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EFFECT OF DIFFERENT ENERGY DRINKS ON LIVER AND HEART ENZYMES IN RATS

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ABSTRACT

Eighteen-year-old Irish athlete was died as a result of playing a basketball game after consuming four cans of red bull in 2000. France, Denmark and Norway have banned red bull. Britain issued a warning against red bull use by pregnant women and children in 2001. There was very limited evidence that the consumption of energy drinks have any effect on the enzymes of our body. Therefore, the present study investigated the effects of six different types of energy drinks (Red Bull, Power Horse, Bison, Bugzy, Boom Boom, and Code Red) on liver and heart enzymes. One hundred forty seven male Wister rats were divided into seven groups in each group 21 rats. The first group is as control drinking water. The other six groups received orally the drink (1.8 ml/250 g/day)daily by gavage for 30 days. After 10, 20, and 30 days, the blood samples were collected from all groups to determined liver and heart enzymes. Inliver, the results showed a significant decrease of alanine aminotransferase concentration by drinking Bison, Bugzy, Boom Boom and Code Red groups. All energy drinking groups showed a significant decrease in the concentration of aspartate aminotransferase except in Red Bull group. Also, they showed decrease of alkaline phosphatase concentration except in Bison group. In heart, the results showed that creatine kinase concentration decreased significantly by all energy drinking groups except Red Bull and Bugzy. All energy drinking groups showed a significant decrease in the creatine kinase-MB concentration except in Bugzy group. As conclusions, most energy drinks may cause a disorder in liver and heart which effect the production of their enzymes.

Keywords: Energy drinks, Caffeine, Liver enzymes, Heart enzymes.

1. INTRODUCTION

In 2011, Ross Cooney, eighteen-year-old Irish athlete, was died as a result of playing a basketball game after consuming four cans of Red Bull (Alsunni, 2011). France banned the popular energy drink especially Red Bull. The French Scientific Committee concluded that Red Bull has excessive amounts of caffeine. In 2008, also Denmark and Norway have banned Red Bull. Britain issued a warning against Red Bull used by pregnant women and children (Ward, 2008).

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International Olympic Committee banned caffeine because of increasing endurance (Clarkson, 1996). Energy drinks are not recognized by the United States Food and Drug Administration or the United States Department of Agriculture (Heneman, 2007).

In 2006, Ministry of Health in Saudi Arabia with delegates from the Ministry of Commerce and Industry and Saudi Arabian Standards Organization (SASO), specialized nutrition studied the energy drinks and revealed some side effects of themsuch as arrhythmia, high blood pressure, and poisoning especially when excessive consumption. Despite these side effects, some companies are still competing to produce and market these drinks (Alhayder, 2004). Some of the more purchased brand names in Saudi Arabia are: Red Bull, Bison, Power Horse, Bugzy, Code Red and Boom Boom.

The term "energy drinks" refers to beverages that contain caffeine in combination with other ingredients of herbal extracts such as guarana, ginseng, and ginkgo biloba, B vitamins, amino acids such as taurine, derivatives of amino acid as carnitine, and sugar derivatives, including glucuronalactone and ribose. These ingredients provide its consumers with extra energy (Brenda *et al*., 2007).

The consumption of energy drinks can significantly improve physical and mental performance, driving ability when tired, and decrease mental fatigue during long periods of consumption (Seifert *et al*., 2011). Unfortunately, the body of literature is limited and it is not known whether these improvements are due to the pure caffeine, or herbal ingredients present in these drinks, or as a result of the combination of its ingredients as well (Scholey and Kennedy, 2004). Guarana, in particular, contains caffeine (1g guarana ≈ 40 mg caffeine) and may substantially increase the total caffeine concentration in an energy drink (Finnegan, 2003).

The caffeine contents of a single serving of "energy drink" can (100 ml) range from 72 to 150 mg. However, many bottles contain 2-3 servings, raising the caffeine content to as high as 294 mg per bottle. In comparison, the caffeine content, per serving (236.56 ml), of brewed coffee, tea, and cola beverages ranges between 134-240 mg, 48-175 mg, and 22-46 mg respectively (Nawrot *et al*., 2003).

In 2004, Savoca revealed that intakes of caffeine > 100 mg/day associated with elevated blood pressure for adolescents. Based on these findings, consumption of energy drinks by pregnant or nursing women, adolescents, and children is not recommended. Caution is warranted even for healthy adults who choose to consume energy beverages. Adverse effects associated with caffeine consumption in amounts ≥ 400 mg include nervousness, irritability, sleeplessness, increased urination, abnormal heart rhythms (arrhythmia), decreased bone levels, and stomach upset (Nawrot *et al*., 2003).

