Author: Kevan Beth Meadors, MD // Editor: Larissa Velez, MD

Energy Drinks and their Potential Toxic Side Effects

One of the more trendy and controversial toxicology topics is the increasingly common consumption of energy drinks and their potential toxic side effects. Red Bull™, one of the earliest and most popular brands on the market, was first introduced in Austria in 1987 and spread to the US in the 90s. Since then, several other brands have become tough competitors, including Monster Energy™, Rock Star Energy™, and 5-Hour Energy™.

Energy drinks can **circumvent the FDA's caffeine limitations and other regulations by being marketed as a dietary supplement**. Dietary supplements are not under the FDA's purview. Drinks marketed in this manner do not require a pre-market approval for their active ingredients, including their additives such as taurine, guarana, and glucuronolactone. They must comply with the Dietary Supplement Health and Education Act of 1994, which has notoriously lax regulations compared to the Nutrition Labeling and Education Act of 1990 that conventional foods are under. They also are only required to list "Supplemental Facts" on their label rather than the "Nutrition Facts" that most of us are accustomed to.

Below is a table that compares the brands previously mentioned and their ingredients.

Energy Drink	Caffeine	Taurine	Guarana	Glucuronolactone
Red Bull (16 oz)	151 mg	1.93 g	-	-
Monster Energy (16 oz)	140-160 mg	2 g	5 g "Energy Blend"	5 g "Energy Blend"
Rock Star Energy (16 oz)	240 mg	2 g	400 mg	Unlabeled
5-hour Energy (~2 oz)	200 mg	1870 mg "Energy Blend"	-	1870 mg "Energy Blend"
1 Cup of Coffee (~8 oz)	~90 mg	-	-	-
Coca-Cola Can (8 oz)	23 mg	-	-	-

Due to loose labeling regulations, some brands group additives together and disclose amounts as a "blend" which prevents consumers from knowing specific amounts of each additive. Also, there are some additives in the ingredients list that do not have amounts reported. The dashes in the table above represent that the specific energy drink listed does not include that additive in its recipe.

Some non-specific clinical manifestations of energy drink toxicity are as follows: **nausea, vomiting, diarrhea, nervousness, restlessness, tremors, insomnia, anxiety, headache, tachycardia, hypertension, dehydration, chest pain, psychosis, seizures, cardiovascular instability and potentially death**. These symptoms are consistent with

caffeine toxicity. How to manage these patients who present to the emergency department with similar symptoms and a history of energy drink usage are listed: **ABCs; labs including BMP to assess for renal failure; CK to rule out rhabdomyolysis; glucose if concern for hypoglycemia; EKG / cardiac enzymes if cardiovascular symptoms are present**. Benzodiazepines should be the first line agent for seizures. A head CT or other diagnostic tests could be warranted with appropriate symptoms e.g. altered mental status / obtunded, focal findings, seizure, etc. And as always, call your friendly Poison Center (1-800-222-1222) if ever unsure about the toxicity or management.

References:

1. Proposed actions for the US Food and Drug Administration to implement to minimize adverse effects associated with **energy drink** consumption. Thorlton J, Colby DA, Devine P. Am J Public Health. 2014 Jul;104(7):1175-80. doi: 10.2105/AJPH.2014.301967. Epub 2014 May 15. http://web.a.ebscohost.com.foyer.swmed.edu/ehost/pdfviewer/pdfviewer?sid=910933e5-e9b9-4c38-a85b-0a00b2d4aa71%40sessionmgr4005&vid=1&hid=4112
2. **The Truth About Energy Drinks**. **Denise Webb, *Today's Dietitian*. Vol. 15 No. 10 P. 62**http://www.todaysdietitian.com/newarchives/100713p62.shtml
3. Red Bull Website: http://energydrink-us.redbull.com/caffeine-red-bull
4. Seattle Times: http://seattletimes.nwsource.com/news/health/links/energydrinkchart10.pdf