give compelling proof that caffeine physical dependence potentiates the reinforcing effects of caffeine through the mechanism of symptom avoidance. Tolerance to the subjective and sleep-disrupting effects of caffeine in humans has been demonstrated. Physical dependence as mirrored in a withdrawal syndrome in humans has been repeatedly demonstrated in adults and recently demonstrated in children. Withdrawal severity is an increasing caffeine maintenance dose, with withdrawal occurring at doses as low as a hundred mg per day. Raised cerebral blood flow could also be the physiological mechanism for caffeine withdrawal headaches. Case studies in adults and adolescents demonstrate that some people meet DSM-IV diagnostic criteria for a substance dependence syndrome on caffeine and feel compelled to continue caffeine use despite needs and {suggestions} to the contrary. Survey information suggests that 9% to 30% of caffeine consumers might be caffeine-dependent consistent with DSM-IV criteria.[4]

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[3] Griffiths, R. R., and A. L. Chausmer. "Caffeine as a Model Drug of Dependence: Recent Developments in Understanding Caffeine Withdrawal, the Caffeine Dependence Syndrome, and Caffeine Negative Reinforcement." *Nihon Shinkei Seishin Yakurigaku Zasshi = Japanese Journal of Psychopharmacology*, vol. 20, no. 5, 2000, pp. 223-231.

[4] Griffiths, R. R., and A. L. Chausmer. "Caffeine as a Model Drug of Dependence: Recent Developments in Understanding Caffeine Withdrawal, the Caffeine Dependence Syndrome, and Caffeine Negative Reinforcement." *Nihon Shinkei Seishin Yakurigaku Zasshi = Japanese Journal of Psychopharmacology*, vol. 20, no. 5, 2000, pp. 223-231.

Pure caffeine (trimethylxanthine) is a silky white powder or needle that melts at 238 ° C and sublimes at 178°C at atmospheric pressure.[5] It is very soluble in hot water. As the solution cools and it deposits crystals of caffeine monohydrate. Caffeine is generally less soluble in solid solvents than it is in hot water. Caffeine is odorless but has a bitter taste. Ground coffee contains caffeine in amounts between 0.75 and 1.5 percent by weight. Therefore, an average cup of coffee contains around 100 mg of caffeine. The caffeine content in tea varies greatly depending on the strength of the tea but averages 40 mg. There is also about 40 mg (0.0014 oz) of caffeine in a 12 oz glass of carbonated cola. Caffeine has a stimulating that affects the central nervous system, heart, blood vessels, and kidneys. Also, it works as a mild diuretic. The effects of caffeine make it a valuable antidote to respiratory depression caused by overdosing (e.g. morphine or barbiturates). The positive effects described in people who consume caffeine include improved motor performance, decreased fatigue, and increased sensory activity. The effects may partly explain the compulsion many adults have to consume coffee or other caffeinated beverages as part of their morning caffeinated wake-up ritual. However, ingesting caffeine can also cause adverse effects in humans, such as irritability, headaches, nervousness or anxiety, nervousness, and insomnia. Decaffeinated coffee and soft drinks were widespread by the mid-1980s, allowing consumers to regulate their caffeine intake while they were still enjoying those drinks.

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caffeine. Finally, caffeine is made of 4 percent of Theophylline, a bitter crystalline compound similar to the theobromine molecular compound.

Some research into caffeine-related health problems is inconclusive. Studies have not shown a correlation between caffeine intake and an increased risk of osteoporosis or an increased risk of miscarriage. There is no conclusive evidence linking caffeine (like coffee) to cancer of the bladder, pancreas, breast, or colon. There is also no conclusive evidence that moderate caffeine intake contributes to heart disease or arrhythmias. However, one study has shown that consuming relatively high amounts of coffee increases homocysteine levels (an amino acid) in the blood, a condition that can contribute to heart attack or Alzheimer's disease. There is ongoing controversy over whether excessive caffeine consumption increases blood pressure, a woman's risk of developing breast lumps, or the occurrence of miscarriages.[6]

Completing this research has increased my knowledge of not only dreams but also my understanding of caffeine and how it composes certain chemicals to regulate appropriately. I also was not aware that caffeine is considered and is the most drug used in the world.

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[6] "Caffeine." *National Center for Biotechnology Information. PubChem Compound Database*, U.S. National Library of Medicine, pubchem.ncbi.nlm.nih.gov/compound/Caffeine#section=Taste.

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