

Nutrition and Health Info-Sheet

For Health Professionals

Produced by
Karrie Heneman, PhD
Project Scientist
Sheri Zidenberg-Cherr, PhD
Cooperative Extension
Nutrition Science Specialist
Department of Nutrition
University of California
Davis, CA 95616
2007

Some Facts About Energy Drinks

What are energy drinks?

The term “energy drinks” refers to beverages that contain caffeine in combination with other ingredients such as taurine, guarana, and B vitamins, and that claims to provide its consumers with extra energy (1). This term was created by companies in the beverage industry (1) and is not recognized by the United States Food and Drug Administration (FDA) or the United States Department of Agriculture (USDA).

Is there evidence that these energy drinks increase energy?

There is limited evidence that consumption of energy drinks can significantly improve physical and mental performance (2), driving ability when tired (3), and decrease mental fatigue during long periods of concentration (4). Unfortunately, the body of literature is limited and it is not known whether these improvements are due to the caffeine, other herbal ingredients, or as a result of the combination of the ingredients found in a beverage (2).

Can consumption of energy drinks have adverse effects?

The caffeine content of a single serving of energy drink (8 to 12 fl oz) can range from 72 to 150 mg; however, many bottles contain 2-3 servings, raising the caffeine content to as high as 294 mg per bottle. In comparison, the caffeine content, per serving (8 fl oz.), of brewed coffee, tea, and cola beverages ranges between 134-240 mg, 48-175 mg, and 22-46 mg respectively (5). A recent literature review determined that consumption of up to 400 mg caffeine daily by healthy adults is not associated with adverse effects (5). However, groups that are at risk, such as women of reproductive age and children, should limit their daily consumption of caffeine to a maximum of 300 mg for the former and 2.5 mg/kg body weight for the latter; (5) thus they may need to avoid consuming energy beverages with a higher caffeine content. Adolescents should limit caffeine consumption, as intakes greater than 100 mg/day has been associated with elevated blood pressure (6). Based on these findings, consumption of energy drinks by pregnant or nursing women, adolescents, and children is not recommended.

Caution is warranted even for healthy adults who choose to consume energy beverages. Consumption of a single energy beverage may not lead to excessive caffeine intake; however, consumption of two or more beverages in a single day can. Other stimulants such as guarana and ginseng are often added to energy beverages and can enhance the effects of caffeine. Guarana, in particular, contains caffeine (1g of guarana is nearly equal to 40 mg caffeine) (7) and may substantially increase the total caffeine in an energy drink. Adverse effects associated with caffeine consumption in amounts of 400 mg or

more include nervousness, irritability, sleeplessness, increased urination, abnormal heart rhythms (arrhythmia), decreased bone levels, and stomach upset (5).

Furthermore, it should be noted that energy drinks contain added sugar. According to the USDA Dietary Guidelines, sugar should be limited in the normal daily diet

What is the caffeine and sugar content of energy drinks?

Drink	Serving (fl. oz.)	Servings per container	Sugar per serving (g)	Caffeine per serving (mg)	Kcal
Diet Rockstar Energy Drink™	8	2	0g	80	10
Full Throttle™	8	2	29g	72	111
Go Girl Sugar Free™	12	1	0g	150	3
Lo-Carb Monster XXL™	8	3	3g	80	10
Monster Energy Assault™	8	2	27g	80	100
Monster Energy XXL™	8	3	27g	80	100
Red Bull Sugar Free™	8.3	1	0g	80	10
Red Bull™	8.3	1	27g	80	110
Rockstar Energy Drink™	8	2	30g	80	130
Rockstar Juiced™	8	2	21g	80	90
Wired 294 Caffeine™	8	2	26g	147	100

Note: This table does not include amounts of other stimulants found in energy drinks that can enhance the effects of caffeine.

There are many unusual ingredients in energy drinks. What do they claim to do?

