

Energy & Sports Drinks

Hydration and health concerns

Need a boost in your day? Need to optimize your workout? What about a can of Red Bull, Snapple Fire, Power House, Atomic Energy, or another energy drink? What about Gatorade, Powerade, Allsport, or another sports drink? Can any of these help? Do these products really do what they claim? Or should I just drink water?

This issue of *HealthHints* will take a look at what's inside of these beverages and how they can help and/or harm. We will use the term "energy drink" to represent highly caffeinated drinks that may also contain other stimulants, amino acids, vitamins, minerals, and herbs and claim to increase mental and physical stamina and alertness, such as Red Bull. We will use the term "sports drink" to represent drinks that contain carbohydrates and electrolytes and claim to replenish the body's fluid and electrolyte needs after physical activity, such as Gatorade.

INSIDE

HEALTH HINTS...

Energy & sports drinks	1
Energy drinks	1
Caffeine & performance	4
Sports drinks	4
Want a sports drink without the price?	5
How much fluid is enough?	6
References	7

Energy Drinks

Arouse or a ruse? A boost or a bust?

You may have heard the claims of energy drink manufacturers: increased energy, metabolism, stamina, mental alertness, etc. Energy drinks include such brands as Red Bull, SoBe Adrenaline Rush, Snapple Fire, Blue Ox, Power House, Atomic Energy, and others. People consume energy drinks before workouts, when dancing all night (often mixing them with alcohol), or just as an afternoon pick-me-up.¹

"Energy drinks are meant to supply mental and physical stimulation for a short time."² The primary ingredients are usually:

- caffeine,
- taurine (an amino acid, one of the building blocks of protein), and
- glucuronolactone (a carbohydrate).²

Energy drinks may also contain:

- guarana, a South African plant that supplies a caffeine-like substance;
- other stimulants, like ginseng; and
- various other amino acids, vitamins, minerals, and herbs.¹

The question is, do energy drinks do what they purport? And why have Canada and some European countries banned some or all energy drinks? Here's what we know.



Caffeine is a well-known stimulant, so in reference to stimulating the central nervous system, energy drinks do have the ability to do this—giving your brain and body a boost for a period of time. Caffeine peaks in the system 1–2 hours after consumption. So, just like a cup of coffee, an energy drink can perk you up for a while and then the effect drops off.

The problem is, there are downsides to the use of energy drinks and potential dangers if these types of drinks are used improperly (overused or misused). That's why these products have been banned in some countries. Consuming too many energy drinks, mixing them with alcohol, and using them as sports drinks are of prime concern.

Problems may include:

- heart irregularities,
- nausea and vomiting, and
- electrolyte disturbances.²

At least one death has been reported among young athletes consuming energy drinks, notably Red Bull.^{1,3} The high levels of caffeine in these drinks are not suitable for children.¹ Children who increase their daily intake of caffeine with energy drinks could experience increased arousal, irritability, nervousness, or anxiety.⁴

Caffeine

"Individual responses to caffeine vary, and these drinks should be treated carefully because of how powerful they are."⁵ Energy drinks may contain as much as 80 mg of caffeine (the equivalent of an average-strength cup of coffee). This compares to 37 mg in Mountain Dew and 23 mg in Coca-Cola Classic. If caffeine makes you "jittery," the drinks may actually impair performance. High levels of caffeine can boost heart rate and blood pressure, causing palpitations. If we assume that energy drinks replace consumption of other sources of caffeine among non-pregnant adults, then safety concerns about caffeine consumption are minimal. However, adding large amounts of caffeine to current levels consumed could be of concern,⁴ considering it could cause increased blood pressure and heart irregularities. Pregnant women should use any source of caffeine cautiously and in modera-

