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Combining energy drinks and alcohol

A recipe for trouble?

Background

Combining energy drinks (such as 'Red Bull®') with alcohol is becoming increasingly popular, particularly among young people. However, as yet, limited research has been conducted examining the harms associated with this form of drinking.

Objective

To review current evidence associated with combining energy drinks with alcohol and provide recommendations for addressing this issue within primary care.

Discussion

Combining alcohol with energy drinks can mask the signs of alcohol intoxication, resulting in greater levels of alcohol intake, dehydration, more severe and prolonged hangovers, and alcohol poisoning. It may also increase engagement in risky behaviours (such as drink driving) as well as alcohol related violence. General practitioners should be aware of the harms associated with this pattern of drinking, and provide screening and relevant harm reduction advice.

Keywords: carbonated beverages; alcoholic beverages; adolescent; young adult; caffeine; taurine; guarana; glucuronolactone



Energy drinks, such as 'Red Bull®' and 'V', are beverages that are designed to provide a boost of energy or enhance alertness.^{1,2} Red Bull® was the first energy drink to be released and was introduced into Europe in 1987. Since then, the number of available energy drinks has increased to over 500 brands worldwide,³⁻⁵ with sales exceeding \$500 million per annum in the United States of America.⁶

What are the ingredients in energy drinks?

The main ingredients in energy drinks are caffeine, guarana, taurine and glucuronolactone (*Table 1*).

Caffeine

Caffeine is a central nervous system stimulant. A standard 250 mL energy drink contains 85 mg of caffeine, which is equivalent to the amount of caffeine found in an average cup of coffee.^{1,4} Alarming however, some energy drinks contain up to 500 mg of caffeine per serve.⁵ It has been suggested that energy drink companies include natural ingredients, such as guarana, yerba mate and coca leaf, to exceed the legal caffeine content limit,⁴ which in Australia is 320 mg/L.⁷

Guarana

Guarana is a herbal substance extracted from a South American climbing plant of the maple family, Sapindaceae. It has long been used by Amazonians to increase alertness and energy. Guarana contains around twice the caffeine found in coffee beans. Guarana is more slowly absorbed into the gastrointestinal tract and thus is said to have a longer lasting effect than caffeine sourced from coffee beans.³

Taurine

Taurine is an amino acid which modulates cardiac and skeletal muscle contractility. Taurine is naturally produced in the body, but nearly all commercially available taurine is chemically synthesised. There is some evidence that taurine improves brain function and



Table 1. Ingredients in energy drinks

In a typical 250 mL energy drink you will find:

- 80–300 mg caffeine (which may be derived from pure caffeine, guarana and/or other natural sources of caffeine such as yerba mate)
- Up to 1000 mg taurine
- 60 mg glucuronolactone
- Up to 40 g sugars (glucose/sucrose)

You might also find:

- B group vitamins
- Ginseng (a herb also noted to boost energy)
- Ginkgo biloba (a natural ingredient noted to have antidepressant properties)
- L-Carnitine (an amino acid that helps improve energy levels)
- Creatine (a source of protein)

exercise performance, as well as lowering blood pressure. It is estimated that the daily intake of taurine in humans is between 40 and 400 mg. Some energy drinks contain more than 10 times the average person’s suggested daily limit of taurine.³

Glucuronolactone

Glucuronolactone is a naturally occurring metabolite formed from glucose. It is thought to fight fatigue and provide a sense of wellbeing. In some energy drinks, the amount of glucuronolactone is more than 250 times the amount found in other food sources.³

What are the health consequences associated with energy drinks?