There was very limited evidence that the consumption of energy drinks had any effect on the enzymes of our body. Therefore, this study investigates the effects of six different types of energy drinks (Red Bull, Power Horse, Bison, Bugzy, Boom Boom and Code Red) in liver and heart enzymes with no matter if the cause is caffeine or the others ingredients.

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2. MATERIALS AND METHODS

All the rats received the same basic diet in pellet and were purchased from Grain Silos and Flour Mills Organization, Jeddah, Saudi Arabia. Six different energy drinks (Bison, Power Horse, Red Bull, Bugzy, Boom Boom and Code Red)were purchased from the local market in Jeddah.

This study was carried out using a total number of 147 male Wister rats aged 8-9 weeks with a mean body weight of 230 ± 20 g, supplied from King Fahd Medical Research Center, Jeddah, King Abdulaziz University. The rats were housed in plastic cages, each containing 7 animals at a controlled temperature (24±1 °C), 70% relative humidity and air flow conditions with fixed 12 hour light- dark cycles. Rats were acclimatized for one week before the experiment started. The animal house was approved and licensed.

Rats were randomly divided into seven different groups, each group consisted of 21 rats, received orally the drink (1.8 ml/250 g/day)daily by gavage. Receiving the drink was as follow: water (group 1) as control, Red Bull (group 2), Bison (group 3), Power Horse (group 4), Code Red (group 5), Boom Boom (group 6), Bugzy (group 7).The experimental period for these seven groups was 30 days.

The calculated dose (1.8 ml / 250 gm / day) based on the quantity allowed for an adult which is two cans of energy drink that is equivalent to 500 ml per day and the average weight of an adult man is 70 kilograms.

After 10, 20, and 30 days of the experiment, each rat was weighted and blood samples were individually obtained after a fasting period of 16-18 hours. Blood samples were collectedunder light ether anesthesia retro-orbitallyfrom the inner acanthus of the eye using capillary tubes (Micro Hematocrit Capillaries, Mucaps). The blood was collected into a plain tube and it was centrifuged at 3000 xg for 15 min. The serum was separated and frozen at −80 °C to determine liver and heart enzymes. After decapitation of the rats, livers and hearts were rapidly removed, washed with ice-cold saline and weighed.

Rats were individually weighed at the beginning of the study and after 10, 20, and 30 days of the experimental period.

This study determined liver and heart enzymes such as alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), γ-glutamyltransferase (GGT), creatine kinase (CK), and creatine kinase-mb (CK-MB). Alanine aminotransferase was determined by the method of (Fischbach and Zawta, 1992). While the method of Bergmeyer *et al.*,(1977), was used to determine aspartate aminotransferase. Alkaline Phosphatase was determined by using Bergmeyer *et al.*,(1970), method. The method of Persijn and Van der Slik, (1976), was used to determine the γ-glutamyl transferase activity. The method of Gruber, (1978), was used to determine the creatine kinase. Creatine Kinase-MB was determined by the method of Würzburg *et al.*,(1977).

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3. RESULTS

3.1. Organs Weight

3.2. Heart weight

Table 1 showed the effect of Red Bull, Power Horse, Bison, Bugzy, Boom Boom and Code Red on heart weight of male rats. After 10 days, the result indicated that there were a decrease but not significant on rat heart weight in Red Bull, Bison, Bugzy, Boom Boom and Code Red compared to the control. After 20 and 30 days, administration of all energy drinking groups revealed that a non significant decrease of heart weight compared to the control.

3.3. Liver weight

Table 2 showed the effect of Red Bull, Power Horse, Bison, Bugzy, Boom Boom and Code

Red on liver weight of male rats. After 10, 20 and 30 days, the results indicated that there were a decrease on rat liver weight in all groups but notsignificant compared to the control.

3.4. Liver Enzymes

All liver enzymes were decreased by energy drinks.

