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Studies the Role of *Aloe Vera* Extract In Prevention of Cadmium Induced Pathogenicity in Thymus of Albino Rat

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The present study is focused on the *Aloe Vera* extract in prevention of Cadmium induced Pathogenicity in the thymus. The healthy rats of both sexes were divided into 4 groups. Chronic exposures to Cadmium Chloride produce marked histological alteration in thymus both at cellular and subcellular level. Chronic exposure of Cadmium Chloride induced atrophy of thymus with decreased corticomedullary ratio. The lymphocyte population showed reduction and mesenchymal reticular cell were present dominantly. In most, the nuclear material was disintegrate and scattered all over the nuclear area and most of the Cytoplasmic Organelles were damaged.

The thymus of rats given with the *Aloe Vera* extract only showed better histological details in comparison of control group. Aloe extract given along cadmium chloride significantly subsided the severity of pathogenicity and cell organelles showed regenerative changes.

Keyword: Cadmium Chloride, Ultra Structural Changes, *Aloe Vera*, Thymus.

1. Introduction

Known since the beginning of recorded history *Aloe Vera* is widely accepted in many cultures. Rig-Veda, one of the earliest books on the subject of the natural medicine highlighted the usefulness of Indian herbs.

Aloe Vera is a principal, drought resistant succulent Plant belongs to the family of liliaceae. The plant has a stiff gray lance shaped leaves containing gel in central mucilaginous pulp and outer thickened dark covering.

Pharmacological studies showed that the active ingredients and concentrated in both the gel and rind of *Aloe Vera* leaves. It has about 96% water and contains 200 active ingredients and 75 nutrients (amino acid, oil, minerals, vitamins, enzymes, carbohydrates, folic acid, Iron etc). Clinical evaluation has revealed that *Aloe Vera* play important role in prevention of large no of disorders.

Contribution of metal in shaping civilisation is well known and they also play significant role in differing biological process. C, N, O, S, P, Na, K and ca are required in bulk while Se, Fe, Mg, I, Co, Ni, Ck, Zn, Cr, V, mo are essential and needed in traces, While Hg, Cd, Pb, As etc. finding their way in living system through air, water and food.

Major sources of heavy metal emission include fossil fuels, combustion, mining, metal and smelting. Cadmium is a toxic heavy metal belongs to the same family as Zinc. It occurs in close association with other metallic Ores of Copper and lead discovered in 1817.

The heavy metal cadmium and its salt can exert toxic effect in organism at tissue, cellular and sub cellular and molecular level. The primary goal of the study is to investigate the role of *Aloe Vera* extract in prevention of cadmium induced pathogenicity in thymus organ in rats.

2. Material & Method

I. Experimental Animal: Rat is selected as an experimental animal because it is easy to handle and maintain, share's houses and diet. They have similar structure and functional changes in the relevant organ of human being.

II. Preparation of Aloe Vera Extract: 100 gm of fresh *Aloe Vera* leaf will be grinded in 100 ml of double distilled water in tissue homogeniser and filtered, stored in refrigerator.

III. Toxicant Used: Inorganic salt of analytical grade, Cadmium Chloride is selected as the toxicant for this study. Stock solution have been prepared by dissolving 1 gm of cadmium chloride in 1 litre of double distilled water and from the stock solution measuring quantity of cadmium will be added separately in the drinking water.

IV. Treatment: Rats were divided into four groups of each eight rats in each group.

Group I: 500 ug CdCl₂/kg body weight in drinking water for 30 days.

Group II: 500 ug CdCl₂/kg body weight + 2 ml *Aloe Vera* extract for 30 days

Group III: 2 ml *Aloe Vera* extract for drinking water for 30 days.

Group IV: 500 ug sodium Chloride / kg body weight in drinking water.

3. Histopathological Studies

- A. Light Microscopic Studies
- B. Electron Microscopic Studies

A. Light Microscopic Studies: for this rats from the experimental and control group were sacrificed and thymus tissues were taken out, washed in 1% saline solution to remove the mucus and blood deposits. Cut the tissue in pieces and were fixed immediately in 10% buffered natural formalin and alcoholic bowin's

fluid for 12 hours. The tissue is then washed to remove the traces of formalin and yellow colour of picric acid.

After dehydration the sample were cleared in xylene and embedding in wax (M.P. 58-60 C) Section of 5-6 u in all the tissues were cut and stanning is carried out.

B. Electron Microscopic Studies: to find more Changes in thymus tissues will be processed by histological techniques for election microscopy.

4. Observation

4.1 Normal Histology of Thymus: The thymus is bilobed organ that lies just above the heart. Each lobe is surrounded by capsule and is divided into lobules which are separated from each other by trabeculae. The lobule is organised into two outer and inner (Cortex and Medulla). Both Cortex and Medulla of the Thymus are criss crossed by three dimensional stromal Cell network consisting of epithelial, dendritic cells and macrophages which form the frame work of the organ and contribute to growth and maturation of thymocytes.

The function of thymus is to generate Cord and T-cell that will protect the body from Injection.

4.2 Cadmium Induced Histopathological Changes in Thymus

Exposure of Rats to Cadmium (500 ug/kg) for 30 days resulted into a starry sky appearance of thymus. Extensive loss of lymphocytes from the Cortex was quite evident.

