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The role of vitamin E In reducing the side effects of Gabapentin on some physiological parameters related to the heart in male albino rats

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Abstract: The study was designed to evaluate the role of vitamin E in reducing the side effects of gabapentin on some physiological parameters related to the heart in male albino rats,(30) males were used, who were divided into three equal groups : The control group was given physiological saline solution in concentration(0.9%), the treatment group T1 was given gabapentin at a concentration of (100mg / Kg) of body weight, treatment group (T2) was given gabapentin at a concentration of (100mg / Kg) of body weight and vitamin E at a concentration of 80 mg/kg of body weight, the results revealed that gabapentin causes significant increase in some parameters related to the heart,Vitamin E helped reduce them.

Keywords: *CPK, LDH, Myo, Gabapentin, Vitamin E, Tropo.*

1. Introduction

Gabapentin (GBP) is marketed commercially under the name Neurontin, often used as an adjunct to other antiepileptic drugs. It is a highly bioavailable drug, undergoes minimal metabolism, and is excreted via the kidneys (17,21). GBP is a new, second-generation drug that was approved by the US Food and Drug Administration in 1993 and has been available generically in the United States since 2004 (10).

Its original use was as a muscle relaxant and anticonvulsant but its potential as an anticonvulsant and adjunct to more potent anticonvulsants has been demonstrated. It is prescribed off-label for a range of disorders including bipolar disorder, trigeminal neuralgia, pruritus, and migraine (14,19).

The pharmacokinetics of the drug make GBP ideal due to its rapid absorption, limited metabolism, and low risk of drug interactions. The drug does not inhibit or stimulate hepatic enzymes, which reduces the possibility of interaction with other drugs. The drug also does not inhibit or stimulate metabolism like other drugs (6,16).

Vitamin E is one of the most important fat-soluble vitamins and biological antioxidants that break free radical chains to protect tissues from lipid peroxidation damage (4). It is considered essential for the safety and function of the reproductive, muscular, circulatory, nervous, immune, and circulatory systems (11,12). It is one of the essential vitamins for humans and animals, as the body needs it because it is unable to manufacture it (3 ,5).

Vitamin E has multiple physiological effects. Although the mechanism of physiological action is not fully known, most of the biological activities of this vitamin are due to its activity as an antioxidant. It plays an important role in preventing the oxidation of lipids in biological membranes by reducing free radicals and other oxidizing agents and preventing the formation of peroxides (9,15).

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2. Materials and Methods

In this study, 30 adult male white rats aged (3-4) months and weighing between 16-170 kg were used. The animals were divided into three groups as follows:

1-Control group C: included (10) animals given the physiological solution for 60 days.

2-The first treatment T1: included (10) animals given Gabapentin only at a concentration of (100 mg/kg) of body weight for 60 days (20).

3-The third treatment T2: It included (10) animals that were given Gabapentin at a concentration of (100 mg/kg) of body weight and then Vitamin E at a concentration of (80 mg/kg) of body weight for 60 days.

After the end of the specified period of the experiment, the animals were anesthetized by placing the rats inside a container with a tight cover containing cotton soaked in chloroform for a few seconds. Blood was drawn directly from the heart using 5 ml medical syringes, 3 ml of blood was placed in test tubes free of anticoagulant, the samples were placed in a centrifuge at a speed of (3000 rpm) for (15) minutes to obtain serum and conduct biochemical tests and oxidation indicators on them later.

3. Results

The results shown in Table 1,2 showed a significant increase ($P<0.05$) for the T1 treatment in the concentration of (Tropo, Myo, LDH, CPK) (Ca, Na, K,) in the blood serum of rats that were dosed with GBP at a concentration of (100 mg/kg)of body weight compared to the control group C, while the results showed a decrease ($P<0.05$) in the concentration of (Tropo, Myo, LDH, CPK) in the blood serum of the T2 treatment group that was dosed with GBP at a concentration of (100 mg/kg) and vitamin E at a concentration of 80 mg/kg of body weight compared to the T1 treatment group, while the T2 treatment showed a significant increase in the concentration of (Tropo, Myo, LDH, CPK) (Ca, Na, K,) compared to the control group C.

Table 1.
Shows the effect of GBP and vitamin E on the level of (Tropo, Myo, LDH, CPK) in male albino rats.

Groups	MYOng/ml	CPK Pg/ml	TROPng/ml	LDH U/L
Control	19.358±0.605D	1035.844±2.932D	0.491±0.008D	161.211±0.332D
T1	36.780±0.206A	1682.288±19.876A	2.065±0.034A	358±1.957A
T2	26.719±0.347B	1396.086±18.277B	1.286±0.018B	263.153±0.908B

Note: *Value represents the mean ± the standard error
* Different letters in one column indicate significant differences ($P<0.05$) between the totals

Table 2.
Shows the effect of GBP and vitamin E on the levels of (Ca, Na, K) in male albino rats.

Groups	K mmol/L	Na mmol/L	Ca mg/dl
Control	4.483±0.099D	120.903±0.139D	9.156±0.090D
T1	9.40±0.096A	200.831±0.290A	20.430±0.260A
T2	7.20±0.147B	173.140±0.687B	11.168±0.252B

Note: *Value represents the mean ± the standard error
* Different letters in one column indicate significant differences ($P<0.05$) between the totals

Table 3 shows a significant increase ($P<0.05$) in the concentration of MDA, which is matched by a significant decrease in the concentration of GSH, CAT in the treatment group T1 compared to the control group C, while the results of the study showed a significant decrease ($P<0.05$) in the concentration of MDA, which is matched by a significant increase in the concentration of GSH, CAT in the treatment group T2 compared to the treatment T1, while the treatment group T2 showed a significant increase ($P<0.05$) in the concentration of MDH, which is matched by a significant decrease in the concentration of GSH, CAT compared to the control group C.

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Table 3.
Shows the effect of each of the drug GBP and vitamin E on the level of each of (MDA, CAT, GSH) in male white rats.

Groups	GSH (Umol/mg)	CAT (U/ml)	MDA (Umol/mg)
Control	2.546±0.012C	0.648±0.007C	1.62±0.008C
T1	1.02±0.029A	0.235±0.005A	5.838±0.185A
T2	1.995±0.032B	0.533±0.008B	2.845±0.027B

Note: *Value represents the mean ± the standard error
* Different letters in one column indicate significant differences (P <0.05) between the totals

4. Discussion

The results showed a significant increase in the concentration of (Tropo, Myo, LDH, CPK) and the concentration of (Ca, Na, K) and the concentration of (MDH) in the T1 treatment, which could be considered evidence of damage to the heart muscle in the animals of this group due to the drug, because antiepileptic drugs can cause damage and destruction to the membranes of the heart muscle cells by free radicals **(1, 7).**

The increase in the concentration of (GSH, CAT) in the T2 and T3 treatments compared to the T1 treatment can be attributed to the ability of vitamin E to prevent the formation of lipid peroxide by preventing the excessive production of free radicals (13). Vitamin E is also an inhibitory factor for membranes and works on their flexibility and resistance to oxidation by inhibiting free radicals and breaking their reactive chain (8).

The decrease in the concentration of the parameters in treatment T2 compared to treatment T1 may reflect the positive role of vitamin E in reducing the harmful effects of the drug on the level of each of these parameters and reducing the damage to the membranes of cardiac muscle cells (18), because vitamin E is an antioxidant that has a high ability to protect the heart by stimulating the process of adaptation of the cardiac muscle to resist the oxidative stress to which it is exposed by increasing the effectiveness of antioxidant enzymes (2).

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