3.5. Alanine Aminotransferase Level

Table 3 showed the effect of Red Bull, Power Horse, Bison, Bugzy, Boom Boom and Code Red on alanine aminotransferase level of male rats. After 10 days, the result indicated that there were a significant decrease in alanine aminotransferase level by 37.6 % (P=0.001), 35.9 % (P=0.006), 32.5 % (P=0.004), 21.4 % (P=0.005) and 29.1 % (P=0.002), respectively, compared to the control except Red Bull group. After 20 days, administration of Power Horse, Bison, Bugzy, Boom Boom and Code Red, revealed that a significant decrease of alanine aminotransferase level by 26.3 % (P=0.005), 25.5% (P=0.000), 16.7 % (P=0.002), 13.2 % (P=0.004) and 32.5 % (P=0.000), respectively, compared to the control. While after 30 days, administration of Bison, Bugzy, Boom Boom and Code Red revealed that a significant decrease of alanine aminotransferase level by 28.9% (P=0.003), 10.7% (P=0.05), 14.0% (P=0.004) and 24.8% (P=0.004), respectively, compared to the control.

3.6. Aspartate Aminotransferase Level

Table 4 showed the effect of Red Bull, Power Horse, Bison, Bugzy, Boom Boom and Code Red on aspartate aminotransferase level of male rats. After 10 days, the results indicated that there were significant decreases in aspartate aminotransferase level in Red Bull, Power Horse, Bugzy, and Boom Boom groups by 12.5 % (P=0.001), 16.6 % (P=0.007), 14.2 % (P=0.001) and 22.0 % (P=0.000), respectively, compared to the control. After 20 days, administration of Power Horse, Bison, Bugzy, and Boom Boom revealed that a significant decrease of aspartate aminotransferas level by 22.2 % (P = 0.000), 21.8 % (P=0.004), 11.6 % (P=0.001) and 27.5 % (P =

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0.000), respectively, compared to the control. While after 30 days, administration of Power Horse, Bison, Bugzy, Boom Boom, and Code Red revealed also a significant decrease of aspartate aminotransferase level by 21.5 % (P=0.000), 22.8 % (P=0.003), 24.6 % (P=0.000), 29.8 % (P=0.000) and 46.4 % (P=0.000), respectively, compared to the control.

3.7. Alkaline Phosphatase Level

Table 5 showed the effect of Red Bull, Power Horse, Bison, Bugzy, Boom Boom and Code Red on alkaline phosphatase level of male rat. After 10 days, the result indicated that there were a significant decreases in alkaline phosphatase level in Red Bull, Power Horse, Bugzy, Boom Boom and Code Red groups by 17.5 %, 15.5 % , 13.6 %, 19.7 % and 24.5 %, respectively, compared to the control (P = 0.000 to all). After 20 days, the results showed that a significant decrease of alkaline phosphatase level by Red Bull, Power Horse, Bugzy, Boom Boom and Code Red by 16.2 %, 21.3 %, 19.3 %, 22.3 % and 22.9 %, respectively, compared to the control (P = 0.000 to all). While after 30 days, aspartate aminotransferase level showed a significant decrease in Power Horse, and Code Red by 22.4 % and 10.3 %, respectively, compared to the control (P = 0.000 to all).

3.8. γ-Glutamyl Transferase (γ-GT) Level

Table 6 showed the effect of Red Bull, Power Horse, Bison, Bugzy, Boom Boom and Code Red on γ-glutamyl transferase level of male rats. After 10, 20, and 30 days, the result indicated that there were insignificant decreases in γ-glutamyl transferase level by all energy drinking groups compared to the control.

3.9. Heart enzymes

3.9.1. Creatine Kinase Level

Table 7 showed the effect of Red Bull, Power Horse, Bison, Bugzy, Boom Boom and Code Red on creatine kinase level of male rats. After 10 days, the result indicated that there were decreases in creatine kinase level by all energy drinks but only Bison had a significant decrease by 16.4 % (P=0.000) compared to the control. After 20 and 30 days, the result showed a significant decrease of creatine kinase level by all energy drinks groups. After 20 days, by 18.1 %, 29.7 %, 45.6 %, 25.1%, 15.9 %, and 20.5 %, respectively, (P = 0.000 to all). While after 30 days, by 25.3 % (P=0.001), 34.9 % (P=0.000), 28.2 % (P=0.000), 40.8 % (P=0.000), 31.6 % (P=0.000), and 29.2 % (P=0.000), respectively, compared to the control.

3.9.2. Creatine Kinase-MB Level

Table 8 showed the effect of Red Bull, Power Horse, Bison, Bugzy, Boom Boom and Code Red on creatine kinase-mb level of male rats. After 10 days, the result indicated that there were a

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decreases in creatine kinase-mb level in all energy drinks, but had a significant only in Red bull by 23.6 % (P=0.006) compared to the control.

