

HEALTH NOTES BY Evelyn Ames “Energy Drinks”: It’s the Caffeine!

The word "caffeine" came from the German word *kaffee* and the French word *café*, each meaning coffee. (<http://www.medicinenet.com/caffeine/article.htm>). Caffeine is a psychoactive stimulant drug found in many products (e.g., dietary supplements, chocolates, soft drinks, tea, coffee, and OTC drugs) and a main compound in the highly marketed “energy drinks.” Some comparisons of caffeine content in food products and beverages are provided in the following table:

Beverage	Milligrams	Energy Drink	Milligrams
Brewed coffee (8 oz)	60 – 120 mg	Monster Energy (16 oz)	160 mg
Decaf coffee (8 oz)	1-5 mg	Full throttle ((16 oz)	144 mg
Black tea (8 oz)	45 mg	Red Bull (8.5 oz)	80 mg
Green tea (8 oz)	20 mg	Spike Shooter (8.4 oz)	300 mg
Coca Cola (12 oz)	34 mg	SoBe No Fear (8 oz)	130 mg
Pepsi (12 oz)	38 mg		
7 up/Sprite (12 oz)	0 mg		
Dark chocolate (1 oz)	20 mg		
Milk chocolate (1 oz)	6 mg		
Jolt cola (12 oz)	72 mg		
Mountain Due (12 oz)	71 mg		
Diet Cola (12 oz)	47 mg		
		For comparison of OTC Vivarin	200 mg

Physiological Effects: at 200 mg, the cerebral cortex of the brain is activated, drowsiness is decreased, mental alertness and mood elevated, and arousal of brain waves (EEG patterns). At 500 mg, caffeine affects the autonomic centers of the nervous system in which the cerebral blood vessels constrict (may be helpful for some with migraines), dilation of coronary artery, and heart and respiration rates increase. The basal metabolic rate may be increased by about 10% in chronic users of caffeine whose intake is 500 mg or more a day. (*Drugs, Society and Human Behavior*) The U.S. Food and Drug Administration classifies a "moderate intake" of caffeine as "generally recognized as safe," meaning generally safe for most adults. Low to moderate intake = 130 mg - 300 mg per day; moderate = 200 mg -300 mg per day; high doses = above 400 mg per day; heavy use = more than 6,000 mg/day. For further pharmacological information about caffeine, check <http://emedicine.medscape.com/article/1182710-overview>.

Mechanism of Action: caffeine (and other xanthines) blocks the brain's receptors for adenosine (a neurotransmitter). The purpose of adenosine is to produce behavioral sedation (a feeling of relaxation) by inhibiting the release of other neurotransmitters that would do the opposite (stimulate). Caffeine gets into the synapse area and blocks receptors for adenosine; therefore, there is a release of neurotransmitters that cause the CNS (central nervous system) to be stimulated.

Absorption and metabolism: absorption is rapid after oral intake with peak blood levels reached in 30 minutes. The maximal central nervous system effects are reached in about 2 hours. Caffeine is metabolized in the liver but approximately 10% is excreted from the body unchanged.

Blood Pressure and Heart Rate! A study of “15 healthy young men and women drank two cans of an energy drink that contained 80 milligrams of caffeine every day for a week. All agreed to abstain from any other forms of caffeine for two days prior to and throughout the study.” The results showed that “within four hours of consuming the drinks on the first day, systolic blood pressure (the top number) shot up by 9 points; on the seventh day, it rose 10 points. Diastolic blood pressure (the bottom number) rose 5 points on both days” “Heart rate increased five beats per minute on the first day; seven days on the last” (<http://www.medicinenet.com/script/main/art.asp?articlekey=85045>).

Is caffeine physiologically addictive? In general, when withdrawal reactions (symptoms) occur, a drug is considered addictive. If a person were accustomed to drinking 3 caffeinated cokes a day and decided to go

cold turkey and stop drinking coke, the most likely withdrawal symptoms would be a headache (18 hours later and several days to one week), decreased alertness, vigor, fatigue, lethargy and nervousness.

