

Histological Effect of Onion, Tea Against Lead Acetate in Some Organs of Sprague–Dawley Rats

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Abstract

The study aimed to investigate the negative effects of lead acetate on the liver and kidneys tissues of male Sprague Dawley rats. It was conducted on 28 male rats of the aforementioned strain. The rats were divided into four groups, including the control group (provided with regular food only), lead acetate group (LD 50), onion group (provided with lead with water and dried onion powder at a rate of 4% with the food) and tea group (provided with lead with water and tea powder at 1% with the food). The results of the current study showed that the control group was a normal marker of hepatocytes (Central Vein, Sinusoid, Hepatocyte) While we note that the results of the T2 group, we find that there is severe damage to the tissues of the liver cells. Through the results of the study, we find the occurrence of a large grouping of lymphocytes and severe congestion. Hepatocytes, the results of the T4 group showed hemorrhage and no accumulation of lymphocytes, as was the case in the results of the T2 group. Regarding the sections of renal tissue, the results of the study showed that the control group had normal tissues as well as parts of the kidneys (Bowmans Capsule, glomerulus, Distal, convoluted tubule, Proximal convoluted tubules), while the renal tissue for T2 suffered from severe hemorrhage and very severe cell damage, and compared with the results of T3, we find that the renal tissue of T3 is distinguished by the presence of partially shrink glomerular and is not better than both T2 and T4 tissues, which are characterized by a clear shrinkage of the glomeruli and the presence of hemorrhage, but with less than T3. Therefore, we find that the best results in terms of therapeutic nutrition for liver cells are T4 (tea 1%) and kidney T3 cells (onion 4%).

Keywords: Lead (Pb) acetate toxicity; Onion; Tea; Kidney; Liver.

Introduction

Pollution with heavy metals includes many aspects of life, such as the soil, which has become very polluted nowadays due to the wrong and unjust use of agricultural fertilizers and urban leaks, as well as pesticides and the extensive exploitation of the soil itself ⁽¹⁾. Air pollution is one of the most dangerous types of environmental pollution, if you compare it with the aforementioned soil pollution, it is the most dangerous in terms of the ease with which pollutants reach the human body directly through the skin, respiratory system and others. In

general, environmental pollution in general and air in particular with heavy metals affects the endocrine glands and organs the vitality of the human body, including pollution with compounds and chemical toxins such as mercury and polychloride and other effects of pesticides and human industrial growth products, as chemical toxins are the most dangerous at the present time among environmental pollutants ⁽²⁾. The widespread use of heavy metals in general and the element of lead in particular in various fields, such as sources of emergency lighting, airport and aviation lights, in addition to its use in the manufacture of batteries, various electronic devices, solar cells and other various devices ⁽³⁾, which made it the most abundant among the environmental pollutants. The danger of the element lead is that it accumulates bioavailable, so it is deadly even at low

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levels in particular for aquatic organisms due to the bioaccumulation property that has negative effects on the physiological functions of the organism (4). Therefore, the negative effects of lead can be mentioned here, as is the case in the nervous system, where lead is considered toxic and badly affects the nervous system, it is also the case in both the immune and urinary systems (as we mentioned earlier in this research). As for the accumulation of lead, it accumulates in the heart and bones, muscles, liver and kidneys (5).

The largest organ in the body in terms of size is the liver, as well as it is the most of the most distinguished internal organs, as we find that most of the compounds that are absorbed in the body pass through the liver, and therefore it is responsible for many vital processes and metabolites in the blood (4%) of total body weight (6, 7). One of the most important vital processes of the liver is albumin production, one of the most important fluid balance factors in the human body, since the increase or decrease in the production of albumin leads to ascites, as well as the process of fluid balance in the blood is closely related to albumin (7). Also, the metabolism of fats and carbohydrates and the processes of regulating these basic components in the body are all among the responsibilities of the liver and its vital processes, we also find that the liver is directly responsible for regulating the levels of glucose in the blood to enable tissues to consume glucose, also the importance of the liver and its relationship to muscles by producing important compounds for muscles such as lactate, alanine. And many of the important vital functions in the human body take place within the liver (6).

