

Risks of energy drinks examined

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“Energy drinks could be dangerous for children and teenagers,” *The Daily Telegraph* has reported. The newspaper said that the use of high-caffeine drinks has been linked to “seizures, mania, stroke and sudden death”.

The news is based on a study that gathered scientific, medical and government literature from around the world to examine the use of energy drinks by children and young adults. The report said that the drinks have been linked to adverse effects, including confusion, rapid heartbeat, seizures and even death. However, due to limited information available it is not clear how common these problems are among young people who consume energy drinks. The authors of the review warn that certain young people, such as those with cardiac problems or seizure disorders, might be particularly vulnerable.

Overall, the review raises potential issues regarding energy drinks. The UK Food Standards Agency advises that “children, or other people sensitive to caffeine, should only consume in moderation drinks with high levels of caffeine”.

Where did the story come from?

The study was carried out by researchers from the University of Miami and was funded by the US National Institutes of Health. It was published in the [peer-reviewed](#) medical journal *Pediatrics*.

The Daily Telegraph provided a reasonable account of this research.

What kind of research was this?

This was a review of the evidence about energy drink consumption in children, adolescents and young adults. The researchers were interested in the contents of these drinks, how commonly they were drunk by young people and the effects of drinking them, including any adverse effects.

The researchers defined energy drinks as those containing caffeine, taurine, vitamins, herbal supplements and sugar or sweeteners that are marketed to improve energy, weight loss, stamina, athletic performance or concentration. They said that, although healthy people can tolerate moderate caffeine intake, heavy caffeine intake has been associated with some serious adverse effects such as seizures, strokes and sudden death. They also said that reports in the media and a small number of case studies have associated these types of adverse effects with the use of energy drinks, warranting their further investigation. They suggested that children with certain conditions, such as cardiovascular disease or diabetes, may be at greater risk of adverse effects.

The researchers also said that, although the US Food and Drug Administration (FDA) regulates the amount of caffeine in soft drinks such as colas, it does not regulate the amount in energy drinks.

What did the research involve?

The researchers carried out a search of the PubMed medical literature database for studies on energy drinks, and also used Google to identify further articles. They also looked at manufacturers' websites for product information.

They classified the information identified based on its source and study design (if applicable). They used the information to:

- define what energy drinks are
- assess data on the consumption of energy drinks by children, adolescents and young adults
- identify caffeine and energy drink overdose data
- examine how the body is affected by the ingredients in energy drinks
- identify potential problems of energy drinks among children and adolescents
- assess the marketing of energy drinks
- report current regulation of energy drinks
- propose educational, research and regulatory recommendations

What were the basic results?

The researchers identified 121 sources of information that were relevant to their review. This included 81 articles in the scientific and medical literature, 10 government agency reports, three interest groups and 27 pieces in the popular media.

Studies identified

In the scientific and medical literature, the researchers identified no [systematic reviews](#) of energy drinks and no [randomised controlled trials](#) looking at their effects. They identified:

- 46 general review articles or perspectives on various topics relating to energy drinks
- 16 experimental studies looking at, for example, the cognitive and physiological effects of energy drinks
- 2 [cohort studies](#) looking at caffeine and sleep patterns in children and caffeine exposure in children, adolescents and young adults
- 4 surveys looking at consumption of energy drinks and knowledge of caffeine effects among doctors
- 8 case reports of adverse effects after energy drink consumption
- 5 basic science studies in animals and humans

Ingredients of energy drinks

The review distinguished between energy drinks, enhanced/fortified vitamin waters and sports drinks that are intended to rehydrate the body after intense exercise. Based on product information, they found that the energy drinks often contained high levels of caffeine. They described caffeine and other common ingredients of energy drinks, whether they had any therapeutic uses in clinical medicine, any purported benefits of these ingredients in energy drinks, and any adverse effects related to excessive dosage of these ingredients. Common ingredients included:

- caffeine
- guarana (a plant extract that contains caffeine and other compounds)
- taurine
- L-carnitine
- ginseng
- yohimbine

The researchers reported that taurine and guarana were generally considered safe by the FDA, while the other ingredients have been associated with adverse effects at high doses, including nervousness and anxiety (caffeine), stomach upset or diarrhoea (caffeine, L-carnitine, ginseng), seizures (caffeine, L-carnitine), and vascular adverse effects such as rapid heartbeat or altered blood pressure (caffeine, ginseng, yohimbine).