After 20 days, creatine kinase-mb level decreased by all energy drinks, but it was a significant by administration of Red bull, Bison, and Code Red, by 20.2 % (P=0.002), 20.5 % (P=0.007), and 20.2 % (P=0.007), respectively, compared to the control. While after 30 days, creatine kinase-mb level showed an insignificant decrease in all energy drinking groups compared to the control.

4. DISCUSSION

In this study heart weight showed a non significant decrease in all energy drinking groups compared to the control. Also, liver weight showed a decrease in all energy drinking groups compared to the control group. Alrasheedi and Abdel-Mageid (2007)revealed that the consumption of energy drink causing the death of liver cells and reduce in the nuclei which may cause loss liver weight.

Results showed a significant decrease in the concentration of alanine aminotransferase and aspartate aminotransferase in all energy drinking groups compared to the control group. This result is compatible with the results of Alrasheedi and Abdel-Mageid (2007). Also, with the study of Noriyuki *et al.* (2000) which revealed that high concentration of caffeine decrease the activity of alanine aminotransferase and aspartate aminotransferase. The decline in the activity of the liver enzymes may be due to the herbs that are added to the energy drinks such as Kava-Kava which causes liver failure according to the study Nakamishi *et al.* (2000), and Kraft *et al.* (2001),. Also, the study of Skinner *et al.* (2000), revealed that the herb Ephedra defect the function of the liver which decreases the activity of its enzymes.

All energy drinking groups showed a significant decrease in the concentration of alkaline phosphatase compared to the control group except in Bison which had no effect. These results differ from the results of Raj *et al.* (2009), who concluded that the consumption of 3 ml soft drink containing caffeine and carbonated water per 100g body weight as the energy drink was elevated the alkaline phosphatase level compared to the control group. This contrary may be due to the difference of the dose used in the experiment where Raj used more than four times the dose in this study. In addition, Bison has no effect because it is the only energy drink contains folic acid where the lack of folic acid leads to a deficiency of alkaline phosphatase (Jeremy and Kaslow, 2011).Gama-glutamyl transferease (GGT) level showed a decrease but not significant in Red Bull, Bugzy, Boom Boom and Code Red groups compared to the control group. This result is compatible with the results of Kono *et al.* (1994) and Pintus and Mascia (1996). Gama-GT levels in the blood are very sensitive to the change of the liver function. Normally, GGT is present in low levels, but when the liver is injured, the GGT level can rise (Pintus and Mascia, 1996).

The significant decrease in the concentrations of creatine kinase and creatine kinase-mb in all energy drinking groups compared to the control group may be due to decrease of heart weight.

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However, there is a deficiency in the literature of the biological, pharmacological and clinical action of energy drinks in these enzymes.

5. CONCLUSION

The most ingredients of energy drinks contain a large amount of caffeine which activate the body and increase its energy. Energy drinks have a negative effect on the liver and heart cells which cause a decrease in their enzyme productions. To be in the safe side avoid drinking them in large quantities or for long period. It should be drinking in moderation. This study found that Bugzy may be consider as the safer energy drink than the other five drinks (Red Bull, Power Horse, Bison, Boom Boom and Code red) because this drink has a weak effect to the liver and heart enzymes.

Energy drinks should be taken according to the label instruction which is 500 ml or two cans a day. Also, they are not for pregnant or breastfeeding women, people less than 16 years old, who are suffering from heart disease, high blood pressure, diabetics and sensitive to caffeine. If people practiced physical activities, they should drink enough water to help rehydrate their body system instead of taken energy drink.

Athletes should be taken sport drinks instead of energy drinks. Sports drinks are designed to provide rehydration during or after athletic activity, while energy drinks are stimulants consumed to give a boost of energy. The energy drinks should not be taken before going to sleep because of the caffeine's stimulative affect. Finally, for a healthy body we have to drink the proper amount of water or any desirable fresh fruit juices.

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Table-1. The effect of different energy drinks on heart weight (gm) of male rat after 10, 20 and 30 days. Each value represents the mean ± SD.

