Chemical and Biological Studies on some Types of Energy Drinks Using Experimental Animals

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Abstract

The present study investigated the effects of three types of energy drinks on the general health status of normal rats . Ninty Four adult male albino rats were divided into (7) groups (7 rats in each group). Group One was control which rats fed on basal diet , Group type1 (Redbull)fed on basal diet and were given by oral as 6 ml/rat, Group type 1 fed on basal diet and were given by oral as 12 ml/rat, Group type 2 (power Horse) fed on basal diet and were given by oral as 6 ml/ rat, Group type 2 fed on basal diet and were given by oral as 12 ml/rat , Group type 3 (Black) fed on basal diet and were given by oral as 6 ml\ rat , Group type 3 fed on basal diet and were given by oral as 12 ml/ rat . All groups fed basal diet and were given these energy drinks daily by oral during experimental period for 6 weeks . Blood samples collected after 12 hours fasting from scarified under ether ana esthesia at the end of experiment to determined serum triglycerides, total cholesterol, uric acid , urea (Kidney functions), GPT, GOT (Liver functions) and some Hormones . The obtained results showed that the energy drinks which used in that study effected dangerously on the healthy status of the tested rats by increasing lipid profile and decreasing the level of male hormones. So, it caused, by long period, many diseases as diabaticm, hypertension ,depression and dental problems.

Key words: Energy drinks –Redbull – Power Horse- Black- Caffeine - Taurine - Ginseng - Guarana .

Introduction

An energy drink is a type of beverage containing stimulant drugs, caffeine, which is marketed as providing mental and physical stimulation. They may or may not be carbonated and many also contain sugar or other sweeteners, herbal extracts and amino acids. They are a subset of the larger group of energy products, which includes bars and gels, and distinct from sports drinks, which are advertised to enhance sports performance. (Malik et al., 2006). Energy drinks may consist of various types of acids, which reduced the pH of the oral cavity. Some of these acids are tartaric acid, lactic acid, maleic acid and phosphoric acid (Tahmassebi et al.,2006). Other constituents of energy drinks such as caffeine and phosphoric acid may contribute to these effects (Margaret et al.,2009). According to Margaret et al. (2009),the definition of energy drink is not universal. It commonly refers to carbonated soda that could have a caloric or non caloric sweetener. It is usually those energy drinks with sweetening such as sugar or HFCS. The definition may be broadened to take account of noncarbonated sweetened beverages such as cordials, flavored mineral waters, ‘‘energy’’ drinks, ‘‘sports’’ drinks, iced tea , fruit juice drinks, and punches but not usually dairy-based beverages.

Caffeine has a similar chemical structure to that of adenosine allowing caffeine to attach to the adenosine receptors. The main mechanism of action of caffeine, in concentrations typically achieved after the consumption of a caffeinated beverage, is to act as an adenosine receptor blocker in the brain (Pettenuzzo et al., 2008). Caffeine also has a stimulatory effect on thermogenesis . In addition, caffeine consumption has also been linked to reducing food intake and to promote lipolysis in both animals and humans (Lopez-Garcia et al., 2006).

Taurine (2-aminoethyl sulfonic acid) is sulfur containing amino acid that is the most abundant amino acid found naturally in our bodies, primarily in the retina and skeletal and cardiac muscle tissues (Imagawa et al., 2009). Taurine is derived from the metabolism of methionine and cysteine (Stipanuk, 2004).

In the body, taurine undergoes mainly conjugation to form bile salts as well as degradation to sulfate. This metabolism allows for

larger dietary intakes of taurine, with excess eliminated unchanged in the urine (Munro and Renwick, 2006).

Guarana comes from the Paullinia cupana plant, indigenous to South America. It originated in the Amazon basin in Brazil, where it has had a long history of use (Angelo et al., 2008). It is commonly known for its small-berry like fruit it produces, which contains 1 to 3 dark seeds, which accounts for the only edible part of the guarana plant (Scholey and Haskell, 2008).

