International Journal of Pharmaceutical Archive-3(1), 2014, 285-290
Available online through www.ijpaonline.info ISSN 2319-7226

RESEARCH ARTICLE

IMPACT OF SUBLETHAL CONCENTRATION OF POTASSIUM DICHROMATE ON BIOCHEMICAL FACTORS OF ALBINO WISTAR RAT

UMASANKAR.K*, BALWIN NAMBIKKAIRAJ, and MANLEY BACKYAVATHY.D

PG and Research Department of Zoology, Voorhees College, Vellore, India.

(Received on: 10-01-13; Revised & Accepted on: 27-01-14)

ABSTRACT

The chemical and related industries occupy a key position in the economic life of a nation. The chemical industry supplies a vast range of products which find their way in to a wide spectrum of human activity. Many of these chemical when present in the environment are potentially hazardous. Some being explosive some inflammable, some toxic and yet some others corrosive etc. Adverse effect of chromium are mainly associated with hexavalent from which are highly toxic to humans. Inhalation exposure to the insoluble chromium (IV) results in the retention of metals inside lungs for long period of time. Exposure to hexavalent chromium causes dermatitis allergic skin reaction, respiratory diseases and gastro – intestinal ulcers. In the present investigation the biochemical factors namely, total protein, free amino acids, total lipids and free fatty acid were estimated as per the standard methods as follows in various tissue such as brain, kidney, muscle and liver of albino wistar rats exposed to sublethal concentration of potassium dichromate to the duration of 15, 20 and 30 days. The results show all the biochemical factors values of total protein increased gradually from less to longer duration. Whereas the free amino acids gradually decreased. The total lipids are gradually increased the free fatty acid are gradually increased. The values are statistically significant.

Key words: *Biochemical factors, Albino wistar rat, Potassium dichromate.*

INTRODUCTION

Environmental pollution cause health problems by affecting human health and lives, economic problems by affecting human property and materials, ecological problem by disturbing a balanced ecosystem, interfering with the conservation of natural resources and threatening the mere existence of some species and aesthetic problems by generally affecting human senses. The environmental detoriation by man is attributable to three major causative factors such as over population, urbanization and industrialization. The increasing amount of waste generated by these phenomena undoubtfully degrades the quality of land, air, water and food (Southwick, 1976).

The rat that are used in laboratory research are domestic rats of the species albino wistar of the species albino wistar rats. The hexavalent chromium, potassium dichromate has been selected as a test chemical in the study. Since the basic tanning powder produced in the TCC workers are exposed.

MATERIALS AND METHODS

The white rats albino wistar 200 -250 mg were used for the experiment. They were maintained on commercial diet supplied by “Hindustian level Limited” Bombay marketed the trade name Gold Mohur Feed” water provided aslibitum.

Toxicity Evaluation (LD^{50})

The LD50 for potassium dichromate was determined by dispensing potassium dichromate in drinking water orally. Different logarithmic concentration were determined by Finney (1964). In view of above route of administration for experimental studies, Potassium dichromate was mixed in water (basing on its body weight) for sublethal dose. The water volume was restricted to 50 ml/ day to allow the rat to drink. In some cases if water is remaining readministered orally through a dispencer to maintain dose Vs body weight ratio.

Corresponding author: UMASANKAR.K*
PG and Research Department of Zoology, Voorhees College, Vellore, India.
E- mail: K.umasankar.1986@gmail.com

The biochemical factors namely total protein free amino acids, total lipids and free fatty acids were estimated as per the standard methods follows in various tissue such as brain, kidney, muscle and liver of rat albino wistar exposed to sublethal concentration of potassium dichromate to the duration of 15, 20 and 30 days.

The total protein in the tissues of albino wistar was estimated by the method of Lowry *et al*., (1951). Free amino acid level was estimated by the method of Moore and Stein (1954). The total lipid content was estimated by the method of Folch *et al.*, (1957). The total fatty acids were estimated as per the method described by Natelson. (1971).

STATISTICAL ANALYSIS

All the data were analyzed as per the method of Pillai and Shinha (1968).

