



## THE EFFECTS OF ENERGY DRINKS' COMPONENTS ON THE BODY

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**Relevance.** Consumption of energy drinks has increased in recent years due to aggressive marketing aimed at young people and the belief in their ability to improve physical and cognitive performance. However, the long-term effects of these drinks on health and performance are unknown. Research is currently underway to determine any potential negative effects. Energy drinks contain caffeine and other ingredients, such as taurine, guarana, ginseng, and vitamins, which are considered stimulants. The ready availability of energy drinks in stores and other retail outlets has encouraged their consumption, but also increased the risk of negative side effects. Thus, while energy drinks may provide short-term benefits, their long-term effects remain unclear. Energy drinks contain caffeine, sugar, and other additives that boost alertness and energy but can have negative health effects. Energy drink consumption has increased significantly among young people, who prefer them to caffeine.

**Keywords:** Energy drinks, caffeine, taurine, carnitine, guarana and B-complex vitamins.

Energy drink consumption among young people and athletes has increased significantly, but has raised concerns about potential health side effects. These concerns include potential cardiovascular and nervous system problems, and the risk of addiction. A published review of studies revealed a significant number of negative consequences, particularly for the cardiovascular and neurovegetative systems. Nine



cases of cardiac arrest, including three fatal ones, were reported following excessive energy drink consumption. Caffeine, the main component of these drinks, plays a role in the adverse effects. Animal studies have confirmed these findings in humans.

The review also highlights the need for more careful consideration of sudden cardiac death cases, particularly among young people, associated with energy drink consumption. Stricter regulation of the consumption of these drinks, based on scientific data and literature, is recommended. The need to create regulations that would govern the consumption of energy drinks, taking into account their potential negative health impacts, is also discussed.

Energy drinks are high in caffeine, sugar and other additives. They contain legal stimulants that can increase alertness, attention, and energy, but can also cause adverse health effects, including digestive problems, nervousness, high blood pressure, and serious problems such as kidney damage and stroke. Teenagers often consume these drinks to boost energy and performance in school or sports.

Consumption of energy drinks among children and adolescents has increased significantly in recent years, leading to increased caffeine consumption. Although caffeine consumption among young people has declined, energy drink consumption has increased significantly. The amount of caffeine in these drinks varies widely, with dosages ranging from 50 to 505 mg per can or bottle, compared to 77 to 150 mg per cup of coffee. Studies of energy drink consumption have revealed a wide range of adverse health effects, including mild and more serious problems, as well as links to deaths. Caution is advised when consuming these drinks, especially for adolescents and children.

In particular, it is claimed that taurine and gluconolactone are the main components responsible for the effects attributed to Red Bull. Taurine, a derivative of the amino acid cysteine, is found in abundance in cardiac and skeletal muscle [3,14]. Its involvement covers various physiological functions, including neuromodulation, stabilization of cell membranes and regulation of intracellular



calcium levels [13]. The recognized antiarrhythmic effect of taurine is due to its ability to regulate cation transport [10].

It promotes modulation of the inward-rectifying  $K^+$  current and action potential duration in cardiac muscle [6], and inhibits the fast  $Na^+$  current, thereby inducing class I antiarrhythmic activity [9]. Its presence in significant concentrations in the brain underlines its key role in neuroprotection and enhancement of neurotransmission [2]. The prospect that taurine, when combined with caffeine, enhances attention span, reaction time, and emotional state has attracted the interest of researchers, although convincing evidence of a combinatorial cognitive effect has not yet been obtained.

Seidl et al. conducted a double-blind, placebo-controlled study in which the experimental group was given caffeine, taurine, and glucuronolactone, which resulted in a reduction in motor reaction time and an increase in emotional state scores [12]. Although the study suggested a positive cognitive impact, an interaction between the GABAergic, glycinergic, cholinergic and adrenergic neurotransmitter systems was suggested, which is recognized by the caffeine factor [5].

Glucuronolactone, a product of hepatic glucose metabolism, serves as a precursor for the synthesis of ascorbic acid. In the 1960s, Japanese researchers noted its performance-enhancing properties. The study demonstrated an increase in swimming endurance in laboratory rats after direct intestinal administration of glucuronolactone, glucose, glycogen and other substances, with the first group outperforming all others in two out of three cases. The findings suggest that the equivalent dose for humans may be between 1 and 2 g of glucuronolactone, compared to 600 mg in a can of Red Bull.

Detoxification potential may contribute to these results, as glucuronolactone supplements may strengthen the body's natural defenses against carcinogens and tumor-promoting factors. Additional ingredients commonly found in energy drinks include carnitine, guarana, and B-complex vitamins. Carnitine, which consists of



several compounds including L-carnitine, acetyl-L-carnitine, and propionyl-L-carnitine [8], is an amino acid derivative. It occurs naturally in many foods, especially those of animal origin, and is available as dietary supplements.

Carnitine is synthesized endogenously in the liver, kidneys, and brain from the amino acids lysine and methionine [4]. This compound plays a key role in energy production, serving as an essential cofactor that facilitates the transfer of long-chain fatty acids into the mitochondria for oxidation, resulting in the production of energy from adenosine triphosphate (ATP) [1].

