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The Effect of Chromium Picolinate On Liver Enzymes and Neurotransmittersin the Male Rats.

Haider Salih Jaffat*, and Afyaa Sabah Nasir.

Science Faculty, University of Kufa, Najaf, Iraq.

ABSTRACT

The presentstudyis suggested to evaluate the effect of chromium picolinate on the liver enzymes and neurotransmitters in the male rats. Albino rats were divided into three groups each group have ten rats. The first group received standard diet and distilled water as control group,the second group received chromium picolinate at dose 3 mg/kg, the third group received chromium picolinate at dose 6 mg/kg after six weeks half number of rats from each group were sacrificed while the remainder rats were sacrificed after eight weeks. The results show no significant change ($p>0.05$) in the liver enzymes in the rats treated with chromium picolinate for six and eight weeks but the results recorded significant decrease ($p<0.05$) in the dopamine level (DA) while significant increase ($p<0.05$) in serotonin level (5-HT) in the rats treated with chromium picolinate for six and eight weeks. These results proposed no significant effect of chromium picolinate in the liver enzymes in the same time it has toxic effect in the neurotransmitters on healthy rats.

Keywords: CrP, DA, 5-HT.

Corresponding author

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INTRODUCTION

Chromium is an essential nutrient required for carbohydrate and lipid metabolism. The estimated safe and adequate daily dietary intake for chromium is 50-200 mg/d [1]. A variety of chromium supplements are available, with chromium picolinate being the most common. The most stable form available of supplementation appears to be chromium picolinate, which is least affected by nutritional and environmental factors.[2].

Chromium picolinate works together with insulin produced by the pancreas to metabolize carbohydrates [3].Chromium picolinate has been used in alternative medicine to treat chromium deficiency, as an aid to controlling blood sugar in people with diabetes or prediabetes, to lower cholesterol, and as a weight loss supplement [4]. The present study is proposed to evaluate of thedifferent doses of chromium supplementation (3/6 mg/kg of chromium picolinate) at different time intervals on liver enzymes and neurotransmitters in rats.

MATERIALS AND METHODS

Chromium picolinate (Crp) is purchased from the Chromax company, U.S.A.

Determination of liver enzymes

ALT & AST activity are determine by colorimetric method according to the biolabo kit,france [5]. Colorimetric determination of ALP according to biomerieux kit [6].

Determination of neurotransmitters

This laboratory test was determine by ELISA kit (Elabscience,U.S.A.) (www.elabscience.com). The levels of serotonin in serum were evaluate byELISA kit (Elabscience, U.S.A.) (www.elabscience.com).

Experimental Design

Thirty male albino rats strain (*Rattus norvegicus*) weighting (225-250g) obtained from the animal house in the science faculty/Kufa university. The rats kept under observation for one week before starting the experiment for acclimatization. fed on standard diet and distilled water *ad libitum* . Then animals were divided into three groups each group have ten rats. The first group received standard diet and distilled water as control group, the second group received chromium picolinate at dose 3 mg/kg, the third group received chromium picolinate at dose 6 mg/kg after six weeks half number of rats from each group were sacrificed while the remainder rats were sacrificed after eight weeks by Ketamine and xylazine and blood samples have collected by heart puncture and put into serum tubes in the room temperature for several minutes and were centrifuged for 20 minutes at 3000 rpm. At the end of experiment (8 weeks) the remainder groups of rats also anaesthetized by the same method and the blood samples were saved.

Statistical Analysis: Data were expressed as mean ± S.E. and Statistical Analysis was carried using computerized SPSS program version (21) with one way ANOVA [7].

RESULTS AND DISCUSSION

The current results in table (1) are showed no significant change ($p>0.05$) in liver enzyme values in the serum of rats treated with chromium picolinate for six, eight weeks. These results agreement with [8]have reported the average value of AST,ALT and ALP were not affected by the administration of the chromium picolinate ($p>0.05$) in the male white rats.

Oral administration of 0.45-77ppm of trivalent chromium drinking water did not produce any pathological changes in the liver and kidneys of dogs, though these organs had a relatively high chromium content [9]. However, in one case, 1200 to 2400 mg chromium picolinate for 4-5 months was found to produce renal toxicity and in another case 600 mg of chromium daily for 6 weeks is found to produce acute interstitial nephritis [10].

Treatment with chromium picolinate did not alter serum AST and ALT levels as well as liver morphology of normal rats. this indicates that chromium picolinate does not cause hepatoxicity in rats under the normal conditions [11].