Ginseng is a herb that has been used for over 2000 years by people in East Asian countries including China, Japan, and Korea as a remedy for various diseases and for promoting longevity (Nam et al., 2005). Panax ginseng is the primary commercial species and is often referred to as Korean or Asian ginseng ; however, the root is the most prominent and dominates the commercial sales. The roots are typically not harvested until after the 5th or 6th year of growth when their ginsenoside concentrations are at their peak (Mahady et al., 2001).

L-Carnitine is an amino acid usually created by the liver and kidneys; it helps metabolism and energy levels. Because of the way it interacts with the body, it may act as a thermogenic and help increase weight loss and endurance during exercise. The need to supplement this amino acid is still not clear. D-Carnitine is "inactive" and may actually hurt endurance levels. Rare sides effects include nausea, vomiting, abdominal pain, and diarrhea (Kavita et al., 2008).

The use of high- intensity sweeteners has increased significantly over the past 20 years owing to the appearance, and acceptance, of new types in the market. The intense sweeteners are used in diet energy drinks. Saccharin; is the first intense sweetener to be used on a commercial scale.In 1983 aspartame and acesulfame K were approved in the energy drinks industry (aspartame in particular) as a replacement for saccharin as found byDavid and Philip , 2006.

Flavourings may be natural or artificial in nature. Some are used in the form of an emulsion. Artificial Vanillin is an example offlavours used in energy drinks The flavouring materials used consisted mainly of herbal/botanical extracts, for example, ginger, nettle, nutmeg, horehound, lemon, oil,vanilla etc. (Tahmassebi et al., 2006).

Food colours are broadly divided into two classes: Natural and artificial. The natural colours are botanical extracts, with the exception of carmine (a red colour).Artificial (synthetic) colours permitted in energy drinks to a maximum level of 100 mg/l. Colours were restricted to mainly variants of brown and red, that is, those which could be produced from caramel or cochineal.This remained the case until the introduction of synthetic aniline dyes around 1880 (David and Philip, 2006).

In addition to contributing to overall stability, such additives are also used, where appropriate, in energy drink formulations to impart stability to natural clouds, for example, dispersions of fruit solids and to improve mouth feel characteristics by increasing the viscosity of the drink (David and Philip, 2006).

According to Johnson et al.,(2007) ,the chronic consumption of large amounts of cola-based energy drinks may increased the risk ofchronic kidney diseases.Because cola energy drinks may contain large amounts of high-fructose corn syrup. Highly caloric carbonated energy drinks are often sweetened with high fructose corn syrup, which makes soda inexpensive to produce. Also,fructose itself may cause kidney damage, perhaps mediated by uric acid . Energy drinks have been hypothesised to increase the risk of gastric reflux and the risk of OesophagealAdenocarcinoma, but case–control studies have reported inverse or null associations with laryngeal or oesophageal cancers (Lagergren et al.,2006). So, This investigation studied the effect three types of energy drinks on the biological parameters of albino rats.

Material and Methods

A - Materials:-

The beverages used in this study were three types of energy drinks were collected from local market of Shebin El-Kom City, Menoufia governorate, Egypt. Production date November 2015 and used in November 2015.

Table (A) : The composition of energy drinks used in this study:-

Ingredients Nutritional information / 100ml	Type (1) Power horse	Type (2) Redbull	Type (3) Black (lime of mint)
Energy	191 kg/45 kcal	112.5 kcal	203J/ 47 kcal
Protein	0.0 g	-	-
Fat	0.0 g	-	-
Carbohydrates	10.7 g	-	113 g
Taurin	0.4 g	0.4%	0.4%
Caffeine	32.0 mg	0.03%	32.0 mg
Niacin	8.0 mg	8.0 mg	7.0 mg (44%)
Vitamin B6	2.0 mg	2.0 mg	1.4 mg (100%)
Pantothenic acid	2.0 mg	2.0 mg	1.98 mg (33%)
Riboflavine	0.06 mg	0 mg	0.5 Mg (20%)
Vitamin B12	2.0 mg	0.002 mg	-
Fibers	-	-	-
Sodium	-	-	0.1 g

Experimental animals:-

Fourty nine (49) adult male albino rats, average body weights ranged between (150±5 g) were used in this study. The rats were divided into 7 groups each one of them 7 rats. All groups of rats were housed in wire cages and fed on the basal diet during experimental period for 4 weeks

B - Methods:

Animals diet:-

The basal diet was prepared according to AIN (1993). The vitamin mixture was prepared according to Campbell (1963), while salt mixture was prepared according to Hegsted et al. (1941).

