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Role of *Aloe vera* extract in prevention of cadmium induced histoarchitecture changes of lymph node in albino rat

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Abstract

The present study focused on the role of aloe vera extract in prevention of cadmium induced pathogenicity in lymph node of albino rat. Healthy and two month old rats of both sexes were divided into four groups. Rats of I group were given 500 µg cadmium chloride per Kg body weight in drinking water for 30 days. Rats of II group were given extract of Aloe leaves 2 ml per day for 30 days. Rats of III group were treated with 500 µg/kg body weight of cadmium chloride along with 2 ml of Aloe extract. Rats of fourth group served as control. Chronic exposure of cadmium chloride produced marked histological alteration in lymph node both at cellular and subcellular levels. Light microscopic study revealed a number of histopathological changes in lymph node of rats of I group. There was extensive degeneration of cells in the cortical and paracortical regions of lymph node that resulted into the reduction in size in cadmium treated rats. At subcellular level, ultrastructural changes were swelling of mitochondria, increase in the number of free ribosomes due to detachment from RER, and nuclear fragmentation in most of the lymphocytes. Lymph node of rats given with aloe vera extract only showed better histological details in comparison of rats of control group.

Keywords: Cadmium chloride, ultrastructural changes, Aloe vera, Lymph node.

1. Introduction

Man has created a rapidly growing industrial base shaping advanced material to meet his needs that requires a high input of energy and resources with consequent increase in pollution. The heavy metal can exert toxic effects in the organism at a large number of biochemical sites and inhibit a number of enzymes. Cadmium is a toxic heavy metal belong to family same as zinc and mercury. It exist in close association with other metallic ores of copper and lead. It may also occurs in fumes from smelting of the metals.

Aloe-vera known as "plant of immortality". It is perennial, drought resistant succulent plant belongs to family liliaceae. The plant has a stiff grey-green lance shaped leaves containing clear gel in central mucilaginous pulp and other outer thickened dark covering. The plants has about 96% water and contain 200 active ingredients and 75 nutrients including essential oil, amino acid, minerals, vitamins, enzymes and glycoproteins. The heavy metal and its salts can exert toxic effect in organism at tissue, cellular and subcellular level. The primary goal of the study is to investigate the role of aloe-vera extract in prevention of cadmium induced pathogenicity in lymph node.

2. Material and Method

Experimental animal- Rat is selected as an experimental animal because it is easy to handle and maintain share house and diet.

Aloe-vera extract preparation- 100 gm of fresh aloe-vera leaf will be grinded in 100 ml of double distilled water in tissue homogenizer and filtered, stored in refrigerator.

Toxicant used- stock solution of has been prepared by dissolving 1 gm of cadmium chloride in 1 liter of double distilled water.

Group I – 500 µg cd cl₂ /kg body weight in drinking water for 30 days.

Group II – 500 µg cd cl₂ /kg body weight + 2 ml aloe-vera extract for 30 days.

Group III- 2 ml aloe-vera extract for 30 days in drinking water.

Group IV- 500 µg sodium chloride 1 kg body weight in drinking water.

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3. Histopathological Studies

a. Light microscopic studies: for this rats was sacrificed and lymph node tissue were taken out, washed in 1% saline solution to remove the mucus and blood deposits. Cut the tissues in pieces and were fixed immediately in 10% buffered natural formalin and Bowin's fluid for 12 hours. After dehydration the sample were cleared in xylene and embedding in wax.

b. Electron Microscopic Studies: To find more changes in lymph node tissue will be processed by histology techniques for electron microscopy as per standard methods.

4. Observation

1. Lymph Node -lymph node were encapsulated structure dispersed throughout the body. It consist of capsule and trabeculae, cortex, medulla, lymph vessels and sinuses. The capsule consisted of collagen and reticular fibers with a few scattered elastic fiber. The lymphoid parenchyma between the trabeculae was supported by a three dimensional network of reticular fibers in which reticular cells, lymphocytes, macrophages and plasma cells were enmeshed. The cortex is a dense mass of lymphoid cells. I was made up of lymphatic nodules some of which appeared fairly homogenous consisting of small B lymphocyte. Other may have light cellular centre surrounded by a dark rim of small B lymphocytes. This was the germinal centre. The primary nodules and germinal centre together comprise the outer cortex. The medulla was the central continuation of paracortical part of the cortex and was composed of T- lymphocytes. The medulla consist of a network of reticular fibres and reticular cells, small lymphocytes mature plasma cells and macrophages. The ultrastructure of capsule showed that it contained fibroblasts and central nucleus. The lumen of subcapsular sinus contained macrophages, small and large lymphocytes, mast cell and plasma cells.

2. Histomorphological changes in lymph node- Chronic poisoning of cadmium chloride 500 µg/kg body weight for 30 days to rats produced significant alteration in the lymph node. The capsule of the lymph node ruptured at places. Follicle become indistinct and pyknotic nuclei with apoptotic bodies were observed. Poikilocytosis was observed in the cells of cortical region. The macrophages showed elevation in their number. Ultrastructurally, widening of space between two unit membranes of nuclear envelope, fragmentation of nuclear material and increase in granular component of the nucleoli were observed. Swelling of mitochondria, loss of cristae with matrix contained electron dense granular inclusions, increase in number of lysosomes, vesiculation of RER were also seen in different cells of lymph node of cadmium treated rats. Coadministration of cold extract of aloe in cadmium treated rats resulted in to dramatic reversal of histoarchitecture of different cells types and their organelles.

5. Discussion

The ability of an organism to respond to foreign material is phylogenetically ancient. Among heavy metal, cadmium exposure have allured the circumspection of toxicologists and environmentalists. Because of health problems associated with this toxic metal. Cadmium is ubiquitous in environment, low level of cadmium produced no apparent toxicity but being a cumulative poison, it produced significant pathological changes in various tissues in long term exposure. At cellular

level it produces abnormal reproduction, differentiation and maturation. Cadmium may affect the permeability of cell membrane and disturb energy metabolism. The cadmium was found localized chiefly in the nuclei of most of the lymphocytes and reticular cell. Aloe-vera extract coadministration reduced the degree of damage in follicular, interfollicular and paracortical areas of lymph node.

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