Treatment with chromium picolinate significantly decreased elevated AST and ALT levels. Treatment also decreased the vacuolization and hypertrophy of hepatic cells observed in nSTZ-diabetic rats. Further, liver being the next organ to kidney in accumulating chromium, the possibility of nephrotoxicity in addition to the effect on altered hepatic function is studied in the present investigation. Treatment with chromium picolinate did not alter serum AST and ALT levels as well as liver morphology of non-diabetic rats. This indicates that chromium picolinate does not cause hepatoxicity in non-diabetic or diabetic rats under the conditions of the present investigation. Since chromium picolinate is found to possess significant anti-diabetic potential in STZ as well as STZ-diabetic rats it is reasonable to believe that improvement in renal and hepatic function as well as morphology could have resulted from the alleviation of the diabetic state of animals [12].

Also, the results in figure (1) and (2) are noticed significant decrease ($p<0.05$) in dopamine level and significant increase ($p<0.05$) in serotonin level in the animals after oral administration of chromium picolinate for six and eight weeks in contrast with control group.Chromium picolinate salt is effective as an antidepressant treatment during a typical depression. Thus, these preliminary studies suggest the antidepressant potential of chromium in affective disorders[13].

Chromium picolinate salt, administered 400-600 µg/day, is effective in patients suffering from a major depressive disorder [14]. Moreover, the beneficial effect of the chromium supplementation to pharmacotherapy was also reported in endogenous or dysthymic affective disorders [15]. These studies suggest the possible antidepressant properties of chromium in affective disorders. The present data generally confirmed the antidepressant-like activity of chromium and pointed to the involvement of the monoamine system in this activity. The previous studies by [16] and Khanam and Pillai [17] indicated the participation of the serotonin system in the antidepressant-like effect of chromium picolinate in the modified rat forced swim test (FST). This assumption is based on their results that chromium (when used chronically), besides reducing the immobility time, increased the swimming yet not climbing parameter of this test. Our present data are different and indicating that the noradrenergic pathway is connected with the chromium effect in the FST in rats, since the climbing yet not the swimming is increased. This result may be depend to different rat strains, doses and salts of chromium treatment. All the data suggest that both serotonergic and noradrenergic pathways are involved in the antidepressant-like action of chromium in the forced swim test (FST) in rats [18] .

The current serotonin hypothesis of depression and the mechanism of antidepressant action implicate the role of serotonin receptors in this concept. The importance of 5-HT1A receptor-mediated signaling in antidepressant like activity in the FST was demonstrated [19], while antagonism, but not enhancement, of the 5-HT2A/C receptors seems to have an antidepressant effect in both the rodent screening tests [20] and clinical studies [21]. The present studies indicate that $CrCl_3$ antidepressant like activity in the FST is dependent on serotonergic transmission *via* 5-HT1A and 5-HT2A/C therefore, chromium displays a 5-HT1A profile similar to the classic antidepressants. The importance of the 5-HT2A/C receptors in this activity remains to be established[22].

The results of the current study suggested no toxic effects of chromium picolinate on lipid profile parameters on healthy rats while it has toxic effects on the antioxidant enzymes.

Table (1) Effect of chromium picolinate in the liver enzymes in the rats treated for six weeks.

Duration of treatment	Doses of CrP	**AST (U/L)**	**ALT (U/L)**	**ALP (U/L)**
Six weeks	3 mg/kg	45.67±3.51	31.00±1.00	22.33±3.51
	6 mg/kg	56.33±8.08	30.33±9.07	23.67±6.11
Eight weeks	3 mg/kg	47.33±4.61	27.67±6.65	22.00±4.58
	6 mg/kg	53.67±10.06	26.33±4.04	26.33±6.65
control		48.67±3.21	24.33±3.21	18.33±2.88
L.S.D. 0.05		4.624	5.416	4.314

