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IMPACT OF ENDOTOXIN ON PHYSIOLOGICAL RESPONSES OF RAT EXPOSED TO TEXTILE ENVIRONMENT.

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ABSTRACT

Occupational health hazards among people exposed to various types of organic and inorganic dusts are known for centuries. Industrialization has led to operating of machines in enclosed spaces and handling of synthetic and natural fibers on such machines creates a new microenvironment.

Cotton textile industry is the single largest industry employing lacs of workers, but the powerloom sector of this industry is operating with adverse working conditions without any research or innovation.

The animal model rat has been developed by our laboratory to study effects of occupational stresses and hazards on exposure to textile environment.Serum protein profile showed increase α and β- globulins and decreased total proteins and albumin level. Agglutination assay shows C-Reactive protein. The present findings suggest extrapulmonary activity of inhaled particles in the textile environment besides the pulmonary effects.

Keywords: serum proteins, C-Reactive protein, animal model, textile environment, endotoxin

INTRODUCTION:

Occupational health hazards among the person exposed to different organic dust have been known for many centuries with industrialization the handling of cotton by machines in enclosed spaces created a new kind of microenviromnent that seems to affect the health of the exposed workers.

Recently attempts have been made to simplify terminology used to describe reactions to various types of dust exposure. It has been well established that, exposure to cotton, flex, or hemp dust is also associated with health hazards. Historically, these health hazards have been categorized as the response to either single to multiple exposures, mill fever may occur following the first exposure to relatively high dose of cotton dust [1-2] this Febrile and Flu like response is not present after repeated exposures. Chronic exposure can result in byssinosis.

Textile industry in India holds the International repute of being the third largest producer of textile only next to USA and Japan. It is one of the biggest source of our country's economic development and contributes substantially by earning valuable foreign

Powerloom sector is one of the important but unorganized parts of textile industry. It is well dispersed in the country but mainly aggregated in three states Maharashtra, Gujarat and Tamil Nadu and subsequently in, another states like West-Bengal, Punjab, Uttar Pradesh. In Maharashtra, Bhivandi, Malegaon and Ichalkaranji are the three biggest powerloom centers. Powerloom industry occupies key position in economy of the state. Though cotton textile industry at Ichalkaranji constitute the largest single industry employing over 2 lakhs of workers, very less attention has been aid to health status and safety of powerloom workers [3]. It is important to note that, it is the only sector of textile the industry which is running without research or innovation of any kind.

To fully investigate the nature of health hazards and Physiological reactions to cotton dust, its dose dependence and the time course, mechanisms governing these reactions, and

etiological agents in the cotton dust, an animal model predictive to human response has been developed. The animal model has been developed with the view that it will mimic febrile and pulmonary reactions of human to cotton dust inhalation. This model has been useful in identifying the nature of endotoxin(s) which are major etiological agents. The model was also useful to test feasibility of proposed preventive measures that remove endotoxin from bulk cotton by suitable treatment. This study was also instrumental in the growing scientific awareness that acute and chronic reactions to cotton dust which has the common basis with regard to etiological agents and mechanism of disease development.

MATERIAL AND METHODS:

Experimental Animals –

The animals used for research were adult male albino rats (*Rattus norvegicus*) weighing about 220-250 gms. The rats were kept in metallic cages with enough space for free movement and kept in animal house which has sufficient ventilation and light. The temperature of the room was maintained at 25^0C $+2^0$C. The cages were cleaned everyday and the husk beds replaced after cleaning. The animals were fed standard pellet feed and water *ad libitum.* All experimentation was done using INSA- ethical guidelines for use of animals in scientific research.

The rats were divided in to two groups, control group and exposed group. The exposed group consists of 4 sets, with 3 rats/set. The sets were labeled as R1,R2, R3 and R4, and as per the period of exposure as E1, E2, E3 and E4. The rats of all 4 sets were exposed to cotton dust in powerloom sector, the exposure schedule were as follows,

EXPOSURES

Set-I rats were exposed to cotton dust in powerloom sectors for 1 day, for a period of 6hrs /day. Set –II rats were exposed to cotton dust in powerloom sectors for 2 days 6hrs/day

Set-III rats were exposed to cotton dust in powerloom sectors, for 3 days 6hrs/day

Set-IV rats were exposed to cotton dust in powerloom sectors for a period of 6hrs/day, 3 days and 15 days recovery following exposure (To study the effect of recovery).

Sacrifice Procedure-

The rats of control group and exposed groups were sacrificed by cervical dislocation. dissected, the blood collected for hematological and serological studies.

Quantitative Estimation of Serum Proteins:

Serum Proteins were estimated by Biruet Method.

CRP estimation: CRP was estimated by Latex agglutination method.

Serum protein Electrophoresis: Serum protein electrophoresis was carried out by cellulose acetate membrane electrophoresis technique cellogel (CAE)

RESULTS:

The animal model rat was exposed to cotton dust and associated endotoxin(s) in powerloom sector in 4 sets and the results obtained were compared with that of control rats. The results obtained were as follows. Fig-1 and Fig.2 show the control and Test serum protein electrophoresis profile indicating significant alterations in the serum proteins composition in all sets on acute exposure. Increase in α and β- globulins and decrease in total proteins and albumin level were observed . The CRP was moderately positive in sets I, and positive II and III respectively. (see Table No. 1)

CRP is a phagocytosis promoting factor and its synthesis is promoted by injection of endotoxin, in experimental animals, Hurliman et al.(1960) [4] CRP has been reported to inactivate the enzyme enolase in neutrophils and to ultimately inhibit respiratory burst. In turn the neutrophils can influence the status of liver, [5]. Similarly

significant alterations in liver structure and function has been observed. [7].The experimental data of present study indicates several structural and functional changes in the body of rats exposed to powerloom sector[6-10]

The significant aspect of the present investigation is that the animal model developed in our laboratory is found to mimic the physiological responses of human to cotton dust inhalation. This model is found to be useful in identifying the nature of occupational hazards in textile environment and the nature of etiological, agent responsible for health hazards. The present study is useful for growing scientific awareness that, reactions to cotton dust which, have a common basis with regard to etiological agents and mechanism of occupational diseases development.

CONCLUSION:

In Textile industry, several hazardous conditions exist, which synergistically affects the health and comfort of the workers ultimately decreasing the work efficiency and hence productivity. It is necessary to monitor the occupational environment and health status of the workers periodically. It is also necessary to create awareness regarding the ill effects of industrial hazards. The animal model developed helps us a lot to access the status of environment in industries.

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Fig.1Control

Fig.2 Test

Serum protein electrophoresis pattern showing,
Fig. 1- Normal profile of albumin, alpha1- globulins, alpha2- globulins, Beta- globulins and Gamma- globulins.
Fig. 2- Dysprotemic profile of albumin, alpha1- globulins, alpha2- globulins, Beta- globulins and Gamma- globulins.

Sr. No	Serum protein(Latex test)	Control	Set-I	Set-II	Set-III	Set-IV
1.	C-Reactive protein (CRP)	Negative	Slightly positive	positive	positive	Negative
2		Negative	Slightly positive	positive	positive	Negative
3		Negative	Slightly positive	positive	positive	Negative
4		Negative	Slightly positive	positive	positive	Negative
5		Negative	Slightly positive	positive	positive	Negative

Table. No. 1: C-REACTIVE PROTEIN CHANGES IN RATS EXPOSED TO POWERLOOM ENVIRONMENT