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Short Communication

Effect of $AlCl_3$ Mediated Toxicity on the Hemato-biochemical Profile of Adult Male Albino Mice

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FI designed the study. MNA, AA and MA conducted the lab experiments and analyzed the data. SF prepared the manuscript.

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ABSTRACT

The aim of this study was to report the effects of $AlCl_3$ mediated toxicity on the hematobiochemical profile of male albino mice. Eight week old male albino mice were used as experimental animals and were divided into two groups. First group was treated with 80mg/Kg body weight of $AlCl_3$ for 16 days while control group was treated with saline solution for the same period of time. Complete blood count were determined in both experimental treatments at the end of dose supplementation. Our results revealed that oral supplementation of 80mg/Kg body weight of $AlCl_3$ for 16 days did not affect ($P > 0.05$) any of the studied parameters of complete blood count. On the other hand, serological parameters like triglycerides ($P = 0.0075$), total proteins ($P = 0.042$) and creatinine ($P = 0.0038$) were significantly higher in treated male mice when compared with their untreated control group indicating the hazardous effects of $AlCl_3$ on blood chemistry of adult male albino mice.

Aluminum is the most abundant metallic element in the earth's crust (Nayak, 2002). It is also found in ionic state in most of plant and animal tissues and also in natural water reservoirs (Jiang, *et al*., 2008; Buraimoh *et al*., 2012). Aluminum enters in human and animals body through respiratory and gastrointestinal tracts (Domingo *et al*., 1993). Aluminum has great potential to be noxious for humans as cement producing factories distribute particulate matters contain, high amount of aluminum and animals and populations living near the factories are exposed to it (Shehla *et al*., 2001). Aluminium is reported to be a powerful neurotoxic element and plays significant role in the deterioration of nerve cells in human brain as well as in experimental animals and can result into Alzheimer's disease like phenotype leading to decline in brain function (Manisha *et al*., 2012).

Although Aluminum is extensively used in food, medicine, tooth paste and a number of other industries including cement, limited information is available in literature regarding its hazardous effects in living systems. Present study was designed to report the effects of $AlCl_3$ mediated toxicity on the complete blood count and selected parameters of serum biochemical profile of male albino mice, if any.

Materials and methods

Eight week old male albino (n=12) mice were orally supplemented with 80 mg $AlCl_3$/Kg body weight, another group (n=12) was orally supplemented with saline solution for 16 days. The blood was analyzed haematologically as well as biochemically.

Complete blood count, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), packed cell volume (PVC), hemoglobin level (HB), total red (TRBC) and white blood cell count (TWBC), total lymphocytes, monocytes, neutrophil count and total platelets count was determined in treated and untreated albino mice by using hematology analyzer FMI- 6180 (Jiangsu, China) following Aslam *et al*. (2015). While serum biochemical parameters such as cholesterol, alanine transaminase (ALT), aspartate transaminase (AST),

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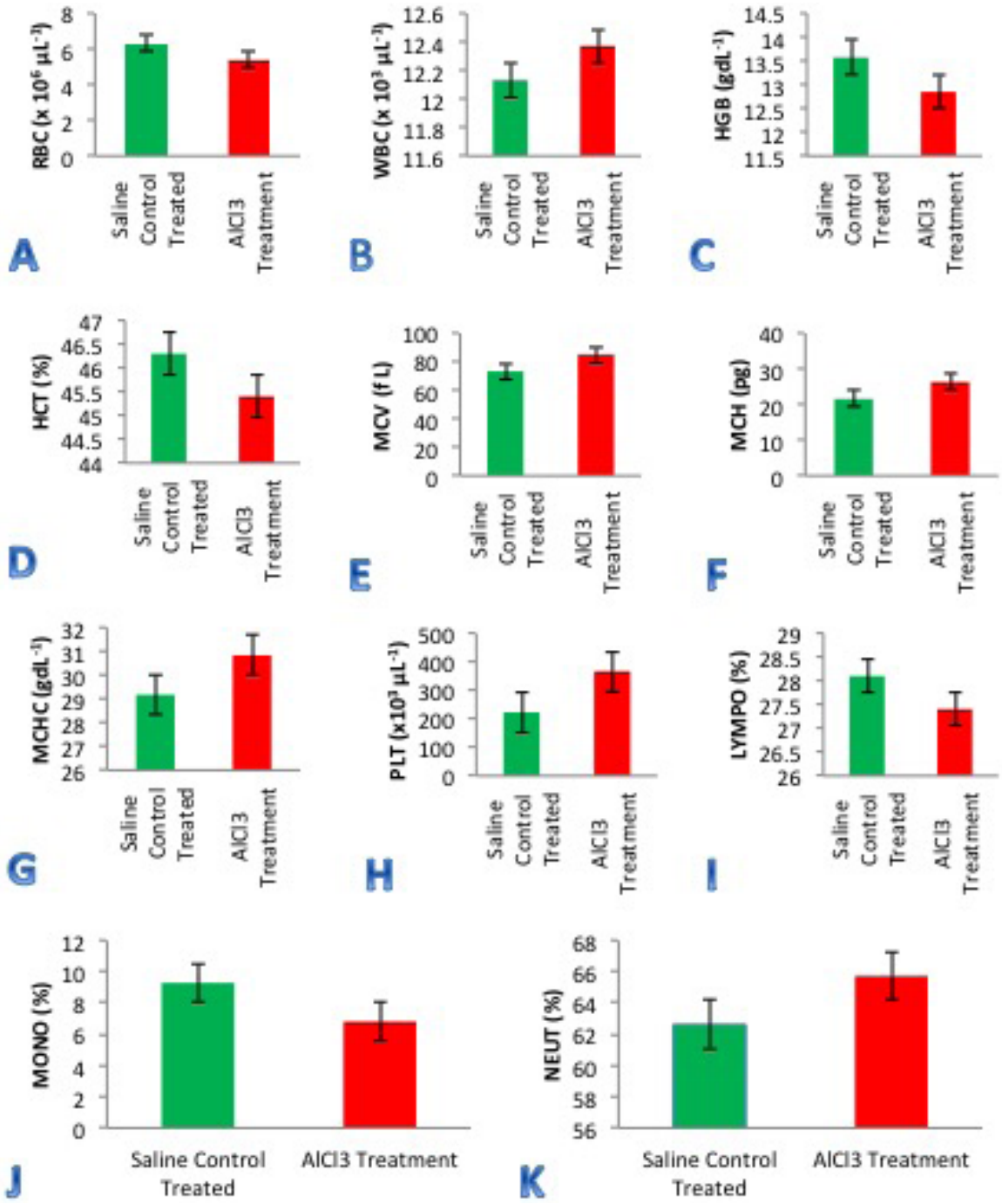