Ingredient	Found In	Functional Claims
Carnitine	Monster™, Rockstar™, Full Throttle™	Improves endurance (14), increases fat metabolism (15); protect against cardiovascular disease (16)
Glucuronolactone	Go Girl Sugar Free™, Red Bull™, Monster™	Promotes excretion of toxins and protects against cancer (1)
Guarana	Monster™, Rockstar™, Full Throttle™	Increases energy, enhances physical performance, and promotes weight loss (18)
Inositol	Go Girl Sugar Free™, Red Bull™, Monster™, Rockstar™, Wired B ₁₂ Rush™	Decreases triglyceride and cholesterol levels, lowering risk of cardiovascular disease (13)
Panax Ginseng	Monster™, Rockstar™	Speeds illness recovery; improves mental, physical, and sexual performance; controls blood glucose, and lowers blood pressure (17)
Super Citramax (Hydroxy Citric Acid, Garcinia Cambogia Extract)	Go Girl Sugar Free™	Suppresses appetite, resulting in weight loss (10)
Taurine	Go Girl Sugar Free™, Red Bull™, Monster, Rockstar™, Full Throttle™	Lowers risk of diabetes (11), epilepsy (11), and high blood pressure (12)
Yohimbine HCL	VPX Redline™	Improves sexual performance (8, 9) and promotes weight loss (10)

Is there scientific evidence to support these claims?

Ingredient	Scientific Evidence
Carnitine	There is no clinical evidence that carnitine use is effective for increased endurance (14) or weight loss, (15) but it may protect against heart disease (16).
Glucuronolactone	Scientific evidence does not exist to support claims regarding the efficacy of glucuronolactone (1).
Guarana	A major component of guarana is caffeine (13). Caffeine consumption has been associated with increased energy, enhancement of physical performance, and suppressed appetite.
Inositol	Scientific evidence does not exist to support claims regarding the efficacy of inositol (13).
Panax Ginseng	Scientific evidence does not exist to support claims regarding the efficacy of panax ginseng (17).
Super Citramax (Hydroxy Citric Acid, Garcinia Cambogia Extract)	There is scientific evidence that use of this supplement decreases food consumption (10).
Taurine	Clinical evidence is insufficient to show that taurine is effective in treating diabetes or epilepsy (11), but it may lower blood pressure (12).
Yohimbine HCL	Although yohimbine HCL may increase blood flow to sexual organs, there is no evidence that it increases sexual arousal (8). It may be effective at treating erectile dysfunction (9). Currently no evidence exists to support the claim that use of this supplement leads to weight loss (10).

Is consumption of these ingredients safe?

Ingredient	Safety
Carnitine	Insufficient data exists to establish the safety of carnitine use (15).
Glucuronolactone	Insufficient data exists to establish the safety of glucuronolactone use at the concentrations found in energy drinks (1).
Guarana	This substance is generally regarded as safe (GRAS) by the Food and Drug Administration Center for Food Safety and Applied Nutrition (FDA CFSAN).
Inositol	Inositol is generally regarded as safe (GRAS) by the Food and Drug Administration.
Panax Ginseng	Insufficient data exists to establish the safety of panax ginseng use (17).
Super Citramax (Hydroxy Citric Acid, Garcinia Cambogia Extract)	Insufficient data exists to establish the safety of super citramax use (10).
Taurine	Insufficient data exists to establish the safety of taurine use (1).
Yohimbine HCL	Approved for use by the FDA to treat hypertension and sexual dysfunction, but over the counter use is not recommended (10).

Should energy drinks be consumed before or during exercise?

Caffeine is known to increase endurance and its use is therefore banned by the International Olympic Committee (19). Research has found consumption of caffeine prior to heavy exercise to be safe; however, the safety of consuming caffeine in combination with other herbal supplements found in energy drinks prior to or during exercise has yet to be established (1). Until the safety of this practice can be established, consumption of energy drinks prior to exercise by individuals of any age is not recommended.

Should children and adolescents consume energy drinks?

A recent survey of 78 youth (11-18 years) found that 42.3 percent of participants consumed energy drinks (20); however, the effects of ingredients found in energy drinks on children and adolescents has raised concern (13). In adolescents, caffeine consumption has been associated with an increase in blood pressure (6). Based on the limited data regarding safety, it is not recommended that children or adolescents consume energy drinks.

Is it safe to mix energy drinks with alcohol?

A recent study investigating the effects of energy drink consumption in combination with alcohol reported that, despite not feeling intoxicated, participants performed just as poorly on objective measures of motor coordination and reaction time as they did after consumption of alcohol alone (21). In short, an individual may unknowingly overlook the debilitating effects of intoxication because of the sensation of alertness produced by the energy drink. Furthermore, both caffeine and alcohol act as diuretics, increasing the likelihood of dehydration and adverse cardiovascular effects. For these reasons, it is not recommended to consume energy drinks in combination with alcohol.