	10 days	%	20 days	%	30 days	%
Control	0.83 ± 0.0		0.83 ± 0.1		0.81 ± 0.1	
Red Bull	0.82 ± 0.0	1.2 %	0.82 ± 0.0	1.2 %	0.78 ± 0.1	3.8 %
Power Horse	0.83 ± 0.0	0.0 %	0.81 ± 0.1	2.5 %	0.79 ± 0.0	2.5 %
Bison	0.78 ± 0.0	6.4 %	0.79 ± 0.0	5.1 %	0.74 ± 0.1	9.5 %
Bugzy	0.77 ± 0.0	7.8 %	0.82 ± 0.1	1.2 %	0.77 ± 0.0	5.2 %
Boom Boom	0.80 ± 0.0	3.8 %	0.79 ± 0.0	5.1 %	0.78 ± 0.1	3.8 %
Code Red	0.78 ± 0.0	6.4 %	0.81 ± 0.1	2.5 %	0.79 ± 0.0	2.5 %

SD= Standard deviation

Table-2. The effect of different energy drinks on liver weight (gm) of male rat after 10, 20 and 30 days. Each value represents the mean ± SD.

	10 days	%	20 days	%	30 days	%
Control	7.77 ± 0.29		8.00 ± 0.5		7.78 ± 0.2	
Red Bull	7.65 ± 0.55	1.6 %	7.58 ± 0.4	5.5 %	7.50 ± 0.5	3.7 %
Power Horse	7.43 ± 0.41	4.6 %	7.96 ± 0.1	0.5 %	7.66 ± 0.8	1.6 %
Bison	7.47 ± 0.34	4.0 %	7.77 ± 0.5	2.9 %	7.26 ± 0.3	7.2 %
Bugzy	7.73 ± 0.55	0.5 %	7.81 ± 1.1	2.4 %	7.66 ± 0.5	1.6 %
Boom Boom	7.67 ± 0.24	1.3 %	7.53 ± 0.9	6.2 %	7.60 ± 0.9	2.4 %
Code Red	7.71 ± 0.14	0.8 %	7.63 ± 0.2	4.8 %	7.24 ± 0.4	7.5 %

SD= Standard deviation

Table-3. The effect of different energy drinks on alanine aminotransferase level (U/I) of male rat after 10, 20 and 30 days. Each value represents the mean ± SD.

	10 days	%	20 days	%	30 days	%
Control	39.0 ± 2.0		38.0 ± 1.0		40.3 ± 2.1	
Red Bull	35.3 ± 1.5	9.4%	36.3 ± 2.5	4.40%	36.3 ± 1.5	9.90%
Power Horse	24.3 ± 2.1*	37.6%	28.0 ± 2.0*	26.30%	38.3 ± 1.5	4.90%
Bison	25.0 ± 4.0*	35.9%	28.3 ± 1.2*	25.50%	28.7± 1.2*	28.90%
Bugzy	26.3 ± 4.6*	32.5%	31.7 ± 1.2*	16.70%	36.0 ± 1.0*	10.70%
Boom Boom	30.7 ± 1.5*	21.4%	33.0 ± 1.0*	13.20%	34.7 ± 2.5*	14.00%
Code Red	27.7 ± 1.5*	29.1%	25.7 ± 1.2*	32.50%	30.3 ± 2.1*	24.80%

SD= Standard deviation

* = Significant

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Table-4. The effect of different energy drinks on aspartate aminotransferase level of male rat after 10, 20 and 30 days. Each value represents the mean ± SD.

	10 days	%	20 days	%	30 days	%
Control	98.3 ± 1.5		94.7 ± 1.5		96.3 ± 1.5	
Red Bull	86.0 ± 2.0*	12.50%	84.7 ± 0.6	10.60%	86.0 ± 2.0	10.70%
Power Horse	82.0 ± 3.5*	16.60%	73.7 ± 1.2*	22.20%	75.7 ± 2.1*	21.50%
Bison	96.0 ± 4.4	2.40%	74.0 ± 3.6*	21.80%	74.3 ± 3.5*	22.80%
Bugzy	84.3 ± 2.1*	14.20%	83.7 ± 1.5*	11.60%	72.7 ± 0.6*	24.60%
Boom Boom	76.7 ± 1.2*	22.00%	68.7 ± 1.5*	27.50%	67.7 ± 1.5*	29.80%
Code Red	88.3 ± 1.2	10.20%	85.3 ± 1.5	9.90%	51.7 ± 2.1*	46.40%

SD= Standard deviation

* = Significant

Table-5. The effect of different energy drinks on alkaline phosphatase level of male rat after 10, 20 and 30 days. Each value represents the mean ± SD.