Fig. 1. Effect of $AlCl_3$ administrated to male albino mice (n=6) for 16 days on various hematological parameters such as RBC (A), WBC (B), HGB (C), HCT (D), MCV (E), MCH (F), MCHC (G), PLT (H), LYMPHO (I), MONO (J) and NEUT (K) All values are expressed as Mean ± Standard Deviation. P-value presents the results of 2 sample t-test conducted for each parameter between the two treated groups. $P > 0.05$, non-significant.

total protein, creatinine and triglycerides were analyzed in serum samples by using Hitachi 902 automatic analyzer (Japan) following the instructions of diagnostic kit manufacturers.

All the data is expressed as Mean ± SD Statistical package Minitab (version 17, Pennsylvania) was used for

the statistical analysis of the results. Two sample t-test was used to compare all studied parameters of complete blood count and serum biochemistry between $AlCl_3$ and saline treated male albino mice.

Results and discussion

Figure 1 shows the effect of $AlCl_3$ on complete blood count, whereas Figure 2 shows serum biochemistry of male albino mice.

Analysis of our results indicates that the hematological profile of male albino mice remained unaffected following 16 days exposure to 80 mg/Kg body weight of $AlCl_3$ These findings are contradictory to those reported by Aziz and Zabut (2011) as they observed significant decrease in hemoglobin red blood cells and hematocrit while significant increase in lymphocytes, white blood cells, mean corpuscular hemoglobin, mean corpuscular volume and platelets in albino rats,each weighing 100-120 gm, treated for eight week with 40mg/L AlCl3 as compared to their untreated control group. In another similar study conducted by Manisha *et al*. (2013) it was reported that 100 mg Aluminum exposure for 90 days to old male rats resulted in a significant ($P < 0.05$) decrease in total erythrocyte count, hemoglobin and PVC, while white blood cells were increased significantly as compared to control group.