Health problems associated with energy drinks relate to excessive caffeine intake, particularly in people consuming more than 200 mg of caffeine daily. Symptoms of excessive caffeine consumption (or poisoning) include insomnia, nervousness, headache, nausea, vomiting, tachycardia and palpitations.⁸ In large amounts, guarana is associated with many of the same adverse effects as caffeine, including insomnia, tremors, anxiety, palpitations, urinary frequency and hyperactivity.³ While taurine and glucuronolactone are not necessarily harmful when consumed alone, there is insufficient data regarding their potential synergistic effects with one another, or with caffeine and guarana.^{3,5,9}

Between 2004 and 2006, there were 41 reported cases of adverse reactions from energy drinks in the USA. Common symptoms included nausea/vomiting, tachycardia, hypertension, agitation, tremors, dizziness and chest pain.⁵ In some cases, energy drink consumption has been associated with death.⁸ This is most often in the context of consumption during or after sport. Red Bull® was banned in France after the death of an 18 year old male who died as a result of playing basketball after consuming four cans of Red Bull®. Red Bull® was also banned in Denmark, although the ban has recently been revoked.³

Mixing energy drinks with alcohol – a recent trend

There is increasing evidence that a greater proportion of young people around the world are using alcohol in combination with energy drinks, particularly in licensed venues.^{2,9–11} While energy drinks are typically combined with vodka or Jägermeister (known as ‘jagerbombs’),^{4,10,12} a wide range of prepackaged alcoholic energy drinks have also recently hit the market.

Studies from Italy and the USA show that 25% of university students report in the past month, consumption of energy drinks in combination with alcohol.^{2,11} In an Italian study, 36% of students reported using alcohol and energy drinks more than three times in the past month.¹¹ Prevalence rates among young people in Australia are unknown, but 69% of regular ecstasy users surveyed as part of the Ecstasy and Related Drugs Reporting System report having previously combined alcohol with energy drinks. This sample of 756 ecstasy users from around Australia (with a mean age of 24 years) reported consuming an average of three energy drinks in their last session of use,¹³ which exceeds the recommended intake of two energy drinks per day.⁷

Problems associated with mixing energy drinks and alcohol

There is a small but growing body of research highlighting the harms associated with combining alcohol and energy drinks (Table 2).^{2,3,9,10,14} These studies identify three main harms associated with mixing alcohol and energy drinks:

Table 2. What are the harms of mixing energy drinks and alcohol?

Reduced sensitivity to the signs of alcohol intoxication, thereby increasing the likelihood of:

- alcohol poisoning
- impaired judgment leading to:
 - accidents (eg. stepping in front of traffic)
 - poor decision making (eg. driving while intoxicated)
 - risky behaviour (eg. risky sexual behaviour, violence)

Dehydration leading to:

- diarrhoea
- nausea/vomiting
- fatigue
- headaches
- increased heart rate
- muscle cramps
- more severe hangover (affecting subsequent work productivity and driving performance)

Mixed messages to the nervous system resulting in cardiovascular problems (eg. palpitations) and disturbed sleep



- energy drinks may mask the feeling of alcohol intoxication. This is likely to be associated with the stimulant effects of caffeine and guarana, but also taurine. Data from animal studies has shown that taurine may mask some of the effects of alcohol and possibly encourage greater consumption. Alcohol has also been noted to have a negative effect on taurine homeostasis in humans.³ Combining alcohol with energy drinks may enable greater levels of alcohol intake, which can lead to greater intoxication and even alcohol poisoning. Furthermore, greater levels of intoxication, but increased feelings of alertness, can create a false perception of actual impairment. This may lead to poor decision making and increased levels of risky behaviours, such as drink driving, sexual risk taking (such as engaging in unsafe sex) and violence.⁹ Greater alcohol consumption is also likely to lead to more severe and prolonged hangovers, which can result in absenteeism, poor work performance and impaired driving or operation of machinery¹⁰
- alcohol and energy drinks are both diuretics and hence dehydration is more likely. There have been a number of deaths associated with energy drink consumption after sport as a consequence of dehydration.³ Given that alcohol is likely to further exacerbate levels of dehydration, this poses a serious concern – particularly if these drinks are being consumed by young people who are dancing for long periods of time. Increased dehydration also has the potential to exacerbate the effects of a hangover, and lead to greater impairment the day after consumption of these drinks
- mixing stimulants with depressants sends mixed messages to the nervous system. High levels of caffeine are likely to raise one's heart rate and blood pressure, while the depressant effects of alcohol are likely to have the opposite effect. Recent research among young alcohol and 'party drug' users¹⁵ found that increased heart rate and palpitations were the most frequently reported adverse effects associated with alcohol and energy drink consumption, along with sleep disturbance.

