



Energy booster

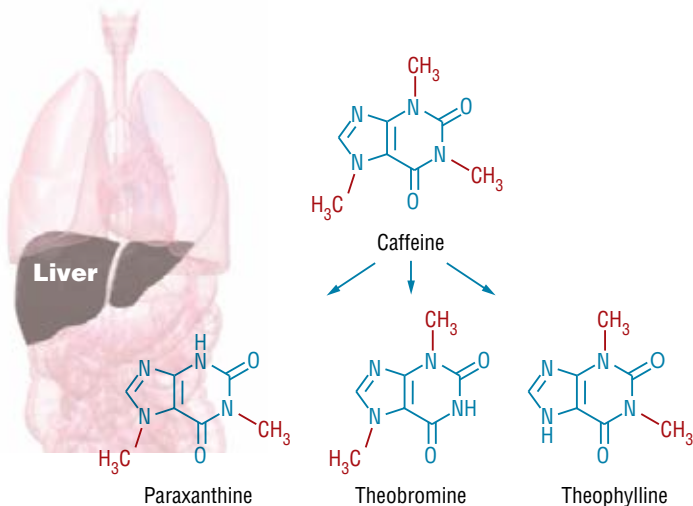
Do you feel like a zombie in your 8 a.m. class? The National Sleep Foundation reports that teenagers need about 9 hours of sleep to do their best. The sleep-inducing hormone, melatonin, is produced around 11 p.m. Let's do the math; 11 p.m. + 9 hours... You are definitely not ready to face the world until 8 a.m. Classes should begin at 9 a.m.! To wake up your brain during first-period chemistry, you grab coffee on your way to school. Manufacturers are developing products that are designed for those "not-so-morning" people. How about **Wired Waffles** washed down with **Kickstart** fruit punch? These products advertise increased energy and enhanced physical and mental performance. What do they have in common? *Caffeine!*



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Caffeine in the liver

In the liver, caffeine is broken down into three molecules.



Molecule	Effects on the Body
Paraxanthine	Improves athletic performance by releasing fat to fuel muscles
Theobromine	Increases oxygen and nutrients to the brain
Theophylline	Increases heart rate and force of contraction

SOURCE: STRUCTURES IN C&E N 2/4/13 P. 12 "CAFFEINE JITTERS"

Caffeine in the brain

Caffeine is structurally similar to adenosine, a chemical found in our brains (Fig. 1). Both molecules are soluble in water and fat, so they easily cross the blood-brain barrier. In the brain, adenosine protects us by slowing nerve cell activity. Due to its similar structure, caffeine binds to the adenosine receptors.



Therefore, caffeine not only blocks adenosine's protection, but it also increases nerve cell activity, leaving us alert, stimulated, and, occasionally, with coffee jitters.

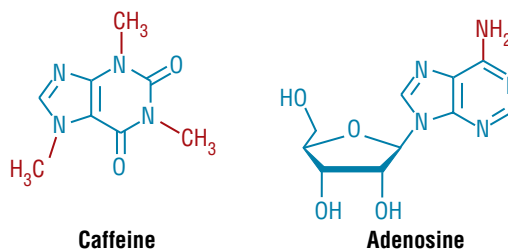


Figure 1. Chemical structures of caffeine and adenosine

Too much caffeine?

Caffeine occurs naturally in foods such as coffee, tea, and chocolate. It is commonly added to other products to give a morning jolt or an afternoon "pick-me-up" (table below). How much caffeine per day is safe? For teenagers: 200–300 milligrams (mg); for adults: 400 mg. But metabolic systems differ. Also, some antibiotics block the breakdown of caffeine, and com-

binning caffeine with alcohol can be dangerous. **You may feel the effects of caffeine within half an hour, and these effects can last 4–6 hours.** Caffeine stimulates the brain like amphetamines, so the following overdose symptoms are similar: nervousness, headache, and rapid heartbeat. So how much caffeine do you ingest daily? Try calculating your daily total at: <http://www.virtual-medicalcentre.com/caffeinecalculator.asp>. *CM*



"Energy" Food	Size	Caffeine (mg)
Coffee	5 oz.	100
Soda	12 oz.	50
Wired Waffles	1 waffle	200
Kickstart fruit punch	16 oz.	92
Cracker Jack'D	1.25 oz.	100
5-Hour Energy Shot	1.93 oz.	215
Jolt Energy Gum	1 stick	45
Extra-Strength Excedrin	2 tablets	130

STRUCTURES ON WIKIPEDIA, [HTTPS://EN.WIKIPEDIA.ORG/WIKI/CAFFEINE](https://en.wikipedia.org/wiki/Caffeine)

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