Guarana (*Paullinia cupana*), a climbing plant native to the Amazon, has historically served as a stimulant and traditional medicine among indigenous peoples of Brazil [11]. Guarana seeds significantly exceed coffee beans in caffeine content and contain additional xanthine alkaloids such as theobromine and theophylline [7].

This herbal supplement increases the caffeine content and stimulant properties of energy drinks (EDs), without requiring the caffeine content to be listed on product labels due to its status as a herbal supplement. The B complex of eight vitamins includes thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine hydrochloride (B6), biotin (B7), inositol (B8), and cyanocobalamin (B12).

These vitamins act as coenzymes that are essential for proper cellular function, particularly mitochondrial activity and energy production. Therefore, it has been suggested that B vitamins may increase energy expenditure. Energy drinks may provide short-term benefits, but their potential negative effects make their use risky. Moderate consumption, awareness of potential risks, and choosing healthier energy-boosting alternatives will help minimize harm and maintain overall health and well-being. To reduce the risks associated with energy drink consumption, the following preventative measures and recommendations should be followed: Limit consumption: Recommended Daily Intake: Do not exceed the recommended daily



intake of caffeine (usually up to 400 mg for adults). For adolescents and children, this intake should be significantly lower.

Moderation: Avoid regular and excessive consumption of energy drinks. Use them only when absolutely necessary. Healthy Eating: Ensure adequate intake of nutrients, vitamins, and minerals through a balanced diet. Physical Activity: Regular exercise helps maintain high energy levels and stamina. Preventing negative effects from energy drinks involves mindful consumption, choosing healthy alternatives, being aware of the risks, and consulting with healthcare professionals. Following these measures will help reduce health risks and maintain overall well-being.

### **literature**

1. Belay B., Esteban-Cruciani N., Walsh C.A., Kaskel F.J. The use of levo-carnitine in children with renal disease: A review and a call for future studies. *Pediatr. Nephrol.* 2006;21:308–317. doi: 10.1007/s00467-005-2085-4.
2. Chepkova A.N., Doreulee N., Yanovsky Y., Mukhopadhyay D., Haas H.L., Sergeeva O.A. Long-term enhancement of corticostriatal neurotransmission by taurine. *Eur. J. Neurosci.* 2002;16:1523–1530. doi: 10.1046/j.1460-9568.2002.02223.x.
3. Eley D.W., Lake N., Eter Keurs H. Taurine depletion and excitation-contraction coupling in rat myocardium. *Circ. Res.* 1994;74:1210–1219. doi: 10.1161/01.RES.74.6.1210.
4. Ferreira G.C., McKenna M.C. l-Carnitine and Acetyl-l-carnitine Roles and Neuroprotection in Developing Brain. *Neurochem. Res.* 2017;42:1661–1675. doi: 10.1007/s11064-017-2288-7.
5. Kim W. Debunking the Effects of Taurine in Red Bull Energy Drink. *Nutr. Bytes.* 2003;9:1.
6. Lake N., de Roode M., Nattel S. Effects of taurine depletion on rat cardiac electrophysiology: In vivo and in vitro studies. *Life Sci.* 1987;40:1017–1026. doi: 10.1016/0024-3205(87)90322-5.
7. Moustakas D., Mezzio M., Rodriguez B.R., Constable M.A., Mulligan M.E., Voura E.B. Guarana Provides Additional Stimulation over Caffeine Alone in the Planarian Model. *PLoS ONE.* 2015;10:e0123310. doi: 10.1371/journal.pone.0123310.



8. Ross A.C., Caballero B., Cousins R.J., Tucker K.L., Ziegler T.R. *Modern Nutrition in Health and Disease*. 11th ed. Lippincott Williams & Wilkins; Baltimore, MD, USA: 2014. Carnitine; pp. 252–253.
9. Satoh H. Inhibition of the Fast Na<sup>+</sup> Current by Taurine in Guinea Pig Ventricular Myocytes. *Gen. Pharmacol. Vasc. Syst.* 1998;31:155–157. doi: 10.1016/S0306-3623(97)00385-6.
10. Schaffer S.W., Shimada K., Jong C.J., Ito T., Azuma J., Takahashi K. Effect of taurine and potential interactions with caffeine on cardiovascular function. *Amino Acids*. 2014;46:1147–1157. doi: 10.1007/s00726-014-1708-0.
11. Schimpl F.C., da Silva J.F., Gonçalves J.F.d.C., Mazzafera P. Guarana: Revisiting a highly caffeinated plant from the Amazon. *J. Ethnopharmacol.* 2013;150:14–31. doi: 10.1016/j.jep.2013.08.023.
12. Seidl R., Peyrl A., Nicham R., Hauser E. A taurine and caffeine-containing drink stimulates cognitive performance and well-being. *Amino Acids*. 2000;19:635–642. doi: 10.1007/s007260070013.
13. Timbrell J.A., Seabra V., Waterfield C.J. The in vivo and in vitro protective properties of taurine. *Gen. Pharmacol. Vasc. Syst.* 1995;26:453–462. doi: 10.1016/0306-3623(94)00203-Y.
14. Wassef B., Kohansieh M., Makaryus A.N. Effects of energy drinks on the cardiovascular system. *World J. Cardiol.* 2017;9:796–806. doi: 10.4330/wjc.v9.i11.796.