The kidneys, like the lungs and the testicles, are considered to be the dual organs in the human and animal body, but at the same time they are unlike the liver, as they do not constitute more than (0.5%) of the body weight in normal cases and are considered the most important parts of the urinary system (6, 7). We also know that the metabolic and biological processes in general in the body result in byproducts, and here the role of the kidneys in getting rid of these wastes in the urine production process (6). It is also good to point out here the importance of the kidneys in regulating blood pressure in addition to the adrenal gland. As for the structure of the kidneys, it generally consists of several parts, the most important of which is the cortex and medulla and

their parts (7).

The fact that herbs were used in ancient medicine and so far, are that they contain important chemical compounds such as antioxidants and many beneficial natural chemical compounds (8). Also, natural chemical compounds as well as nutritional treatments are definitely the best when compared with treatments and industrial chemical compounds, so we worked on using medicinal plants in this study (onions, tea).

Materials and Methods

Animals and general experimental procedure

Because of the seriousness of environmental pollution with lead on one side and the importance of the vital organs referred to above on the other side, and the multiple benefits of plants (onions and tea), as we mentioned in the introduction to the research, it was very important to study the effect of lead on liver and kidney tissues as well as studying the ability of the referred plants to resist The negative effect of lead on the tissues of these important internal organs. This study was conducted in (Tehran University Laboratories), during which 28 Sprague - Dawley males were raised for a period of 60 days. The rats were grouped into four groups. The groups were determined on the basis of the treatment. The control group was distinguished by the fact that no concentration of lead or medicinal plants was added. Rather, it gave freedom to access to distilled water and regular feed, while the second group was provided with regular feed, but lead was added to distilled water within (LD50) dose without any medicinal plant. The regular diet of the third and fourth groups was changed by adding (1%) of tea powder to the fourth treatment, while onion powder at (4%) concentration was added to the diet of the third group, and the third and fourth treatments were also supplied with distilled water containing lead with the same concentration of the second treatment.

Preparation of Histological sections

In the laboratories of Tehran University (Iran - Karaj), liver and kidney tissues were prepared (slides). According to the method (Hammond et al., 1978), tissue sections were prepared and examined for the purpose of identifying the damages caused by lead to the tissues of

the liver and kidneys.

Results and Discussion

The results of the liver showed a clear deterioration in the liver tissue of the treatment rats (T2) (these rats were provided with lead acetate at a concentration of 0.046% with distilled water). One of the manifestations of the deterioration of the liver tissue of this group Figure 1 (b) is the presence of severe hemorrhage in addition to significant atrophy in hepatocyte. With a large grouping of lymphocytes in addition to other obvious changes in Figure 1 (b), as for the therapeutic treatments, it was shown (T3) that (the rats subjected to this treatment were provided with onion powder at a concentration of 4% in addition to providing them with water containing lead acetate) A clear difference from treatment (T2) in terms

of the absence of hemorrhage with congestion and this is evidence of a relative improvement Figure 1 (c). As for the treatment (T4) (the rats subjected to this treatment were provided with tea powder at a concentration of 1% in addition to providing them with water containing acetate. Lead) was the best in terms of liver tissue in the current study Figure 1 (d). We notice through the results the absence of congestion with relatively less bleeding when compared with (T2). As for the lymphocytes grouping, it is very little in the treatment (T4) when Comparison with (T2) and (T3) so the fourth transaction is the closest to the control group Figure 1 (a). We can conclude from the above that the best therapeutic treatments for liver tissue are (T4).