In this thymic tissue apoptotic nuclei and cytoplasmic vacuolation was notices in all types of cell. Some plasma Cells were also visible in the thymus. At the Sub cellular level, there were thinned lesions of nuclear membrane but the abnormalities were most seen in Cytoplasm. The Golgi apparatus was swollen. The number of swollen mitochondria which have double membrane but loss of cristae. Cytoplasmic vacuolation is increased and accumulation of fat in globus were also found. There is an extensive dilation of Endoplasmic reticulum was well marked. At the sub- cellular level, the nuclear material was disintegrated and scattered all over

the nuclear area. Degree of reversal of treated rats received. degenerative changes in thymus of cadmium

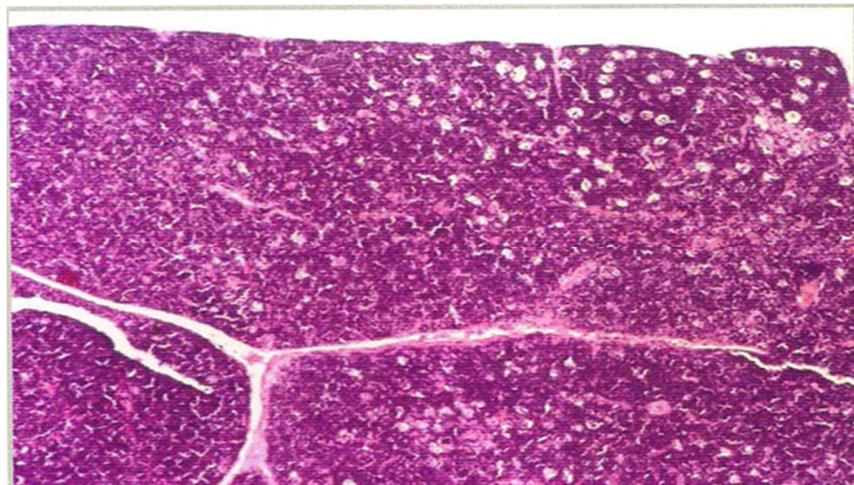


Fig 1: T.S. of thymus of control rat showing normal histoarchitecture. H/E Stain, X-100

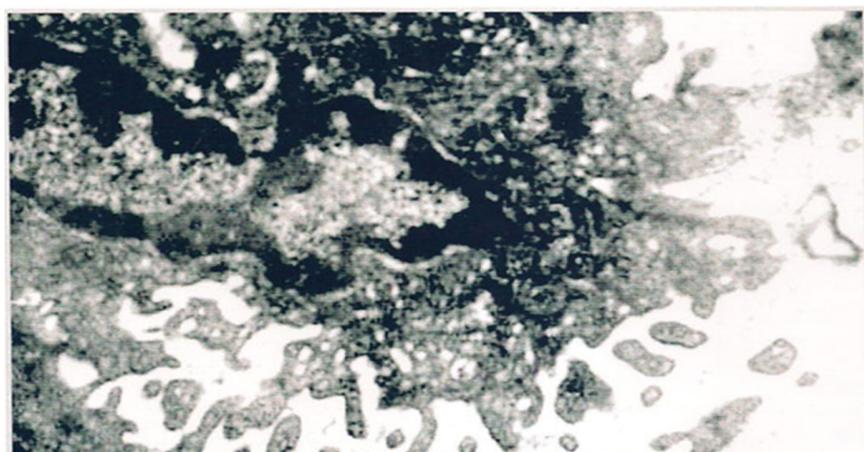


Fig 2: Exposure to 500 ug/kg b.w. of cadmium chloride for 90 days produced severe degenerative changes as revealed by fragmentation and budding off the cellular debris of a thymus cell. X-17200

5. Discussion

Human as well as domestic and wild animals are vulnerable to the higher level of heavy metal pollutants. These heavy metals are within the body through blood circulation, they reach to different organ accumulate there and produce toxic effects causing severe health hazards.

Among heavy metals, Cadmium exposure is ubiquitous in the environment. Low level of Cadmium produced no apparent toxicity but being the cumulative poison, it produces significant changes in various tissues / organ in long term exposure. AT cellular level, they

causes abnormal reproduction, differentiation and maturation. They also affect the permeability of Cell membrane and disturbs the energy metabolism (Lucky and Venu Gopal, 1977). After Chronic exposure Cadmium was found as black precipitate of its sulphide mainly in the lymphoid cell of cortex in thymus.

Aloe Vera extract administration reduced the intensity of precipitate. Cadmium was found localised chiefly in nuclei of most of the lymphocyte and reticular cells of lymphoid organs of rats. The doses of 500 ug/kg body weight was chosen for the study because they gave no apparent clinical signs of cadmium poisoning. It was found that actual thymic weight was decreased in rat but no marked weight gain or loss in rats administered with *Aloe Vera* extract.

Thymus was the 1st lymphoid organ that show morphologic alteration when exposure to cadmium. The decrease in size was 1st sign of toxicity. Cadmium induced atrophy of thymus as a result of lymphocyte depletion in the cortex. Some of the epithelial reticular cells undergoes cytoplasmic vacuolation with the elevation in nuclear and cytoplasmic densities. The Cortico medullary junction become indistinct and cell population mainly consistent of epithelial and mesenchymal reticular cells after being exposed to 500 ug/kg Cadmium for 30 days. In the thymic tissue, presence of apoptotic nuclei and desquamation of cells in the cortical region. Hence heavy metal toxic cadmium acted as a Cumulative poison. It is concluded that day to day exposure to cadmium effect on structure and functions of thymus. *Aloe vera* Extract of Supplementation to cadmium treated animals resulted in normalisation of cellular architecture of immune organs as revealed by highest degree of regenerative changes in the stimuli.

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7. References

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