Sindh Univ. Res. Jour. (Sci. Ser.) Vo. 41 (1) 63- 66 (2009)

Sindh Univ. Res. Jour.

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METABOLIC TOTAL PROTEIN INVESTIGATION IN LOCAL INDUSTRY WORKERS EXPOSED TO ACID ANHYDRIDES

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(Received 6th April 2009 and Revised 8th May 2009)

Abstract

Organic acid anhydrides (OAAs) are low molecular weight industrial chemicals widely used in all of the main industries. Hyderabad is an important commercial center where industry is booming in and around the city including; Textiles, plastics, dyes, paints, adhesives and pesticides. In the before mentioned industries, use of most reactive organic acid anhydrides is common such as; Phthalic Anhydride, Succinic Anhydride, Maleic Anhydride, Trimellitic Anhydride and Acetic Anhydride. Studies show that Anhydrides are irritants and potent inducers of Asthma, Rhinitis, Allergy and even Cancer (Moller *et al.*, 985; Nielsen, 1992 and Venables, 1989), but still metabolic Protein studies have not been carried out before to differentiate between the workers and healthy subjects. This study is especially made to investigate differences in the workers, clinically and Metabolically. Total proteins and serum albumins were determined from the intravenous blood samples of the control group and exposed workers from one of the major local industries. The study will be useful for both, the industries and clinicians to safeguard the human health by treating these exposed workers to lead their normal lives.

Keywords: Organic Acid Anhydrides, Allergy, Total Proteins.

1. Introduction

Low molecular weight compounds like Organic Acid Anhydrides (OAAs) arehighly allergenic, commonly used in the industries that can cause occupational asthma and sensitization**.** Since Hyderabad is a major industrial center where; textile, plastics, dyes, Paints, adhesives and pesticide industries are located, in which organic Acid Anhydrides are widely used such as; Phthalic Anhydride (PA), Succinic Anhydride (SA), Maleic Anhydride (MA), Trimellitic Anhydride (TMA) and Acetic Anhydride (AA). All these are contributing harmful effects to occupational hygiene and causing adverse health effects such as airways and skin diseases in exposed workers**.** The major clinical effects includes asthma, conjunctivitis, rhinitis, allergy and skin reactions (Drexler *et al*., Nielsen and venables, 1989)**.**

The organic acid anhydrides (OAAs) conjugate with endogenous proteins forming protein adducts of Hexahydophthalic anhydride (HHPA) and Methylhexahydrophthalic Anhydride (MHHPA) in human plasma were reported. In many workers specific Immunoglobulin IgE antibodies induced againstconjugates between an anhydride and Human serum Albumin (HSA) of protein adducts of allergenic compounds.

Protein is found throughout in all physiological systems and has got unique position in metabolism. Most plasma apolipoproteins and endogenous proteins like Serum albumin are synthesized in the liver. The presence of proteins in the liver can even utilized for other tissues such as the brain. Further, the

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metabolic disorders of plasma Albumin may even lead to renal failure especially nephrotic syndrome. Protein adducts of allergenic anhydrides have been reported on different proteins like human serum albumin (HAS) and Hemoglobulin (Hb**)** in exposed workers The OAAs Pose risk to human health by acting as haptens and binding to endogenous proteins is an important factor to occupational hazards towards exposed workers**.** However, the measurement of total protein is therefore a useful approach for investigation of the effect of metabolic changes and biomonitoring indicating the presence of particular disease in the exposed worker.

The aim of current study was to measure the total protein and serum albumin using a micro protein determination by kit method from Merck diagnostics (Germany) which can be used as biomarker behind the induction of various diseases in exposed workers**.** This suggests that role of protein is potential to trigger the dual allergenic problems with anhydrides adducts they give rise to. However, further investigations in this are needed.

2. Materials and Methods

To measure human serum albumin (HSA) and Total protein in the blood serum Microlab 300 were utilized to quantities of exposed industrial workers compared with healthy controls. The intravenous blood (10 ml) 15 samples each for industrial workers and healthy subjects were collected and made to clot before serum was separated by centrifuging at 5000 r.m.p for about 20 minutes. This serum was collected and stored at 40 °C prior to analysis by kit method. All standards used were of analytical grade Merck (Germany) on Microlab 300. The diagnosis was confirmed 15 industrial workers in each group exposed to Organic Acid Anhydrides (OAAs) and 15 healthy controls were included for comparison Purpose. The Clinical data on industrial and healthy group are shown in **(Table –1).**

Table-1. Clinical Data of Controls and Industrial workers .

Patients	n(male)	Age(Mean)
Control	15	37.8
Industrial Workers	15	36.6

Ethics:

Permission for the human study was obtained from the humans gave their samples by their own will.