tion (if at all) for the safety of themselves and their child.⁴

Alcohol

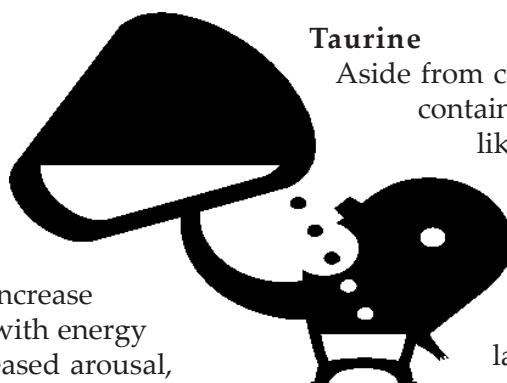
Mixing energy drinks with alcohol further increases the risk of heart rhythm problems.¹ The combination of effects could be dangerous since energy drinks are stimulants, and alcohol is a depressant. "The stimulant effects can mask how intoxicated you are and prevent you from realizing how much alcohol you have consumed. Fatigue is one of the ways the body normally tells someone that they've had enough to drink. The stimulant effect can give the person the impression they aren't impaired. No matter how alert you feel, your blood alcohol concentration (BAC) is the same as it would be without the energy drink. Once the stimulant effect wears off, the depressant effects of the alcohol will remain and could cause vomiting in your sleep or respiratory depression."⁵

Taurine

Aside from caffeine, most energy drinks contain healthful-sounding ingredients, like the amino acid taurine. Taurine is produced by the body on its own and is found in high concentrations in the heart. The problem is, we do not know exactly what it does.⁶ There is a lack of scientific evidence to support the safety of taurine present in energy drinks at concentrations that are several-fold higher than usually obtained from the rest of the diet.⁴ So, the addition of taurine to these products has unknown effects, if any.

Vitamins, minerals, & herbs

Energy drinks may contain various other compounds. A long list of vitamins, minerals, and herbs in a product does not ensure a healthful product. While these vitamins, minerals, and herbs are usually in such small amounts that they are unlikely to have any noticeable effect on performance,⁸ it is important to note that "excessive consumption of particular vitamins or minerals may reduce the bioavailability of other nutrients. Minerals like calcium, iron, and zinc are a good example, where excessive consumption of one can reduce the absorption of the others. Nutrients interact with each other, and good nutrition relies on a balance of all nutrients. This balance is difficult, if not impossible, to



achieve with excessive supplementation. Checking your intake against the recommended daily intake (RDI) is a good way to gauge how much extra you are taking in supplement form.⁷ Some herbs and vitamins also react negatively with medications. If you are taking prescription medications, always talk with your doctor before using any product with such compounds.

Carbohydrates

The final common ingredient in energy drinks is carbohydrates (starches and sugars). Energy drinks typically contain glucuronolactone—a carbohydrate found in plant gums, red wine, and sugar.

We think of carbohydrates in association with fueling muscle energy and balancing body chemistry after endurance exercise. Unlike sports drinks, which are formulated to supply optimal amounts of carbohydrates for endurance exercise, most energy drinks provide far beyond the carbohydrate level recommended for exercisers.

Consuming large quantities of carbohydrates, especially in hot weather, can compromise hydration by slowing the rate at which fluid is absorbed into the bloodstream; it can also be tough on the stomach, causing gastrointestinal distress or digestive difficulties.^{6, 8}

Do not use energy drinks for exercise hydration. In addition to large amounts of carbohydrates, it would likely take the average “weekend warrior” exerciser 15–20 minutes just to burn off the 110 calories of a single can of Red Bull.⁶

Wise consumers

While energy drinks may not be harmful if used in moderation, they should not be thought of as a “natural alternative” to a cup of coffee, soft drink, or sports drink. Claims of improved performance and concentration may be misleading. If you think of energy drinks as highly caffeinated beverages, you probably have a more accurate picture of these products.⁵ We don’t know how all the ingredients may act together, so consider what you are drinking, read the labeling, and be your own wise consumer when it comes to energy drinks.

To minimize health risks:

- Limit your consumption of energy drinks to no more than 500 mL, or two cans per day.
- Don’t mix energy drinks with alcohol.
- Rehydrate your system with water or an appropriately formulated sports drink after exercise or intense physical activity.
- If you have an adverse reaction to an energy drink, report it to your health care provider or a health care organization.⁹

For an extensive list of energy drinks and their ingredients, see the article “Energy drinks: Help, harm, or hype?” at http://www.gssiweb.com/reflib/refs/310/ENERGY_DRINKS_3-12-02.cfm.