Experimental design and animal groups

Energy drinks were given by oral at the dose 6 and 12 ml daily twice a day for 6 weeks . Rats were weighted at the beginning of experimental then weekly and at the end of the experiment. Diet contained casein, cellulose, vitamins and salts were purchased from El-Gomhoria Company, Cairo, Egypt.

Group (1):Control negative group (C-ve), in which normal rats were fed on basal diet during experimental period for 6 weeks.

Group (2):Rats were given Type 1 (Red bull) as 6 ml / twice a day / rat by oral and feeding on basal diet during experimental period for 4 weeks**.**

Group (3): Rats were given Type 1 (Red bull) as 12 ml / twice a day / rat by oral and feeding on basal diet during experimental period for 4 weeks.

Group (4): Rats were given Type 2 (Power Horse) as 6 ml / twice a day / rat by oral and feeding on basal diet during experimental period for 4 weeks.

Group (5): Rats were given Type 2 (Power Horse) as 12 ml / twice a day / rat by oral and feeding on basal diet during experimental period for 4 weeks.

Group (6): Rats were given Type 3(Black) as 6 ml / twice a day / rat by oral and feeding on basal diet during experimental period for 4 weeks.

Group (7): Rats were given Type 3 (Black) as 12 ml / twice a day / rat by oral and feeding on basal diet during experimental period for 4 weeks.

Each of the above groups was kept in a single cage. Diet was given in non scattering feeding cups to avoid loss or contamination of food, water was provided to the rats by means of glass tubes projecting through the wire cage from an inverted bottle supported to one side of the cage. Energy drinks were given by oral. Rats were weighted at the beginning of experimental then weekly and at the end of the experiment.

Biochemical analysis:-

Serum glucose was determined according to Trinder(1969). Enzymatic colorimetric determination of triglycerides was carried out according to Fassati and Prencipe (1982).

Total cholesterol determined according to Allain (1974). Determination of HDL cholesterol was determined according to Lopez (1997). Determination of VLDL (very low density lipoproteins) and LDL were determined according to the method of Lee and Nieman (1996).

Serum Urea was determined according to the enzymatic method of Patton and Crouch (1977). Serum Uric acid was determined according to the enzymatic colorimetric test ofFossatti and Prencipe (1980). Serum Creatinine was determined according to kinetic method of Henry (1974).

Determination of GPT and GoT were determined according to the method of Henry (1974) and Yound (1975). Determination of (Hgb), PCV, MCV, WBC, RBC, platelet count, neutron philes, lymphocytes and monocytes were estimated according to the method described by Dacie and Lewis (1998).

Serum cytokines (serum IL1 was determined using ELISA kits according to the method of (Smith ,1988). Serum IL6 was determined using ELISA kits according to the method described by (Van Snick , 1990). Serum TNF was determined using ELISA kits according to (Maury ,1986).).

Determination of BMD (Bone mineral content) was calculated by BMC of the measured bone area (BA) according to Ohta's method (2002).

DNA extraction and detection of apoptosis (DNA fragmentation assay) were done according to "salting out extraction method" of Aljanabi and Martinez (1997) with some modifications by Hassab El-Nabi (2004).

Statistical analysis:-

The data were statistically analyzed using a computerized Costat program by one way ANOVA using a Completely Randomized Factorial Design (SAS, 1988) when a significant mean effect was detected, the means were separated with the Duncan's Multiple Range Test .Differences between treatments at $P \leq 0.05$ were considered significant. The results are presented as mean ± SD.