RESULTS AND DISCUSSION

Table 1-4 Figure 1-4 and plate indicates the result that the protein increased gradually less to longer duration in the different tissues such as brain, kidney, muscle and liver in 15, 20 and 30 days duration of rat. In the similar way the percent increment of lipids also recorded. The free amino acid and free fatty acid are gradually decreased from exposure rat.

In the percent investigation toxic agent potassium dichromate (K2Cr2O7) has manifested its effect by significantly altering the protein metabolism and slightly in lipid metabolism in the tissue such as brain, kidney, Muscle and liver of male albino wistar rat.

Due to the impairment of energy metabolism, the tissue have not been utilized by the animal for energy production under stress condition of the animal to the heavy metal chromium. In this condition the energy source was obtained from the altering source like amino acid and fatty acids. Due to this utilization the amino acid and fatty acids were decreased in tissues (Suzzki and Fukuda., 1990).

In the present study slight increase in the liver tissue may be due to the adipose tissue breakdown to liberate glycerol for formulation of glucose and fatty acid for energy production as mentioned above. Hence there was decreased content of fatty acid in brain, Kidney and muscle. The increment of fatty acid content in the liver tissue may be due to the fact that the liver was damaged and hence the conversion of fatty acid to glycogen has not occurred. Moreover the fatty acids content from other tissues were brought to liver for breakdown process, hence the fatty acid content might have increased in liver (Steinhoff *et al*., 1986).

In conclusion the administration of potassium dichromate caused changes in the metabolites and metabolism. The changes are very much proven in the liver. This visual observation of liver showed cirrhosis and extensive damage of tissue (Beck *et al*., 1982). This obviously affect the liver metabolism and liver function. Hence there was unusal deposit of carbohydrate and fat in the liver.

REFERENCES

Beck, BD; Brain, JD; Bohannon, DE. (1982) An in vivo hamster bioassay to assess the toxicity of particles for the lungs. Toxicol Appl Pharmacol 66:9-29.

Finney D.J.(1964). Probit Analysis.2nd Ed. Cambridge University Press.

Folch J, Lees M and Stanley G.H.S,(1957). Simple method for the isolation and purification of total lipids from animals tissues.J.Biol.Chem.226, 497- 509.

Lowry,O.H. Rosebrough N.J., Farr, A.L. and Randell, R.J., (1951). Protein measurement with the folin – phenol reagent. J. Biol. Chem. 193: 265 – 275.

Moore, S. and stein, (1954). A modified Ninhydin reagent for the photometric determination of amino acid and related compounds.J.Biol.Chem.211: 909 – 913.

Natelson,S (1971). Free fatty acids in serum in Techniques of clinical chemistry III edition Charles, C. Thomas Publishes spring field I the nos USA 477.

Pillai, S.K. and sinha, H.C.(1968). In; Statistical methods for biological workers Pubs. Ramprasad and Sons. Agra, India.

Southwick, C.H.(1976). Ecology and quality of our environment. D.Van Nostrand Company, New York.

Steinhoff, S, Gad, SC, Hatfield, GK; *et al.* (1983). Listing sodium dichromate and soluble calcium chromate for carcinogenicity in rats. Bayer AG Institute of Toxicology. (Sept., unpublished).

Steinhoff, S., Gad, SC., Hatfield, GK; *et al*. (1986). Carcinogenecity study with sodium dichromate in rats. Exp Pathol 30:129-141.

Suzuki, Y; Fukuda, K. (1990). Reduction of hexavalent chromium by ascorbic acid and glutathione with special reference to the rat lung. Arch Toxicol 64:169-176.

Table -1. Total Protein content in selected tissue of rat (Albino wistar) exposed to sub lethal of potassium dichromate.

Tissue	Normal animal	Experimental Animal			F Value	Probability Value
		15-Days	20- Days	30- Days		
Brain	440.13±0.16	762.43±0.16	1014±0.16	1556.66±0.22	6382156.46	0.0000
Liver	454.54±0.21	954±4.60	1214±2.10	1585.16±4.87	11470.7582	0.0000
Kidney	340.43±2.00	567.42±3.05	971.14±2.90	1437.50±4.09	20032.11157	0.0000
Muscle	135.56±1.40	205.48±1.74	391.83±1.70	554.64±1.62	13427.1882	0.0000

Values means ± of 6 individual observations. Values in parenthesis indicates % change over control.

