IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals

Short Communication

November 2019 Vol.:16, Issue:4

Positive and Negative Effects of Energy Drinks

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Jun Kobayashi*[1], Keiichi Ikeda[2]

[1]Faculty of Nutrition, University of Kochi, 2751-1 Ike, Kochi, Kochi 781-8515, Japan; [2]Faculty of Pharmaceutical Sciences, Hokuriku University, 3 Ho, Kanagawa-machi, Kanazawa, Ishikawa 920-1181, Japan

Submission: 25 October 2019

Accepted: 30 October 2019

Published: 30 November 2019

Keywords: Energy drink, Caffeine, Poisoning, Nutritional drink

ABSTRACT

There is a discrepancy between the intended purpose of energy drinks and their actual usage. Energy drinks are edible foods but are but not healthy, so there should be no special health effects of these drinks other than the intake of water and nutrients. However, due to overdose by consumers who misrecognized some of the intended purposes of energy drinks, there have been reports of poisoning and deaths. In the article, we discuss the positive and negative effects of energy drinks and share our suggestions on their safe consumption.

HUMAN JOURNALS

www.ijppr.humanjournals.com

INTRODUCTION

In Japan, nutritional drinks intended for combating physical fatigue; in addition, they serve nutritional supplements[1]. Many brands of such energy drinks are sold in Japan and other countries. Table 1 shows the typical examples of energy drinks[2]. These energy drinks are classified as foods (soft drinks) but are not medicines or healthy foods. Therefore, the benefits of these drinks would be nothing other than intake of water and nutrients. Since energy drinks are soft drinks, their consumption is desirable appeal in terms of the taste, aroma, and throat like juice. However, the term "energy" (reminiscent of power, vigor, and vitality) may be expected to be as effective as or better than nutritional drinks. There are no restrictions on the dosage and use of such energy drinks, and they are readily available on the market. There have been many reports on the adverse effects of the excessive intake of these drinks. Some cases of poisoning and deaths are attributed to one of the ingredients of the drinks, caffeine. In the article, we confirm the intended purpose and use of energy drinks, followed by suggestions for their safe and appropriate consumption.

Intended Purpose of Energy Drinks and Interpretation by the General Public

The possible effects of energy drinks are listed below.[2]

1) Fatigue recovery: Drink when you work overtime or suffer physical fatigue due to exercise. It is considered that the main ingredients of energy drinks are derived from caffeine and branched-chain amino acids (BCAA; valine, leucine, and isoleucine).

2) Relief from eye strain: Concentration tends to decline when the eyes get tired from desk work. It would be beneficial to consume energy drinks in such cases (nutrients are derived from the B group vitamins, vitamin C, and vitamin A).

3) Suppression of sleepiness during driving: Recommended if you prefer to complete your work even if you need to stay up all night (the main ingredients are caffeine and glucose). 4) Energy supplement before exercise: Generates energy for exercising; ingestion of liquid nutrients instead of solids is thought to be fast and effective.

5) Energy supplement after exercise: For quick muscle recovery, BCAA needs to be consumed rapidly at a high concentration, and for this reason, a highly concentrated amino acid drink is effective.

6) Improvement of male reproductive function: In order to ensure constant blood flow in the corpus cavernosum, supplementation with arginine is necessary. However, these are associated with advertisements and the consumer may just think.

A few academic reports have stated that energy drinks have certain positive effects[3]. The caffeine content in these drinks has long been thought to be beneficial for athletic performance, and until 2003, caffeine was included in doping drugs during international sports events such as the Olympics. Many athletes still consume caffeine with coffee before the competition[4]. In a 2010 paper, it was reported that caffeine ingestion can lead to fatigue reduction and arousal in a short time[3]. A 2014 study conducted on teenage basketball players reported that their muscle strength, endurance, and jumping ability had improved upon caffeine intake[3]. In 2018, there was a report that the exercise performance improved upon consuming an energy drink before aerobic exercise, which was thought to be mainly due to caffeine[5].

The reasons for the small number of studies on the effects of energy drinks are as follows: a) the ingredients of many general foods are difficult to study; b) an energy drink is a food, and even if its effects are examined, it is difficult to obtain an evaluation that is superior to the medicinal ingredients (already known for efficacy) in the content (Although there is addictiveness among the components, but there is no synergy); c) excessive intake of energy drinks may lead to problems because of the well-known high sugar content and the side effects of fat-soluble vitamins such as vitamin D, unlike the case of water-soluble vitamins such as vitamin B. Since energy drinks are not medicines or healthy foods, their beneficial effects on health cannot be guaranteed.