RESULTS :-

1 – Effect of different types of energy drinks for 6 weeks on biological parameters

A – Relative body weight gain (BWG%)

Data presented in Table (1) showed that the mean values of the body weight gain (BWG) for tested energy drinks groups were 12.07± 0.22, 23.07± 0.13, 14.22 ± 1.98, 29.49 ± 2.41, 15.31 ± 1.92 and 30.69 ± 1.22g , respectively, which were higher than that of control negative group (8.09 ± 0.12g

Table (1):Effect of different types of energy drinks (oral 6 and 12 ml / day / rat) for 6 weeks on relative body weight gain (BWG g).

Groups	BWG (g)
Control group	**8.09^{d} ± 0.12**
Type 1 (6 ml / twice a day / rat**)**	**12.07^{c} ± 0.22**
Type 1(12 ml / twice a day / rat)	**23.07^{b} ± 0.13**
Type 2 (6 ml / twice a day / rat**)**	**14.22^{c} ± 1.98**
Type 2 (12 ml / twice a day / rat)	**29.49^{a} ± 2.41**
Type 3 (6 ml / twice a day / rat**)**	**15.31^{c} ± 1.92**
Type 3 (12 ml / twice a day / rat)	**30.69^{a} ± 1.22**
LSD	**4.014**

Means in the same column with different litters are significantly different($P \leq 0.05$).

B -Feed intake (FI)

Data present in Table (2) showed that no significant differences in feed intake (FI) between control negative group which was 23.23 ± 0.34g/4 weeks and all type energy drinks groups at the level 6 ml /day , which being 23.83 ± 2.18, 23.29 ± 0.24, and **23.68 ± 0.07** g/4 weeks**.**

C - Feed efficiency ratio (FER

According to data present in the same table (2), feed efficiency ratio (FER) for control group was the highest group. These results denoted that there were significant decreases in feed efficiency ratio (FER) for all groups when compared with control negative group. The

lowest value of feed efficiency ratio (FER) was found in diet with 12ml type 3of energy drink group. There is no significant differences between type 1 and 2 at the dose 6 ml day

Table(2):Effect of different types of energy drinks (oral 6 and 12 ml / day / rat) for 6 weeks on feed intake (FI) and feed efficiency ratio (FER).

Groups	FI (g/4 weeks)	FER
Negative control	**$23.23^{b} \pm 0.34$**	**$0.103^{a} \pm 0.001$**
Type 1 (6 ml / twice a day / rat**)**	**$23.83^{b} \pm 2.18$**	**$0.071^{b} \pm 0.001$**
Type 1(12 ml / twice a day / rat)	**$24.91^{a} \pm 0.09$**	**$0.040^{d} \pm 0.001$**
Type 2 (6 ml / twice a day / rat**)**	**$23.29^{b} \pm 0.24$**	**$0.060^{b} \pm 0.001$**
Type 2 (12 ml / twice a day / rat)	**$24.96^{a} \pm 0.12$**	**$0.030^{e} \pm 0.003$**
Type 3 (6 ml / twice a day / rat**)**	**$23.68^{b} \pm 0.07$**	**$0.055^{c} \pm 0.001$**
Type 3 (12 ml / twice a day / rat)	**$24.99^{a} \pm 0.23$**	**$0.029^{e} \pm 0.001$**
LSD	**0.92**	**0.003**

Means in the same column with different litters are significantly different ($P \leq 0.05$).

2- Effect of different types of energy drinks for 6 weeks on liver functions.

A – GOT enzyme.

Data presented in Table (3) showed that control negative group SGOT was **40± 3.76** u/l which significantly decrease than the other group. But, there is no significant changes between different levels of type 3 energy drinks. Also, there is no significant changes among **Type 1(**12 ml / twice a day / rat), **Type 2 (**6 ml / twice a day / rat**) and Type 2 (**12 ml / twice a day / rat).The lowest effect in serum GOT levels recorded for **Type 1(**12 ml / twice a day / rat) drink group which significantly change than the others.