Number of animals = 5 for each group

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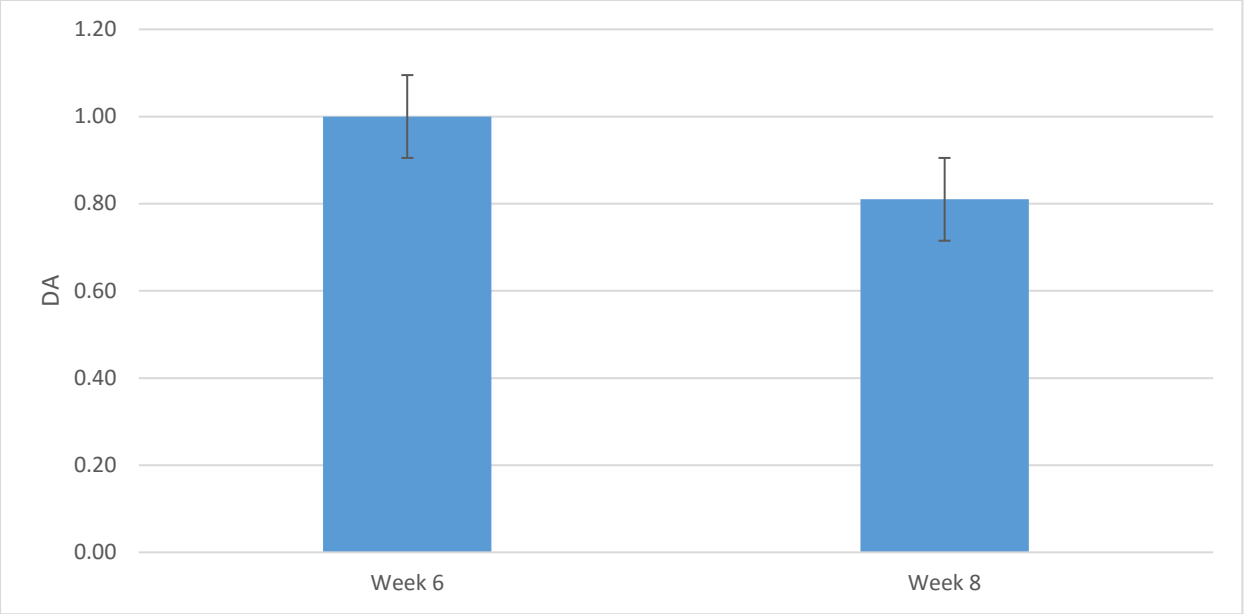
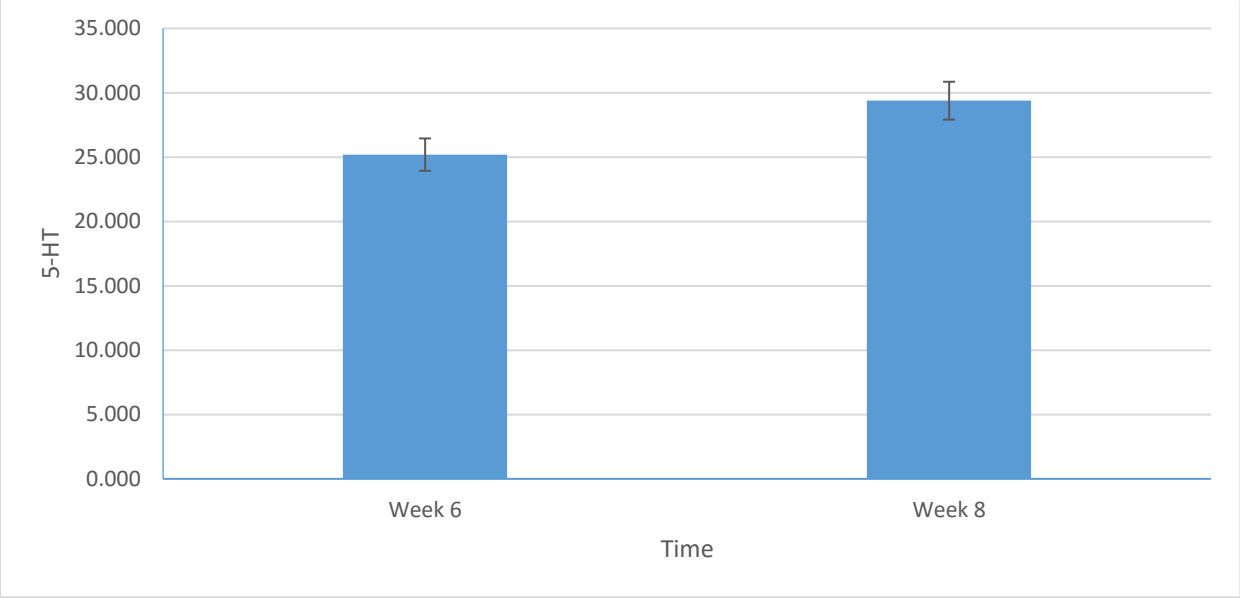
Each value represents mean ± S.E.
CrP : chromium picolinate



L.S.D. 0.05 DA = 0.059

Figure (1) Effect of chromium picolinate in the DA level in the rats for six, eight weeks.

Number of animals = 5 for each group. Each value represents mean ± S.E.



L.S.D. 0.05 5-HT = 0.551

Figure (2) Effect of chromium picolinate in the 5-HT level in the rats for six, eight weeks.

Number of animals = 5 for each group. Each value represents mean ± S.E.

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