**Histological Assessment Of Moringa oleifera Ameliorative Activities On Lead Toxicity In The Spleen Of Adult Wistar Rats**

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**ABSTRACT [ENGLISH/ANGLAIS]**

Lead has been described as a most notorious and universal metallic poisoning that produces a wide range of deleterious effects on body tissues especially due to its ability to aggravate oxidative stress and alter or influence the normal activities of ions among others. The investigation explores the potential of moringa oleifera to reduce or cancel the effect of lead poisoning on the spleen - a vital lymphoid organ. A total of 24 adult Wistar rats, aged approximately 12 months were divided into four groups labeled A-D. The Group A animals were administered Moringa oleifera leaf extract only; the rationale being to observe the sole effect of the extract. The Group B animals were exposed to lead poisoning (50mg/kg body weight). Group C animals were administered lead and moringa oleifera leaf extract concurrently (50mg/kg body weight and 100mg/kg body weight respectively). Group D animals were first exposed to lead intoxication for half total time of treatment and treated with moringa leaf extract for the second half (50mg/kg body weight for lead and 100mg/kg body weight for moringa). All treatment lasted 30 days and the animals were sacrificed by cervical dislocation. The spleen was excised from each animal and processed using the routine Haematoxylin and Eosin staining technique. Photomicrographs were obtained and analysed. Lead exposure or intoxication produced deleterious effects that include reduced sizes of the splenic pulps and consequent increase in the size or area of the connective tissue cords. Moringa oleifera leaf extract at the dosage and duration of treatment employed produced both preserving and ameliorative or reparative effects.

**Keywords:** Spleen, lead, moringa, toxicity, Wistar rats

**INTRODUCTION**

Lead is a common environmental pollutant which accumulates in almost all body tissues [1], with no known beneficial biological role [2]. Various health problems have been reported following long term ingestion of Lead contaminated drinking water, as lead is the most ubiquitous of the heavy metals constituting environmental pollutants. Prolonged exposure to a sub lethal dose of lead has been associated with altered functioning of various body organs and system including...
the hematopoietic and immune systems [3]. Most orally ingested lead is excreted, but a portion is absorbed and enters the circulation where it binds to hemoglobin in the erythrocyte and is carried through the circulation to other body parts by erythrocytes. Previous reports have shown that lead induces anemia which stems from a number of factors namely, decreased hemoglobin synthesis, increased hemolysis arising from membrane fragility, and increased erythrocyte destruction in the spleen [4]. Erythrocytes recognized as fragile or senescent undergo destruction by macrophages in the red pulp of the spleen [5]. Lead has also been shown to lower host resistance to bacterial and viral infections [6].

The spleen, a secondary lymphoid organ present in all vertebrates, contains phagocytes (macrophages and polymorphonuclear cells) responsible for slowing the propagation of an invading pathogen, while an antigen-specific adaptive immune response is being established. However, lead has been reported to alter normal macrophage function by inhibiting macrophage production of nitric oxide [7]. Moringa oleifera is an exceptionally nutritious vegetable tree with a variety of potential uses. Various parts of the plant such as the leaves, roots, seed, bark, fruit, flowers and immature pods has been reported to act as cardiac and circulatory stimulants, possess anti-tumor, [8] antipyretic, antiepileptic, anti-inflammatory, antiulcer, [9] antispasmodic, diuretic,[10,11] antihypertensive, cholesterol lowering, antioxidant, anti-diabetic, hepatoprotective, antibacterial and antifungal properties [12]. Although Moringa has been reported to have been used traditionally to treat splenic enlargement and necrosis [13], there are few evidences to demonstrate its effect in ameliorating the effect of lead poisoning on the spleen. This study was therefore carried out to investigate the toxic effect of lead on the spleen with a trial to diminish this toxicity using Moringa oleifera leaf extract in animal models.