B –GPT enzyme.

Data given in Table (3) showed that the serum level of (SGPT) in control negative group was 43 ± 3.65 U/L. The results showed that there is no significant changes as among Type 1 (6 ml / twice a day / rat), Type 1(12 ml / twice a day / rat) and Type 2 (12 ml / twice a day / rat) when compared to control negative group .At the same time, rats which received Type 3 (12 ml / twice a day / rat)showed a significant increases in the level of SGPT as compared to the others. Control group was the lowest value of SGPT which significantly different from that of the others. The previous studies showed that intake of nutrients (including those found in sweetened beverages) may affect lipid metabolism, and hepatic steatosis(Gaby, 2005).

Table (3):Effect of different types of energy drinks for 6 weeks on SGOT and SGPT levels.

Groups	SGOT(U\L)	SGPT(U\L)
Negative control	40d± 3.76	43 e ± 3.65
Type 1 (6 ml / twice a day / rat)	63c ± 6	57c ± 4
Type 1(12 ml / twice a day / rat)	75 b ± 7	65 c ± 5
Type 2 (6 ml / twice a day / rat)	72 b ± 5	52.66 d ± 4.34
Type 2 (12 ml / twice a day / rat)	84 b ± 7	65c ± 4
Type 3 (6 ml / twice a day / rat)	94 a ± 6	75 b ± 4
Type 3 (12 ml / twice a day / rat)	104 a ± 6	85 a ± 4
LSD	13	8

Means in the same column with different litters are significantly different($P \leq 0.05$).

3- Effect of different types of energy drinks for 4 weeks on on total cholesterol (TC) and Serum high density lipoprotein cholesterol (HDL-c).

Data given in Table (4) showed that the control group was the highest mean value of serum levelsof HDL-c which was **56 ± 2.09** mg/dl while,

in type 3 at the dose 12 ml energy drink group was the lowest mean value of HDL-c. The values denoted that there is no significant changes in serum levels of HDL-c in rats which received energy drinks type 1 (at the dose of 6 and 12 ml) , type 2 and type 3 (at the dose of 6 ml) .

Table (4):Effect of different types of energy drinks for 6 weeks on total cholesterol (TC) and HDL-c levels.

Groups	TC (mg\dl)	HDL-c (mg\dl)
Negative control	99.06 e ± 3 .04	56 a ± 2.09
Type 1 (6 ml / twice a day / rat)	107.93 d ± 2 .67	1050.23 b ± 1.87
Type 1(12 ml / twice a day / rat)	113.42 d ± 4.18	46.67 b ± 3.53
Type 2 (6 ml / twice a day / rat)	113.32d ± 6.68	50 b ± 2.98
Type 2 (12 ml / twice a day / rat)	135.99 b ± 6.21	42.33 c ± 4.22
Type 3 (6 ml / twice a day / rat)	124.05 c ± 6.15	49.06 b ± 2.11
Type 3 (12 ml / twice a day / rat)	144.15 a ± 2.35	39.46 c ± 1.71
LSD	6. 46	5.7

Means in the same column with different litters are significantly different($P \leq 0.05$)

4- Effect of different types of energy drinks for 4 weeks on some hormones values.

Data given in Table (5) showed that tri iodothyronine (T3) levels showed no significant differences among **Type 1 (**6 ml / twice a day / rat**), Type 1(**12 ml / twice a day / rat) and **Type 2 (**12 ml / twice a day / rat). These results recorded a significant increases in triodo thyronine (T3) levels of as compared to control negative group. The lowest value of thyroxine (T_4) level recorded for **Type 3 (**12 ml / twice a day / rat) drink group and there is no significant differences between **Type 2 (**6 ml / twice a day / rat)group and **Type 2 (**6 ml / twice a day / rat)drink group.

Table (5):Effect of different types of energy drinks for 4 weeks on some hormones values.