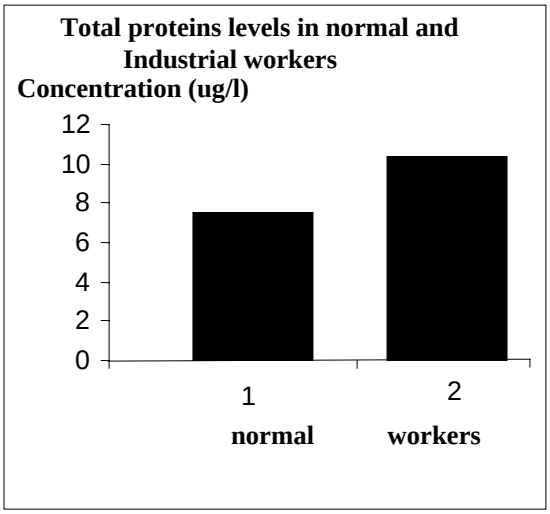
3. Results and Discussion

It has been found that more than 60 % of exposed workers may develop Irritative and allergic symptoms due to Type-1 allergy. (Nielsen *et al.,* 1994) From a decade ago, the highest exposure levels have been found with anhydrides in Solid form during different industrial processes, since during heating their vapors and sublimates have been found in the work place. The results from this study suggests that typically By inhalation exposure carried out for 6-8 hrs daily for few days can even induce respiratory problems in exposed workers. During the first three weeks of exposure of organic acid anhydrides (OAAs) can cause sensitization and allergenic symptoms Including dyspnoea, cough, sneezing, skin irritation and rhinorrhoea at high exposure Levels. Regarding Total protein, industrial workers have been shown to have high serum Total protein levels as compared with control subjects as shown in the **(Table.2)** and by **(Fig. 1).**

Table-2. Levels of total serum in healthy controls and Industrial workers. (All values are expressed as Mean± S.D).

Total protein	Normal persons (Mean± SEM)	Workers (Mean± SEM)
n (Male)	15	15
Mean	7.45 ± 0.654	10.4 ± 1.296

Fig. 1. Graphic representation of total protein



It is even observed that the Serum Albumin (SA) levels significantly and progressively increased in case of exposed organic acid anhydrides workers, While in controlled study shows the decreased concentration as shown in **(Table. 3**) along with **(Fig. 2).** compared with industrial workers.

Fig. 2. Graphical representation of mean.

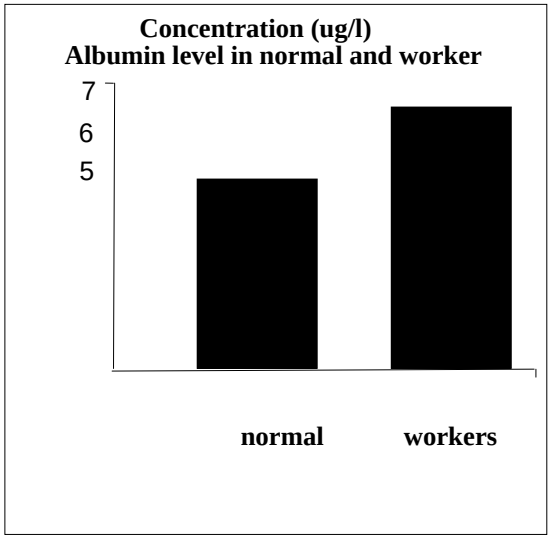


Table: 03 Levels of Albumin in healthy controls and Industrial workers. (Note: All values are expressed as Mean ± S. D).

Albumin	Normal persons (Mean± SEM)	Workers (Mean± SEM)
n (Male)	15	15
Mean	4.446 ± 0.589	6.52 ± 0.696

4. Conclusion

The major organic acid anhydride adducts corresponded to Serum Albumin (SA) in elevated form which may indicate that the adduct mainly originate from the blood. This Would be an interesting finding since protein conjugates with organic acid anhydrides That is the main allergen lead to metabolic disorders and some other diseases in exposed Workers. Moreover, abnormal protein functions as represented was observed more frequently in workers with over exposure. The investigation further suggests to improve the occupational hygiene conditions probably would have positive effects upon the sensitized people at work atmosphere.

5. Acknowledgement

The excellent technical assistance and support was given by Dr. A. B. Ghanghro Institute of biology and Dr. Ghulam Ali are gratefully acknowledged at University of Sindh, Jamshoro. Special thanks to Mr. Abdul Aziz Mastoi for collection of blood samples of industrial workers and healthy controls.

This work was supported by grants from Higher Education Commission (HEC), Islamabad, Pakistan.

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