Areas Where Energy Drinks are regarded as a Problem

There is widespread opinion among the public that energy drinks are solely harmful. One reason for this concern is that energy drinks contain a different class of ingredients than other drinks[6]. In some cases, only a very ineffective ingredient is added, or numerous active ingredients are added (this can also cause side effects). Consumers may be influenced by the placebo effect of these components. Although energy drinks may be consumed along with other foods, the synergistic effect has not been investigated. In Japan, ingredients in food are evaluated individually. Foods for specified health benefits (only some healthy foods) are evaluated as medicines for their effects and side effects (Table 2).

As shown in Table 1, the active ingredients in energy drinks include taurine, guarana, ginseng (medicinal carrot), vitamin B group, sugar, and caffeine[7]. Taurine is a natural amino acid and has a low content, so it is not expected to cause toxicity. There are reports that eye strain may be reduced. Guarana is a plant (*Paullinia cupana*) that grows in the Amazon basin, and its seeds are used as food. Most of its ingredients are caffeine-based, and it is not well understood if it has any other effect[7]. Even if the ingredient label contains only guarana (extract), it must be considered that caffeine is present (drink C in Table 1 must be considered to contain a large amount of caffeine). Medicinal carrot is a processed product that has long been thought to improve physical performance, concentration, and memory. However, since it can increase the rate of blood flow or circulation, continuous consumption of drinks containing medicinal carrot is not preferable as it may increase blood pressure. Group B vitamins are water-soluble and their deficiency leads to many ailments, but it can be said that the energy drink has little effect if meals are properly taken. Most of these vitamins are thought to be excreted as soon as they are absorbed by the human body. Urine may be densely colored due to these vitamins, but this is not a matter of concern[2]. Another concern is the high amounts of sugar present in each energy drink. Ingesting large amounts of sugar can cause severe damage to the body, such as diabetes. Most energy drinks contain about 30 g of sugar per can. Although most of the sugar-free energy drinks use artificial sweeteners, there is lack of clarity about the toxicity of the sweeteners, and they cannot be deemed harmless.

Most of the reported cases of toxicity are related to caffeine. The side effects of caffeine include increased motives and heart rate, arrhythmia, sleep disturbance (insomnia), dyspnea, dizziness, excitement, anxiety, trembling of limbs, headache, diarrhea, and nausea and vomiting caused by digestive organ irritation[8),9)]. Caffeine also leads to poisoning when consumed in large amounts[8)]. Due to resistance, the dose is increased until the desired effect is realized, resulting in side effects caused by overdose (excessive consumption of energy drinks). Some of these side effects contradict the positive effects of energy drinks, and in some cases, maybe life-threatening. The upper limit for the intake of caffeine alone is 400 mg per day[2)], which corresponds to 3−4 high-energy drinks. Furthermore, it has been found that blood concentration tends to increase when caffeine is used in combination with alcohol.

In addition, it is reported that the consumption of one or more energy drinks a week may lead to increased frequency of smoking and drinking[3)]. Another study found that groups that

regularly consume energy drinks showed higher stress, excessive anxiety, depression, and suicidal tendency[3].

CONCLUSION

Energy drinks are preferred by the public, possibly due to the caffeine content or placebo effect, and they can suppress drowsiness and give the feeling of fatigue recovery. There seems to be an effect that will excite and raise awareness. However, as mentioned before, it is important to understand the risk of overdose of these drinks. It is advisable to refrain from consuming more than the prescribed amount (usually, one drink) even if a strong effect is desired. Energy drinks are treated as food, but they are very harmful. In particular, caution must be exercised when intaking excessive amounts of caffeine. Therefore, dealers should be alerted, but at present, it is difficult for them to earn a living by selling food products. For this reason, consumers can purchase a large amount of energy drinks, which in turn leads to excessive consumption, and eventually, poor physical condition and addiction. In order to prevent overdose, it is necessary to limit the sale of energy drinks and increase consumer awareness regarding their possible side effects. A single dose of an energy drink may not cause any problem if the consumption is intended for a temporary effect. However, it is necessary to be cautious with continuous consumption so that it does not lead to dependence and side effects are prevented. If energy drinks are consumed for the primary purpose of realizing an effect, it is a necessary to do so under medical supervision. Drugs are safer because information about the side effects is well known. If energy drinks are consumed only for enjoying their taste, it is preferable to curb the amount of chemicals circulating in the bloodstream by combining the doses of the energy drink with other drinks. In addition, since there is really a combined effect are still unclear, it is necessary to pay sufficient attention to the components of these drinks, especially when used in combination with pharmaceuticals. As described above, energy drinks are foods having strong positive effects, and therefore, attention should be paid to their usage.