MATERIALS AND METHODS

A total of 24 adult Wistar rats (n=24), aged approximately 12 months were divided into four groups labeled A-D. The Group A animals were administered Moringa oleifera leaf extract only; the rationale being to observe the sole effects of the extract. The Group B animals were exposed to lead poising (50mg/kg body weight). Group C animals were administered lead and Moringa oleifera leaf extract concurrently (50mg/kg body weight and 100mg/kg body weight respectively). Group D animals were first exposed to lead intoxication for half total time of treatment and treated with moringa leaf extract for the second half (lead dosage: 50mg/kg body weight; Moringa oleifera leaf extract dosage: 100mg/kg body weight). All treatments lasted 30 days and the animals were sacrificed by cervical dislocation. The spleen was excised from each animal and processed using the routine Haematoxylin and Eosin staining technique. Photomicrographs were obtained and analysed using the Accuscope® Digital Photomicrography Set (DN200M).

RESULTS AND DISCUSSION

Moringa administration produced no histologically observable disruptive or deleterious effect to the spleen; especially its pulps and the surrounding and supportive splenic cord. Lead poisoning produced effects on the spleen including the reduction of the white splenic pulp sizes or diameter. (Figures B1 and B2) as indicated by the red double headed arrow. Consequently, the areas occupied by the surrounding and supportive connective tissue splenic cord appear comparatively larger. In B2, the orange arrow indicates a scar-like feature that suggests an area of damaged cells within the pulp. The feature indicated by the green arrows appears to be stretch of fibrous or rather fibrotic tissue which is only characteristic of this particular photomicrograph. The pulp (white) in this group also stains less prominently especially with respect to the eosin dye. Photomicrographs C1 and C2 present a better or preserved histoarchitecture compared to B1 and B2. The pulps are larger; about the same size in the moringa treated group A. They are also prominent. The entire tissue presents no histoarchitectural disruption. In the D1 and D2 photomicrographs, pulps are prominent; almost comparatively clustered or larger.

From the observations; the effects of lead poisoning on the spleen histoarchitecture include reduction of the pulp size and consequently, larger areas of splenic cord. The observations also suggest that the splenic tissue would become fibrotic. This would most likely compromise the normal functions of the spleen as the affected pulps are the parts responsible for the primary functions of the spleen which include destruction of unwanted red blood cells as well as foreign, abnormal or pathogenic cells. Altogether, the immune functions and role of the spleen are most likely limited.

In both cases- whether, moringa oleifera extract was
Figures A1 and A2: Photomicrograph of the spleen of the animal in the group administered moringa leaf extract only at X160 and X640 respectively; pulps are normal and adequate. Figure B1 and B2: Photomicrographs of the spleen of the animal group administered lead only at X160 and X640 respectively; pulps are comparatively smaller with large areas of intermediate cords. Figure C1 and C2: Photomicrographs of the spleen of the animal group administered lead and moringa leaf extract concurrently; pulps present better integrity than those administered lead. Figure D1 and D2: Photomicrographs of the animal group administered moringa after lead poisoning; pulps are prominent.

Legend: RP: Red Pulp; WP: White Pulp; Red Arrows: Indicate Comparative White Pulp Sizes
administered concurrently (Group C; Photomicrographs C1 and C2) or after lead poisoning (Group D; Photomicrographs D1 and D2); the pulps of the spleen were preserved or restored to a large extent. It would be logical- from the photomicrographs observations to state that the pulps were preserved in Group C (C1 and C2) relative to Group B (B1 and B2). However they were, restored in Group D (D1 and D2) relative to Group B (B1 and D2). Though the white pulps appear a little more prominent in the Group D than in the Group C; there is not enough histological evidence to conclude that this might improve the functional conditions of the spleen in Group D over the Group C. Moringa obviously produced preserving and ameliorative effects against lead poisoning in the spleen tissues in this investigation.

The findings from this study are consistent with that of Muselin et al., (2010); they reported that lead toxicity caused splenic necrotic lesions which were attributed to oxidative stress. A decrease in splenic cellularity and white blood cells was also reported in mice exposed to lead during pregnancy and lactation by Sinder et al., 2000.

CONCLUSION
Lead exposure or intoxication produced deleterious effects which include reduced sizes of the white splenic pulps and consequent increase in the size or area of the connective tissue cords. Moringa oleifera leaf extract at the dosage and duration of treatment employed produced both preserving and ameliorative or reparative effects.

REFERENCES

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CONFLICT OF INTEREST
No conflicts of interests were declared by authors.

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