References:

1. The European Commission on Food Safety. Opinion on Caffeine, Taurine and D-Glucurono- g -Lactone as constituents of so-called "energy" drinks. 1999.
2. Scholey AB, Kennedy DO. Cognitive and physiological effects of an "energy drink": an evaluation of the whole drink and of glucose, caffeine and herbal flavouring fractions. *Psychopharmacology (Berl)* 2004;176:320-30.
3. Reyner LA, Home JA. Efficacy of a 'functional energy drink' in counteracting driver sleepiness. *Physiol Behav* 2002;75:331-5.
4. Kennedy DO, Scholey AB. A glucose-caffeine 'energy drink' ameliorates subjective and performance deficits during prolonged cognitive demand. *Appetite* 2004;42:331-3.
5. Nawrot P, Jordan S, Eastwood J, Rotstein J, Hugenholtz A, Feeley M. Effects of caffeine on human health. *Food Addit Contam* 2003;20:1-30.
6. Savoca MR, Evans CD, Wilson ME, Harshfield GA, Ludwig DA. The association of caffeinated beverages with blood pressure in adolescents. *Arch Pediatr Adolesc Med* 2004;158:473-7.
7. Finnegan D. The health effects of stimulant drinks. *Nutrition Bulletin* 2003;28:147-155.
8. Meston CM, Worcel M. The effects of yohimbine plus L-arginine glutamate on sexual arousal in postmenopausal women with sexual arousal disorder. *Arch Sex Behav* 2002;31:323-32.
9. McKay D. Nutrients and botanicals for erectile dysfunction: examining the evidence. *Altern Med Rev* 2004;9:4-16.
10. Pittler MH, Ernst E. Dietary supplements for body-weight reduction: a systematic review. *Am J Clin Nutr* 2004;79:529-36.
11. Birdsall TC. Therapeutic applications of taurine. *Altern Med Rev* 1998;3:128-36.
12. Militante JD, Lombardini JB. Treatment of hypertension with oral taurine: experimental and clinical studies. *Amino Acids* 2002;23:381-93.
13. Australia New Zealand Food Authority. Inquiry Report: Formulated Caffeinated Beverages. 2001.
14. Brass EP. Supplemental carnitine and exercise. *Am J Clin Nutr* 2000;72:618S-23S.
15. Saper RB, Eisenberg DM, Phillips RS. Common dietary supplements for weight loss. *Am Fam Physician* 2004;70:1731-8.
16. Ferrani R, Merli E, Cicchitelli G, Mele D, Fucili A, Ceconi C. Therapeutic effects of L-carnitine and propionyl-L-carnitine on cardiovascular diseases: a review. *Ann N Y Acad Sci* 2004;1033:79-91.

17. Ernst E. The risk-benefit profile of commonly used herbal therapies: Ginkgo, St. John's Wort, Ginseng, Echinacea, Saw Palmetto, and Kava. *Ann Intern Med* 2002;136:42-53.
18. U.S. Food and Drug Administration. Adverse Events with Ephedra and Other Botanical Dietary Supplements. *FDA Medical Bulletin*, 1994.
19. Clarkson PM. Nutrition for improved sports performance. Current issues on ergogenic aids. *Sports Med* 1996;21:393-401.
20. O'Dea JA. Consumption of nutritional supplements among adolescents: usage and perceived benefits. *Health Education Research* 2003;18:98-107.
21. Ferreira SE, de Mello MT, Pompeia S, de Souza-Formigoni ML. Effects of energy drink ingestion on alcohol intoxication. *Alcohol Clin Exp Res* 2006;30:598-605.

The University of California prohibits discrimination or harassment of any person on the basis of race, color, national origin, religion, sex, gender identity, pregnancy (including childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition (cancer-related or genetic characteristics), ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services (as defined by the Uniformed Services Employment and Reemployment Rights Act of 1994: service in the uniformed services includes membership, application for membership, performance of service, application for service, or obligation for service in the uniformed services) in any of its programs or activities.

University policy also prohibits reprisal or retaliation against any person in any of its programs or activities for making a complaint of discrimination or sexual harassment or for using or participating in the investigation or resolution process of any such complaint. University policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquiries regarding the University's nondiscrimination policies may be directed to the Affirmative Action/Equal Opportunity Director, University of California, Agriculture and Natural Resources, 1111 Franklin Street, 6th Floor, Oakland, CA 94607, (510) 987-0096. **For information about ordering this publication, telephone 1-800-994-8849. For assistance in downloading this publication, telephone 530-754-3927.**