They also described various medications which might interact with the ingredients of energy drinks. For example, they reported that ginseng affects bleeding time and should, therefore, not be used with the anticoagulant warfarin.

Use of energy drinks by young people

According to the researchers, surveys found that about 30-50% of adolescents and young adults reported drinking energy drinks.

Energy drink and caffeine overdoses

The authors said that up until recently, US poison centres did not specifically track overdoses related to energy drinks, instead recording caffeine overdoses without specifying sources. They found that 5,448 caffeine overdoses were reported in the US in 2007, and that almost half of these (46%) occurred in people under the age of 19 years old. They say that Germany, Ireland and New Zealand have recorded energy drink related events in recent years:

- Figures were not reported for Germany, but the types of events reported included liver damage, kidney failure, seizures, heart rhythm problems and death.
- Ireland's poison centre reported 17 energy drink adverse events from 1999 to 2005, including confusion, rapid heartbeat (tachycardia), seizures and two deaths.
- New Zealand's poison centre reported 20 energy drink/energy shot related adverse events from 2005 to 2009, with 12 cases referred for treatment of vomiting, nausea, abdominal pain, jitteriness, tachycardia and agitation.

The review did not make clear whether all these events were in children and young people, or whether the individuals involved had underlying health problems. The New Zealand events were associated with caffeine levels ranging from 4mg/kg bodyweight (200mg total) in a 13-year-old with jitteriness to 35.5mg/kg bodyweight (1,622mg total) in a 14-year-old. According to the Food Standards Agency, a mug of instant coffee might typically contain 100mg of caffeine and a typical small can of energy drink might contain 80mg.

The review also described a sample of adverse events reported in association with energy drinks. These cases included 11 people described as having adverse events in journal articles (age ranging from 25 years to 47 years), 12 young people (middle- and high-school students) described as having adverse events in newspaper articles, and six people described as having adverse events in online news or other sources (4 teenagers, one 28-year-old and one 47-year-old). Some of these individuals had pre-existing medical conditions such as heart conditions, diabetes or psychiatric illnesses. The adverse events varied, and included seizures, delusions, cardiac problems, gastrointestinal problems, as well as two deaths. It is not clear whether the cases described from the different sources (including the poison centre reports) overlapped, or if individual cases were selected for presentation in the review.

Potential risks associated with energy drinks

The researchers listed various potential problems of energy drinks among children and adolescents, including:

- cardiovascular events (high doses of caffeine may have an adverse effect on heart conditions that prohibit the use of stimulants)

- possible effects on children and adolescents with attention deficit hyperactivity disorder (ADHD) or eating disorders
- effects on calorie intake and diabetes
- effects on bone mineralisation

Regulation of energy drinks

The researchers found that several countries and states have debated or restricted the sales and advertising of these drinks. For example, they reported that the UK's Committee on Toxicity investigated Red Bull and determined that it was safe for the general public, but that children younger than 16 years old or people sensitive to caffeine should avoid drinks with high caffeine content.

How did the researchers interpret the results?

The researchers concluded that many ingredients in energy drinks are understudied and not regulated. They suggest that reports of adverse events associated with energy drinks, current knowledge about the substances in them and the information we have yet to discover about them "raise concern for potentially serious adverse effects in association with energy-drink use".

They say that paediatricians should be aware of the potential effects of these drinks in certain vulnerable groups, and screen these groups for their use of these drinks to educate them of their risks. They also suggest that long-term research is needed to assess the effects in at-risk groups.

Conclusion

This review highlights the potential for adverse effects of energy drinks, particularly among certain vulnerable groups. There are a few points to note:

- Much of the available information on energy drinks is from physiological and experimental studies, and individual reports of people who drank energy drinks and experienced an adverse event. It is difficult, based on this type of report, to gauge exactly how common these adverse effects are.
- The review did not provide much detail about the underlying studies. Therefore, it was not possible to judge their quality.

Overall, the review raises potential issues regarding energy drinks. Further research, as called for by the authors, could help clarify the extent of any risks. The UK Food Standards Agency advises that "children, or other people sensitive to caffeine, should only consume in moderation drinks with high levels of caffeine".

- [View article: 'Health Effects of Energy Drinks on Children, Adolescents, and Young Adults.'](#)

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