Caffeine and Performance

In the past, researchers and nutrition experts cautioned against the ingestion of caffeine-containing beverages when engaging in physical activity because it was believed that the caffeine would have a diuretic or laxative effect. This would keep individuals from maintaining an adequate hydration status during bouts of physical activity and could lead to dehydration. More recent research, however, suggests that this may not be true for all individuals since some individuals seem to develop a tolerance for caffeine.¹⁰ For those individuals who tolerate caffeine without problems, drinking caffeine-containing drinks may not be a serious concern. Still, if you do not tolerate caffeine well or it seems to act as a diuretic or laxative, causing you to have to go to the bathroom more often or causing gastrointestinal discomfort, you may want to avoid its use before exercise. Caffeinated beverages are often carbonated; carbonation can also cause stomach discomfort during exercise in some individuals.



Caffeinated beverages are also poor choices for post-exercise hydration because they are not designed with optimal ingredients to rehydrate and balance electrolytes. They have high levels of carbohydrate, which can slow down fluid absorption. Caffeine has been noted as an ergogenic (i.e., performance enhancing) compound because it appears to perk up the central nervous system. Recent work reported 3–9 mg caffeine per kilogram of body weight 1 hour prior to exercise increased endurance running and cycling performance in laboratory tests.¹¹ Still, that's only 1–3 mugs of drip, percolated coffee, and these studies were employed with well-trained, elite, or serious recreational athletes. Negative side effects at the 9 mg level per kilogram body weight, however, were disconcerting.¹¹ Large amounts of caffeine have been banned for use by Olympic athletes. Thus, it is important to note that while caffeine can have performance-enhancing qualities, more is **not** better.¹² "For the average, active teenager or adult who is exercising with the goals of enjoyment and self-improvement, using caffeine defeats these purposes. Proper training and nutritional habits are more sensible and productive approaches."¹¹

Sports Drinks

To drink, or not to drink?

Energy drinks should not be confused with sports drinks. Sports drinks, such as Gatorade, Powerade, and Allsport, are formulated to supply optimal amounts of carbohydrates and electrolytes for endurance exercise, to help rehydrate, and to balance the body's chemistry.

What are carbohydrates?

"Carbohydrates are sugars and starches found in foods like breads, cereals, fruits, vegetables, pasta, milk, honey, syrups, and table sugar. Carbohydrates are the preferred source of energy for your body. Regardless of origin, your body breaks down carbohydrates into glucose

that your blood carries to cells to be used for energy. Carbohydrates provide 4 calories per gram... Your body cannot differentiate between glucose that comes from starches or sugars. Glucose from either source provides energy for working muscles."¹³

What are electrolytes?

"Electrolytes are nutrients that affect fluid balance in the body and are necessary for our nerves and muscles to function. Sodium and potassium are the two electrolytes most often added to sports drinks. Generally, electrolyte replacement is not needed during short bursts of exercise since sweat is approximately 99 percent water and less than 1 percent electrolytes. Water, in combination with a well-balanced diet, will restore normal fluid and electrolyte levels in the body."¹³ However, replacing electrolytes may be beneficial during continuous activity of longer duration, especially in a hot environment.¹³

Here are some guidelines that may help:

For exercise or physical exertion lasting less than 1 hour:

- Plain water works just fine and is cost effective.
- If the flavor of a sports drink is more appealing, that's fine to drink, too. Just remember, sports drinks are not calorie- or cost-free.

For extended periods of exercise or for physical exertion lasting 1 hour or more:

- Sports drinks containing carbohydrates and electrolytes help prevent dehydration and restore important minerals lost through perspiration, and they produce better hydration than water.¹⁴

If you know you will be doing vigorous physical activity, such as participating in a race, sports event, or football practice, it is recommended that you schedule hydration. The following schedule for fluid intake can help you maintain adequate hydration:

- Weigh yourself before the activity.
- Consume 2–3 cups of fluid about 2 hours before the event or practice.
- Consume 1 cup of fluid 15 minutes before the event or practice.
- Consume 1/2 to 1 cup of fluid every 15 minutes during the activity.
- Weigh yourself after the activity, and consume 2–3 cups of fluid for every pound lost.

Remember that during warm, humid days, sweat does not evaporate very quickly from your skin, making the need for scheduling hydration even more important. Cool beverages are the best choice, since they are absorbed better than warm beverages.¹⁵ If you have traveled to a new climate and are not acclimated to the heat, use the hydration guidelines above; have adequate sodium in your diet, and progress gradually in your exercise training to prevent heat cramps and dehydration.¹⁵

A properly formulated sports drink should contain 4–8 percent carbohydrates (about 10–19 g per 8-ounce serving, respectively), electrolytes (sodium and potassium), and water. Most sports drinks on the market are formulated to meet these criteria; however, all sports drinks are not created equal, so read the label to be sure you are getting the right balance.^{15,16} You may also want to read the label for the type of sugar used. Fructose as the primary source of sugar appears to be absorbed more slowly and may cause stomach distress in some people. Look for drinks that contain more glucose or sucrose, rather than fructose.¹⁵

Want a Sports Drink without the Price?