REFERENCES

1) Group-2? Group-3? Classification of nutritional drinks under the Pharmaceutical Affairs Law. Pintle-Nutrition drink specialty page, https://food-drink.pintoru.com/energy-drink/pharmaceutical-affairs-law-classification/ (browsed in August 2019).

2) Is energy drink really effective? Ingredient comparison, risk and side effects summary. Holiday Fan,

https://holidayfan.jp/energydrink/ (browsed in August 2019).

3) Takahiro Miki. The truth of <energy drinks are bad for the body>-overdose to "depression" and "heart disease". Excite, https://www.excite.co.jp/news/article/HealthPress_201801_post_3431/ (browsed in August 2019).

4) Takeshi Makino. A study of an effective product image for the student athlete -Focusing on energy drink. 2012 graduation thesis, School of Sport Sciences, Waseda University http://www.waseda.jp/sports/supoka/research/sotsuron2012/1K09B185.pdf (browsed in August 2019).

5) Natsuko Yukawa, Ayane Hiratsuka. Effect of energy drink intake in exercise performance. Abstracts of presentations of the Japan Society of Home Economics, 70th Annual Meeting, Held on May 25-27, 2018.

6) Jun Kobayashi, Mamoru Tanaka, Keiichi Ikeda. Types and problems for healthy foods distributed in Japan. Int. J Pharmacy Pharm. Res. 2018: 13(4): 205-212.

7) Patrick Allan. Is energy drink bad for people? Lifehacker, https://www.lifehacker.jp/2015/11/151117_energy_drinks.html (browsed in August 2019).

8) Did you drink too much energy drink? Use it well knowing the symptoms and quantity. Asagi's Life Blog, http://seikatublog-asagi.com/kennkoujyouhou/enaji-dorink/ (browsed in August 2019).

9) Hisashi Kuribara. Caffeine intake in the daily life -Mechanism of action and safety assessment. Bull. Tokyo Univ. Grad. Sch. Soc. Welfare 2016: 6(2): 109-125.

Table No. 1: Typical energy drinks and their contents

Energy drinks	Main contents (per 100mL)	Volume (mL)	Feature
A	32 mg caffeine, 120 mg arginine, 0.09 mg vitamin B_2, 3 mg niacin, 2 mg pantothenic acid, 2 mg vitamin B_6, 2 μg vitamin B_{12}	250	The most famous energy drink in Japan. More than 6 billion products sold worldwide. It is thought to be effective for muscle strengthening and improvement of reproductive function (mainly by arginine and caffeine).
B	40 mg caffeine, 125 mg arginine, 82 mg ginseng, 0.7 mg vitamin B_2, 8.5 mg niacin, 0.8 mg vitamin B_6, 1.6 μg vitamin B_{12}	355	An energy drink born overseas, as in A. Strong carbonic acid.
C	52.6 mg caffeine, 52.6 mg arginine, 52.6 mg guarana extract, 157.9 mg food fermented extract	190	An energy drink for women. A nutritious product with a lot of fruit extracts. It contains many vitamins (from fermented extract) as well as a large amount of caffeine (caffeine + guarana).
D	32 mg caffeine, 120 mg arginine, 0.11 mg vitamin B_2, 2 mg vitamin B_6, 2 μg vitamin B_{12}	250	A local energy drink originated in Shikoku, Japan. Yuzu fruit juice is used.
E	1 mg valine, 0.5 mg leucine, 11 mg aspartic acid, 9 mg niacin, 0.8 mg vitamin B_2, 0.8 mg vitamin B_6, 21 mg vitamin C	250	Does not include caffeine. Contains many amino acids such as BCAA.

Based on Reference 2) data.

Table No. 2: Side effect assessment of pharmaceuticals and foods

Products	Drug	Food	
Small classification		Healthy foods (foods for specified health, etc.)*1	Other foods
Target	Evaluation by product	By product	For each ingredient
Component	Substances that give effects (including additive and synergistic effects)	Substance that has an effect (Including additive and synergistic effects)	Food additives, etc. (Does not include additive / synergistic effects)
Examination by country	Yes	Some (functional labelled foods are checked by the manufacturer)	Yes
Simultaneous intake	Basically, do not take with food.	Do not take it with other foods at the same time.*2	There are many opportunities to take it at the same time as other foods.
Note	A lot of complex effects with other foods have been investigated.	Some of the combined effects with other foods have been investigated.	The complex effects between ingredients are not well understood (within the same food, between other foods).

Based on data from Reference 6) and Food Safety Commission.

*1: The effect confirmed by the country.

*2: Due to the nature of food, consume as it is.