	10 days	%	20 days	%	30 days	%
Control	577.7 ± 8.0		566.5 ± 1.2		575.3 ± 8.2	
Red Bull	478.3 ± 3.5*	17.50%	474.7 ± 5.5*	16.20%	535.7 ± 2.3	6.90%
Power Horse	488.3 ± 1.5*	15.50%	446.0 ± 5.3*	21.30%	446.7 ± 4.7*	22.40%
Bison	564.0 ± 2.7	2.40%	556.7 ± 3.2	1.70%	567.0 ± 4.4	1.40%
Bugzy	499.0 ± 3.2*	13.60%	457.0 ± 2.7*	19.30%	526.3 ± 12.7	8.50%
Boom Boom	464.0 ± 3.0*	19.70%	440.0 ± 2.0*	22.30%	522.4 ± 6.5	9.20%
Code Red	436.3 ± 1.5*	24.50%	436.3 ± 3.1*	22.90%	516.1 ± 9.5*	10.30%

SD= Standard deviation

* = Significant

Table-6. The effect of different energy drinks on γ-glutamyl transferase level (U/I) of male rat after 10, 20 and 30 days. Each value represents the mean ± SD.

	10 days	%	20 days	%	30 days	%
Control	7.7 ± 0.6		7.7 ± 0.6		8.0 ± 1.0	
Red Bull	7.0 ± 1.0	8.70%	7.3 ± 0.6	4.40%	7.7 ± 0.6	4.10%
Power Horse	6.7 ± 1.2	13.00%	7.0 ± 1.0	8.70%	8.3 ± 0.6	4.10%
Bison	6.3 ± 0.6	17.50%	7.7 ± 0.6	0.00%	8.0 ± 1.0	0.00%
Bugzy	6.3 ± 0.6	17.50%	7.7 ± 0.6	0.00%	7.7 ± 0.6	4.10%
Boom Boom	7.3 ± 0.6	4.40%	7.3 ± 0.6	4.40%	7.3 ± 0.6	8.40%
Code Red	6.3 ± 0.6	17.50%	7.3 ± 0.6	4.40%	7.7 ± 1.2	4.10%

SD= Standard deviation

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Table-7. The effect of different energy drinks on creatine kinase level (U/I) of male rat after 10, 20 and 30 days. Each value represents the mean ± SD.

	10 days	%	20 days	%	30 days	%
Control	344.6 ± 4.3		351.5 ± 7.6		347.0 ± 5.8	
Red Bull	317.0 ±3.1	8.00%	287.6 ± 6.0*	18.10%	259.3 ± 3.7*	25.30%
Power Horse	296.3 ± 7.9	14.00%	247.0 ± 7.6*	29.70%	226.0 ± 2.7*	34.90%
Bison	288.0 ± 2.6*	16.40%	191.3 ± 8.1*	45.60%	249.3 ± 4.7*	28.20%
Bugzy	296.6 ± 5.3	13.90%	263.3 ± 5.2*	25.10%	205.3 ± 3.5*	40.80%
Boom Boom	302.6 ± 10.7	12.20%	295.6 ± 10.0*	15.90%	237.3 ± 4.3*	31.60%
Code Red	327.0 ± 1.7	5.10%	279.3 ± 9.8*	20.50%	245.6 ± 4.8*	29.20%

SD= Standard deviation

* = Significant

Table-8. The effect of different energy drinks on creatine kinase-mb level (U/I) of male rat after 10, 20 and 30 days. Each value represents the mean ± SD.

	10 days	%	20 days	%	30 days	%
Control	3.8 ± 0.2		3.4 ± 0.5		3.7 ± 0.3	
Red Bull	2.9 ± 0.2*	23.60%	2.7 ± 0.3*	20.20%	3.1 ± 0.2	16.40%
Power Horse	3.4 ± 0.4	9.90%	2.9 ± 0.1	14.90%	3.2 ± 0.3	13.40%
Bison	3.7 ± 0.4	2.10%	2.7 ± 0.2*	20.50%	3.4 ± 0.4	7.80%
Bugzy	3.7 ± 0.2	2.60%	3.1 ± 0.4	8.20%	3.5 ± 0.3	5.40%
Boom Boom	3.7 ± 0.3	2.40%	2.9 ± 0.4	14.90%	3.5 ± 0.2	5.60%
Code Red	3.4 ± 0.5	9.70%	2.7 ± 0.3*	20.20%	3.1 ± 0.3	16.10%

SD= Standard deviation

* = Significant

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