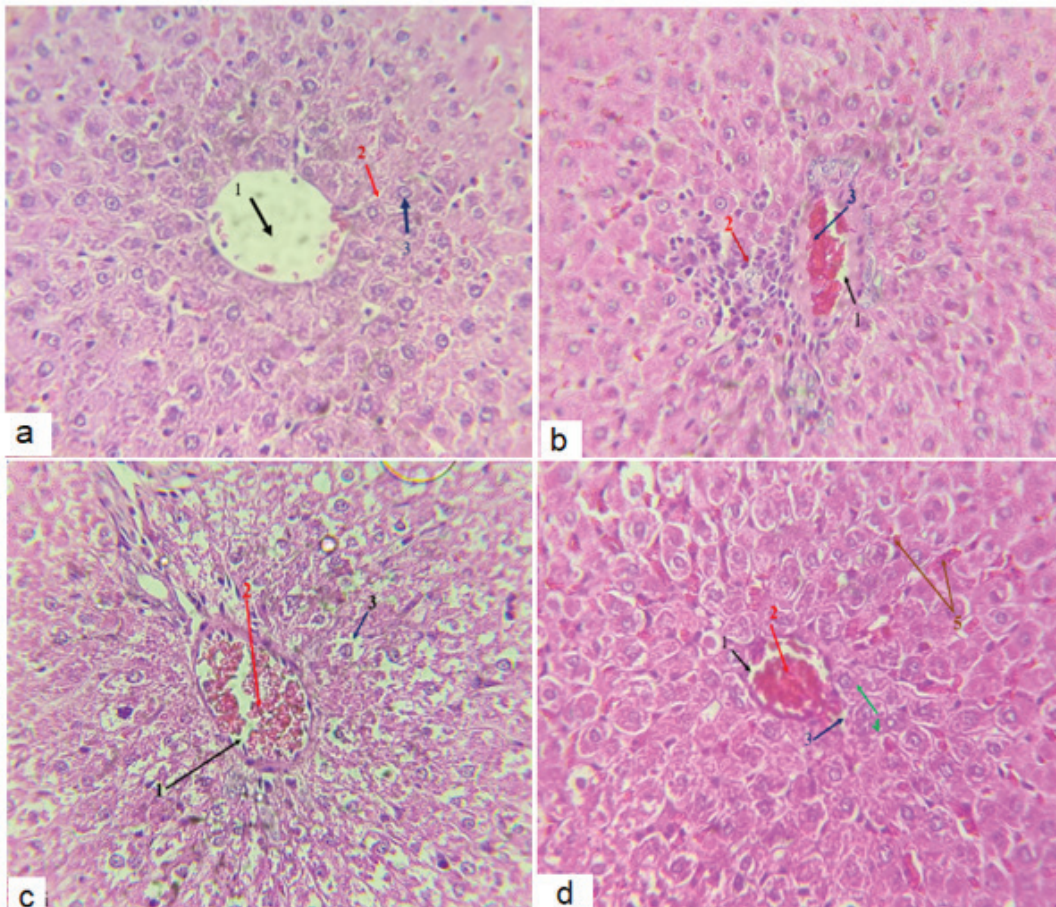


Figure 1- (a) Section of Rat's Liver Control Group show (1 Central Vein, 2 Sinusoid, 3 Hepatocyte), (b) Section of Rat's Liver, Dose 0.046% Pb Acetate, show (1 Central Vein, 2 Aggregation of Lymphoid Cells, 3 Hyperemia), (c) Section of Rat's Liver, Dose 4% Onion against of 0.046% Pb Acetate, show (1 Central Vein, 2 Congestion, 3 Hepatocyte degeneration), (d) Section of Rat's Liver, Dose 1% Tea against of 0.046% Pb Acetate, show (1 Central Vein, 2 Hyperemia of Lymphoid Cells, 3 Sinusoid, 4 Hepatocyte, 5 Hemorrhage). H&E 40 X.

The results of this study also showed significant damage to the kidney tissues, Figure 2 (b) for treatment (T_2). Significant damage and a clear change in the form of (glomerular) was observed, as well as the presence of hemorrhage in more than one site, as well as a general and clear deformation of the histological section, while the results showed (T_4) less than (T_2) damage, we notice glomerular deformation, but it is less than (T_2), meaning the occurrence of shrinkage and not complete damage as in (T_2) and the presence of bleeding much less than the lead acetate group (T_2), either in with regard to (T_3)group, the results of which showed less glomerular shrinkage as well as less hemorrhage if compared to the results of the groups (T_2, T_3, T_4), we will find that the closest thing to the control treatment (1) is treatment (T_3) and this can be seen clearly in the Figure 2 (b),(c) Therefore, we conclude from the above results that the best results are the addition of onion powder at a concentration of 4% against lead acetate (T_3) from the histological point of view of the kidneys.