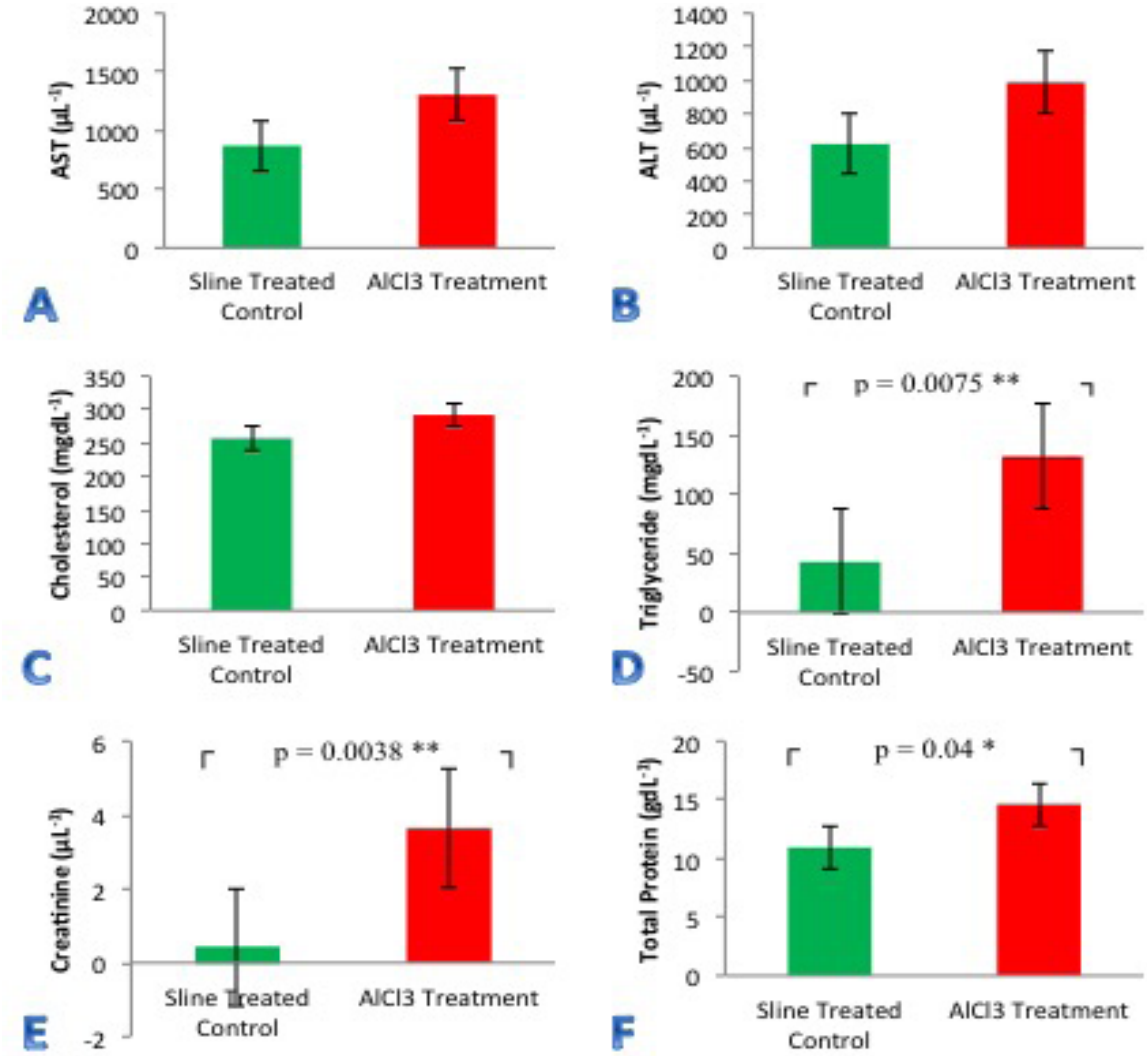

Fig. 2. Effect of $AlCl_3$ administrated to male albino mice (n=6) for 16 days on various parameters of serum biochemical profile such as AST (A), ALT (B), Cholesterol (C), triglyceride (D), creatinine (E) and total protein (F). All values are expressed as Mean ± Standard Deviation. P-value presents the results of 2 sample t-test conducted for each parameter between the two treated groups. $P > 0.05$, non-Significant; $*P < 0.05$, least-significant; $**P < 0.01$, significant.

The differences in the results of compared studies can be attributed to different experimental animals, doses used and their duration of application. Analysis of studied parameters of serum indicated a significant increase in creatinine concentrations in $AlCl_3$ exposed mice (Fig. 2). Increased creatinine concentrations in serum are generally considered as an indicator of abnormal renal function (Szilagyi *et al*., 1994). Our findings are in agreement with the recent report from Majida *et al*. (2014) who has documented a significant increase ($p < 0.0001$) in creatinine concentrations in adult male rats upon exposure to 50 mg/kg body weight of $AlCl_3$ for 60 days as compared to the control group confirming that exposure to $AlCl_3$ results in disturbed renal function in rodents. Aluminum exposure is reported to result in altered total protein levels by indirectly or directly effecting protein synthesis (Goncalves and Silva, 2007). Our results are contrary to the findings of El-Kholy *et al*. (2010) who had reported that Aluminum toxicity of 100 mg / kg body weight for 90 days causes a significant decrease in total protein concentrations in rats compared to control group. The difference in results is probably due to the different exposure time of Aluminum in two studies and probably similar results may be observed in albino mice as well as their exposure time to $AlCl_3$ is prolonged.

Conclusion

$AlCl_3$ administrated orally at 80 mg/ml solvent/Kg body weight did not affect the complete blood count but had drastically affected the serum parameters that are indicator of liver and Kinney functioning indicating disturbed physiology of male albino mice.

Statement of conflict of interest

Authors have declared no conflict of interest.

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