Fig - 1. Total Protein content in selected tissue of rat (Albino wistar) exposed to sub lethal of potassium dichromate

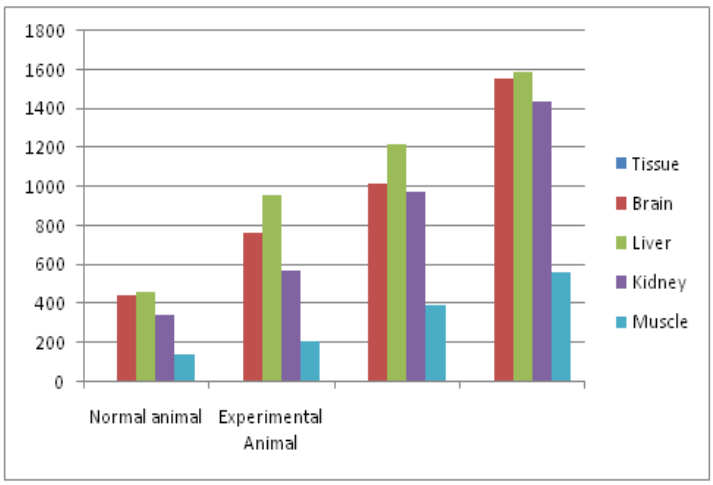


Table-2 Free amino acid content in selected tissue of rat (Albino wistar) exposed to sub lethal of potassium dichromate.

Tissue	Normal animal	Experimental Animal			F Value	Probability Value
		15-Days	20- Days	30- Days		
Brain	13.50±0.42	12.33±0.42	9.00±0.36	6.38±0.60	43.6797	0.00
Liver	14.33±0.42	13.33±0.49	9.16±0.46	7.0±0.34	61.1248	0.00
Kidney	24.43±0.30	21.00±0.34	19.14±0.40	14.33±0.33	152.1482	0.00
Muscle	9.66±0.4	8.16±0.40	6.00±0.00	4.16±0.16	100.0000	0.00

Values means ± of 6 individual observations. Values in parenthesis indicates % change over control

Fig. -2. Free amino acid content in selected tissue of rat (Albino wistar) exposed to sub lethal of potassium dichromate.

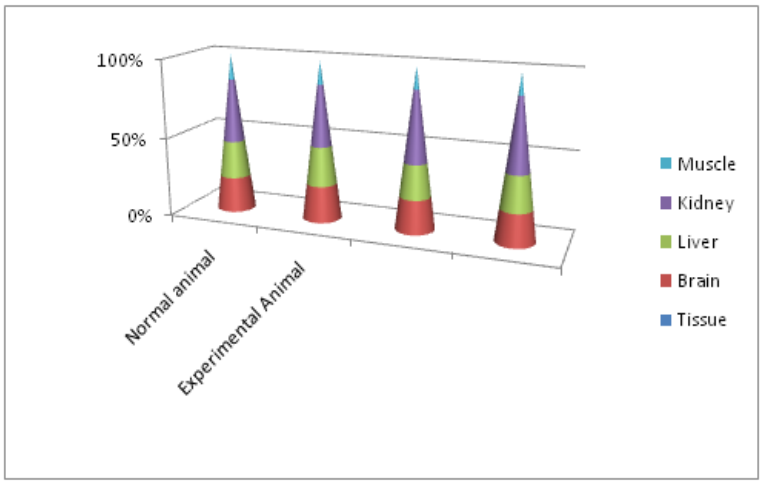


Table -3. Total lipid content in selected tissue of rat (Albino wistar) exposed to sub lethal of potassium dichromate.