Hormones			
Groups	**Triiodothyronine (T3) (pg/ml)**	**Thyroxine (T4) (ng/dl)**	**1-α,25-hydroxyvitamin D(ng/ml)**
Negative control	**2.69 b± 0.02**	**3.33 a ± 0.11**	**23.30b ± 2.29**
Type 1 (6 ml / twice a day / rat)	**2.45c± 0.18**	**2.53 b ± 0.92**	**34.82 a ± 3.44**
Type 1(12 ml / twice a day / rat)	**2.40 c ± 0.68**	**2.5 b ± 0.32**	**33.86 a ± 1.44**
Type 2 (6 ml / twice a day / rat)	**2.66 b ± 0.75**	**2.27 c ± 0.07**	**33.90 a ± 4.59**
Type 2 (12 ml / twice a day / rat)	**2.43 c ± 0.18**	**2.50b ± 0.32**	**32.92a ± 2.24**
Type 3 (6 ml / twice a day / rat)	**2.81a ± 0.23**	**2.15 c ± 0.58**	**33.80 a ± 0.23**
Type 3 (12 ml / twice a day / rat)	**2.61b ± 0.51**	**1.55 d ± 0.19**	**3.80 a ± 0.03**
LSD	**0.008**	**0.12**	**0.45**

Means in the same column with different litters are significantly differ

5- Effect of different types of energy drinks for 4 weekson complete blood count (CBC).

A –Hemoglobin (HB) levels.

Data given in Table (6) showed that hemoglobin level in control negative group recorded 13.53±0.20 mg/dl while, in rats which received different types of energy drinks (type1, 2 and 3 at level 6 ml/twice a day) hemoglobin levels were 11.26 ± 0.92, 11.1 ± 0.4 and 10.1 ± 0.2 mg/dl, respectively.

Table (6):Effect of different types of energy drinks for 4 weeks on hemoglobin levels.

Groups	Hemoglobin (mg\dl)
Negative control	13.53 a ±0.20
Type 1 (6 ml / twice a day / rat)	11.26 b ±0.92
Type 1(12 ml / twice a day / rat)	10.13 c ± 0.83
Type 2 (6 ml / twice a day / rat)	11.1 b ± 0.4
Type 2 (12 ml / twice a day / rat)	10.23 c ± 0.35
Type 3 (6 ml / twice a day / rat)	10.1 c ± 0.2
Type 3 (12 ml / twice a day / rat)	8.81 d ± 0.7
LSD	1.11

Means in the same column with different litters are significantly different($P \leq 0.05$).

6-Effect of different types of energy drinks for 6 weeks on DNA of rat's liver .

Table (7):- DNA fragmentation in liver as affecting by different types of energy drinks for 4 weeks .

Lane	Groups	Intact DNA	Mean1 800pb	Mean2 600pb	Mean3 400pb	Mean4 200pb
1	Negative control	229.71	117.36	81.13	70.863	60.816
2	Type 1 (6 ml / twice a day / rat)	240.54	140.83	106.12	99.843	80.064
3	Type 1(12 ml / twice a day / rat)	248.53	160.66	128.14	122.508	109.307
4	Type 2 (6 ml / twice a day / rat)	244.08	136.9	102.75	86.413	74.035
5	Type 2 (12 ml / twice a day / rat)	256.03	149.04	135.92	119.104	104.56
6	Type 3 (6 ml / twice a day / rat)	242.62	146.67	102.98	122.611	113.449
7	Type 3 (12 ml / twice a day / rat)	259.81	164.114	157.75	102.335	88.97

Dissuction:-

These results of Relative body weight gain (BWG) matched with the results which obtained by **William *et al.*, (2010) and George (2010)**who reported that Potential health problems associated with a high intake of energy drinks which contained sugar-sweetened have been linked to increased energy intakes, weight gain and the obesity epidemic**.**

Similar results obtained by**Malik *et al*.,(2006)**who published a systematic review of 30 studies conducted in the United States and Europe from 1966 through 2005 examining therelationship between sugar-sweetened beverages and weight gain. They concluded that greater consumption of sugar-sweetened beverages (caloric) is associated with weight gain and obesity in both children and adults, with findings of 23 of the 30 studies supporting this conclusion.