Variation in tolerance (the need to increase dosage to obtain effect) of the Xanthines: The Xanthines (oldest known stimulants) are (1) caffeine: most potent, especially on CNS and skeletal muscles; (2) theophylline, which is also in tea, has most potent effect on cardiovascular system and is a good bronchi dilator; theobromine, also in chocolate, is not very potent and has little effect on CNS and muscular system. There is cross tolerance among the xanthines. A person doesn't have to take ingest much to feel the effects. There is specificity to tolerance, meaning that a person doesn't have to increase the amount much to get the CNS stimulation effect on the brain. The direct action on kidneys to increase urinary output does show development of tolerance, meaning one has to increase intake to cause increase in urination. The increase in salivary flow also shows tolerance. The loss of tolerance may take more than 2 months of abstinence.

Energy Drinks: What is the concern, especially when young children and teenagers are drinking them? Energy drinks are classified by the FDA as dietary supplements, not as foods or drugs. This means there are no restrictions as to the amount of caffeine in these products nor are there regulations about the safety and effectiveness of such products. FDA does not require information or warnings of possible health risks of dietary supplements. Soft drinks are classified as foods and must meet FDA regulations as to amount of caffeine in the beverage. What ingredients might one find in an energy drink? Consider these ingredients found in Spike Shooter: N-acetyl-L-tyrosine (a mild central nervous system stimulant), Caffeine anhydrous, Yohimbine HCl, Vitamin B12 (1500 mcg). with other ingredients being carbonated water, citric acid, caffeine anhydrous, sodium citrate, natural and artificial flavors, sucralose, sodium benzoate, FD&C red #40, caramel color, FD&C blue #1. Yohimbe (an herb from tree bark) has been associated with high blood pressure, increased heart rate, headache, anxiety, dizziness, nausea, vomiting, tremors, & sleeplessness. Yohimbe can be dangerous if taken in large doses or for long periods of time. The herb is currently used for sexual dysfunction, including erectile dysfunction in men. (<http://nccam.nih.gov/health/yohimbe/>).

An ABC World News Report (<http://abcnews.go.com/Health/report-shows-energy-drinks-harm-children/story?id=12901333&page=1>) reported on an article in the March 2011 issue of the *Journal of Pediatrics*. An on-line report warned "that caffeine-containing energy drinks like [Red Bull](#), [Rock Star](#) and [Monster](#) -- not to be confused with sports drinks like Gatorade -- may do more than just give young athletes the jitters. They may harm the health of children, especially those with diabetes, seizures, cardiac abnormalities or mood and behavior disorders. Energy drink overdoses in children as young as 5 have been reported both here and abroad and in some cases have resulted in seizures, stroke and even sudden death." Interestingly, "Manufacturers of the popular beverages bristled at the notion that the products could put young people's health at risk," and "that the drinks already contain package warnings that they are not for sale to those younger than 18." "Because kids are smaller, the recommended dose of caffeine that's safe is lower," noted Tara Harwood, pediatric nutritionist at the Cleveland Clinic. "So for the average adult, what is recommended is less than 400 mg of caffeine per day. But in kids, they recommend less than 100 mg of caffeine per day. And the average energy drink, for 8 ounces has about 80 mg of caffeine. So for one 8-ounce can that's putting you close to that limit. Energy drinks do have about three times the caffeine of a regular soda."

Three web sites that compare milligram content of coffees, teas, chocolate, soft drinks, some OTC drugs, and energy drinks: Mayo clinic: <http://www.mayoclinic.com/health/caffeine/AN01211>; Center for Science in the Public Interest: <http://www.cspinet.org/new/cafchart.htm>; and Medicine Net <http://www.medicinenet.com/script/main/art.asp?articlekey=85045>.