Tissue	Normal animal	Experimental Animal			F Value	Probability Value
		15-Days	20- Days	30- Days		
Brain	7.00±0.36	9.50±0.34	12.0±0.63	15.0±0.71	41.754	0.0000
Liver	11.00±0.51	12.40±066	13.43±0.33	15.46±0.63	9.6750	0.0004
Kidney	8.00±0.25	9.33±0.23	13.23±0.33	16.0±0.49	157.0635	0.0000
Muscle	5.16±0.60	7.00±0.36	7.30±0.33	8.66±0.42	10.6265	0.0002

Values means ± of 6 individual observations. Values in parenthesis indicates % change over control.

Fig -3. Total lipid content in selected tissue of rat(Albino wistar) exposed to sub lethal of potassium dichromate

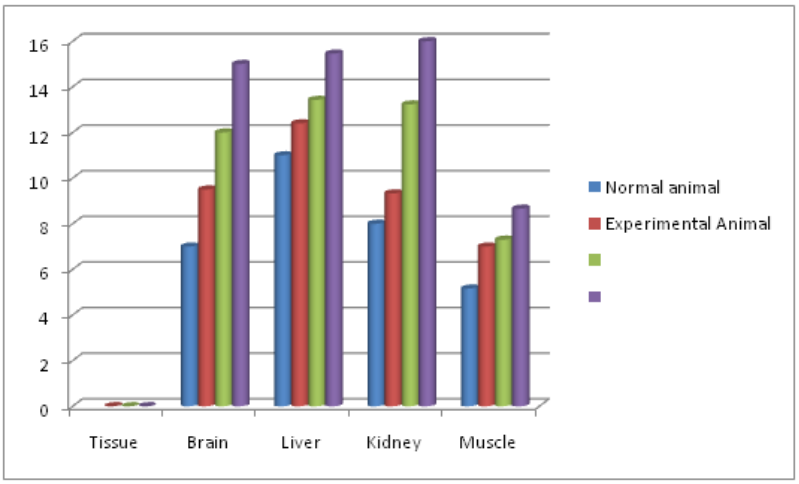
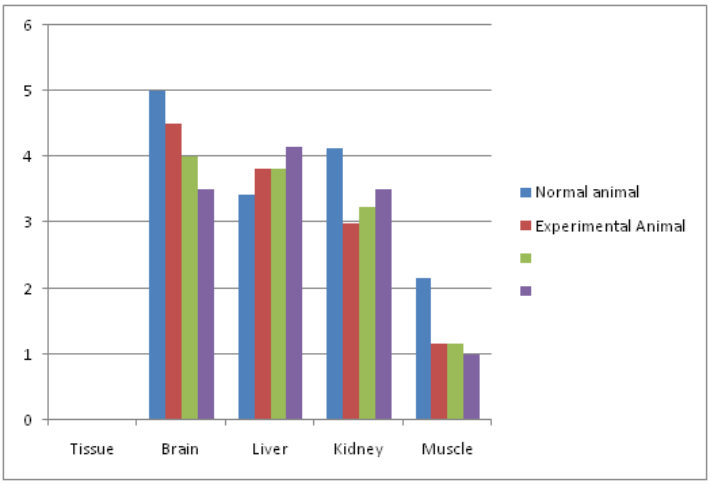


Table -4. Total fatty acid content in selected tissue of rat(Albino wistar) exposed to sub lethal of potassium dichromate.

Tissue	Normal animal	Experimental Animal			F Value	Probability Value
		15-Days	20- Days	30- Days		
Brain	5.00±0.36	4.50±0.22	4.00±0.36	3.50±0.22	4.5435	0.0138
Liver	3.43±0.30	3.83±0.30	3.83±0.16	4.16±0.16	0.4545	0.7170
Kidney	4.14±0.30	3.00±0.16	3.24±0.16	3.50±0.22	1.4815	0.2498
Muscle	2.16±016	1.16±0.16	1.16±0.16	1.00±0.00	13.665	0.0000

Values means ± of 6 individual observations. Values in parenthesis indicates % change over control.

Fig -4. Total fatty acid content in selected tissue of rat(Albino wistar) exposed to sub lethal of potassium dichromate.



Source of support: Nil, Conflict of interest: None Declared