What don't we know?

Although limited research examining the prevalence and harms associated with combining energy drinks with alcohol has been conducted in North America and Europe, no such research is currently available within the Australian context. There is currently no Australian data available on the relationship between energy drinks and alcohol, nor their potential link with intoxication, violence, risk taking, lost productivity, injury and hospital attendance. We also do not have any local or international research available regarding the social and cultural contexts of energy drink and alcohol consumption. Indeed, little is known about the self perceived benefits of combining these beverages, nor in what ways, amounts, patterns, frequencies and locations they are being used.

Implications for primary care

Screening

It is important that general practitioners are aware of the harms associated with excessive energy drink consumption, particularly when used in combination with alcohol. Patients may not be aware that consuming energy drinks is associated with any level of risk, or increase in alcohol related harm. Indeed, many young people are unlikely to know how much caffeine is contained within a standard energy drink, nor be aware of recommendations regarding safe levels of daily caffeine consumption or the potential consequences of consuming high doses of guarana, taurine and glucuronolactone. As a consequence, they may report their level of alcohol consumption but not consider any concurrent energy drink use to be relevant to a health practitioner. It is therefore essential to prompt for this information.

Even among patients who are not presenting with issues relating to alcohol or energy drink consumption, any opportunity to enquire about such habits will be useful. A range of screening tools have been validated for the identification of risky alcohol consumption within primary care settings. The most widely used is the Alcohol Use Disorders Identification Test (AUDIT),¹⁶ a 12 question screening tool that can be delivered in less than 5 minutes. Shorter screening options include the Fast Alcohol Screening Test (FAST),¹⁷ which consists of four questions, and the Single Alcohol Screening Questionnaire (SAS-Q),¹⁸ which has only one question. Adding an additional question to these screening tools, such as 'How often do you drink energy drinks with alcohol?' might be a useful way of screening for this behaviour.

Harm reduction information

Any interaction with a young person within the primary care setting provides an opportunity to raise awareness regarding the potential harms of combining energy drinks with alcohol, as well as providing useful harm reduction messages. Relevant harm reduction information includes:

- awareness of the dangers of consuming more than 200 mg caffeine daily. For this reason, it is recommended that no more than two standard energy drinks are consumed daily (with or without alcohol)
- awareness of the masking effects of energy drinks on alcohol intoxication (which may lead to greater alcohol consumption and poor decision making), including warning against driving even if they do not feel impaired
- awareness of the risks associated with dehydration (including nausea, diarrhoea, headaches and fatigue)
- awareness of the risks associated with combining stimulants and depressants (including mixed messages to the central nervous system).

Conclusion and recommendations

Although limited, there is growing evidence of harms associated with excessive consumption of energy drinks (both in isolation and in combination with alcohol). However, there are currently limited



warnings concerning the harms associated with the combined use of these beverages on prepackaged alcoholic energy drinks. Given the dearth of Australian studies examining alcoholic energy drink consumption, investment in research that explores the patterns and harms associated with such use is urgently required.

In this case, it is worth considering a precautionary stance, recommending that new products combining alcohol and energy drinks demonstrate safety at likely consumption levels before being allowed onto the market. In the meantime, GPs should discuss energy drink consumption with patients and recommend limiting their use (up to two serves per day).

Summary of important points

- International epidemiological data show that the combination of alcohol with energy drinks is popular, particularly among young people.
- Limited Australian research has been conducted examining this phenomenon.
- Energy drinks contain high levels of caffeine, guarana, taurine and glucuronolactone.
- The combination of alcohol with energy drinks is likely to increase the risk of harms associated with consuming either beverage in isolation.
- It is important to specifically ask patients about their energy drink consumption, particularly in instances where they are presenting with issues related to alcohol.
- GPs are well placed to raise young people's awareness of the harms associated with excessive energy drink consumption (in isolation or in combination with alcohol).

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