These results of feed efficisncy ratio (FER) denoted that there were significant decreases in feed efficiency ratio (FER) for all groups when compared with control negative group. The lowest value of feed efficiency ratio (FER) was found in diet with 12ml type 3of energy drink group. There is no significant differences between type 1 and 2 at the dose 6 ml day Fructose consumption can cause progressive liver disease in humans is demonstrated by hereditary fructose intolerance, a rare disease that results from a deficiency of aldolase B enzyme as found by **Santer *et al*., (2005).** Also, fructose has been shown to cause ATP depletion in humans. Therefore, high fructose consumption may contribute to NAFLD pathogenesis because fructose-induced ATP depletion promotes hepatic necro inflammation **(Xiaosen *et al*., 2008).**

Similar results obtained by **Grundy *et al*., (2005)**whofound thatthe chronic consumption of energy drinks can fuel metabolic derangements, includinglow levels of high-density lipoprotein cholesterol (HDL). In parallel to **Aeberli *et al*., (2007)** reported that the rising consumption of calorie-sweetened beverages provides a rising intake of fructose with all of its potential negative biological effects. Fructose is related to lipid disturbances in small dense LDL - cholesterol in children

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دراسات كيميائية وبيولوجية على بعض انواع مشروبات الطاقة باستخدام حيوانات التجارب

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ملخص العربي

تهدف هذه الدراسة الى معرفة تأثير ثلاثة انواع من مشروبات الطاقة الموجودة فى الاسواق المحلية على الحاله الصحية باستخدام حيوانات التجارب (فئران الألبينو) . وقد تم تغذية الفئران جميعا على الوجبة القياسية لمدة أسبوع لاحداث التكيف .ثم قسمت الفئران (49) فأرذكور بيضاء ذات أوزان تتراوح من (150±_5)جم الى سبعة مجموعات بكل مجموعة سبعة فئران حيث قسمت الفئران الى مجموعتين رئيسيتين وذلك لمدة استغرقت ستة أسابيع وهما: المجموعة الضابطة(السالبة) التى تغذت فئرانها على الوجبة القياسية (الوجبة الضابطة) والمجموعة التجريبية(الموجبة) وقسمت الى ستة مجموعات كل مجموعة تحتوى على سبعة فئران وتم حقنها فمويا بأنبوبة جوف معوية فالمجموعه الأولى تم اعطائهم جرعة 6 مل / يوميا بالفم من المشروب الاول (ريد بول)، والمجموعة الثانية تم اعطائهم جرعة 12 مل / يوميا بالفم من المشروب الاول & والمجموعة الثالثة تم اعطائهم جرعة 6 مل/ يوميا بالفم من المشروب الثانى(باور هورس) ، والمجموعة الرابعة تم اعطائهم جرعة 12 مل /يوميا بالفم من المشروب الثانى & والمجموعة الخامسة تم اعطائهم جرعة 6 مل /يوميا من المشروب الثالث(بلاك) ، والمجموعة السادسة تم اعطائهم جرعة 12 مل /يوميا بالفم من المشروب الثالث. كل الفئران تم تغذيتها على الوجبة الضابطة مع جرعات مشروبات الطاقة يوميا مرتين . وبعد انتهاء التجربة تم ذبح الفئران وتجميع عينات الدم لاجراء التقييم البيوكيميائى مثل الجليسيريدات الثلاثية ومستوى دهون الدم ، وتقدير وظائف انزيمات الكبد و ظائف الكلى ، وتقدير بعض الهرمونات . واوضحت النتائج ان المشروبات ادت الى زيادة في مستوى دهون الدم وتقليل هرمونات الذكور وبالتالي استخدامها لفترة طويلة تؤدي الى كثير من الامراض.

الكلمات الافتتاحية: مشروبات الطاقة – الريد بول– الباور هورس– البلاك– الكافايين– الجنسنج–الجورانا.