Here's a recipe for a homemade sports drink that will work as effectively as store-bought drinks, but it costs a lot less:

4 tablespoons sugar
1/4 teaspoon salt
1/4 cup boiling water
1/4 cup orange juice OR 2 tablespoons lemon juice
3 3/4 cups cold water

In the bottom of a pitcher, dissolve the sugar and salt in the boiling water. Add the juice and cold water; chill. Makes 1 quart.

Each 8-ounce glass of this sports drink contains 12 grams of carbohydrate (5 percent glucose), provides 55 calories, and costs about 7 cents to make. A typical store brand may cost about 28 cents per 8-ounce glass.¹⁷



How Much Fluid is Enough?

Getting adequate hydration

During physical activity, fluids are lost through the skin as sweat, through the lungs during breathing, and in the urine. Replacing those fluids is important when engaging in any type of physical activity, whether it is mowing the lawn, playing a game of soccer, or participating in a 10 mile run. Experts agree that consuming adequate fluids before beginning a physical activity is a must. In addition, consuming fluids throughout physical activity is very important.

So how do we know if our bodies are adequately hydrated? “Don’t rely on thirst as an indicator of your body’s need for fluids. By the time you’re thirsty, you’re already dehydrated!”¹⁵ In fact, as we age, thirst becomes an even poorer indicator of the body’s fluid needs; so adequate fluid replacement is especially important as we get older.¹⁸

The most reliable indicator of hydration status is your urine. “If your urine is dark and there’s not much of it, you’re dehydrated and should increase your fluid intake. Drink fluids until your urine is pale yellow/clear and plentiful. In general, drink as much fluid as you can comfortably tolerate both before, during, and after exercise. Frequently drinking small amounts usually works better than drinking a large amount once or twice.”¹⁵

If you are physically active for a duration of 1 hour or more, a cool drink of water may feel satisfying, but “water ‘turns off’ your thirst before complete rehydration occurs. Water also turns on the kidneys prematurely so you lose fluid in the form of urine much more quickly than when drinking a properly formulated sports drink. This is because the small amount of sodium in a sports drink like Gatorade—no more than what is in an equal size glass of milk—allows your body to hold onto the fluid you consume rather than losing it through urine.”¹⁶ So, if you are participating in longer

durations of physical activity, you might want to choose a sports drink or salted snack before the activity. Note: If you have high blood pressure or other medical conditions requiring you to limit your sodium (salt) intake, consult your physician before using sports drinks or other salted foods.

“If you start an exercise session well hydrated, you’ll go a long way towards maintaining performance and personal safety,”¹⁵ whether you exercise for 20 minutes or 2 hours. Stay safe—stay adequately and appropriately hydrated.

If you are not physically active, you still need to stay hydrated, especially in warm weather. “In normal temperatures, the average sedentary person should drink at least 8 glasses of non-caffeinated, non-alcoholic beverages daily. Warm weather and exercise place even higher demands on the body for fluid.... Water is a great beverage choice, but fruit juices, smoothies, seltzer waters, lemonade, soft drinks, milk, and herbal teas are also good.”¹⁵

Note: Like most things done to an extreme, you will want to avoid over-consumption of sports drinks or water.

Abuse of sports drinks may result in adverse effects. One case of potassium-induced ventricular arrhythmia has been reported in a football player who consumed about 5 grams of potassium per day of a hydrosaline drink.¹⁴

Overuse of water can result in hyponatremia, a rare condition where too much water actually dilutes the body’s sodium levels.¹⁸ Water and sports drinks, however, are not dangerous when consumed as recommended—in volumes approximating sweat losses.¹⁸



Did you know?

Sports drinks were first designed for use by the University of Florida’s football team—the Gators—to prevent cramping and dehydration caused by hot weather and physical exertion.¹⁴ Hence, the name Gatorade was given to the drink.

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Texas Cooperative Extension
Attn: Janet M. Pollard
2251 TAMU
College Station, Texas 77843-2251