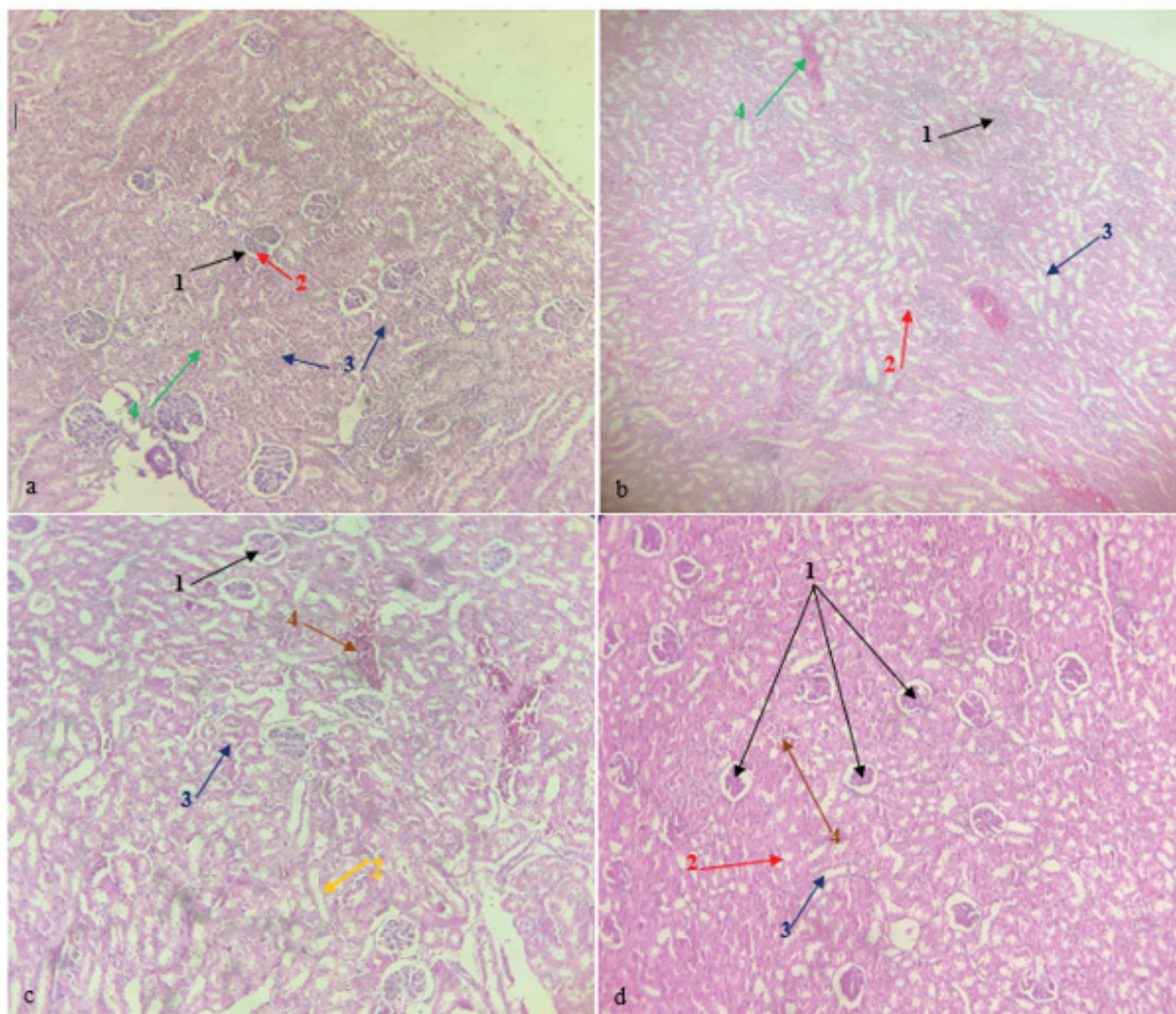


Figure 2- (a) Section of Rat's Kidney, Control Group show (1 Bowman's Capsule, 2 glomerulus, 3 Distal convoluted tubule, 4 Proximal convoluted tubules), (b) Section of Rat's Kidney, Dose 0.046% Pb Acetate, show (1 glomerular shrink glomerular, 2 Proximal convoluted tubules, 3 Distal convoluted tubule, 4 hemorrhage). (d) Section of Rat's Kidney, Dose 1% Tea against of 0.046% Pb Acetate, show (1 shrink glomerular, 2 Distal convoluted tubules, 3 Proximal convoluted tubules, 4 hemorrhage). H&E 40 X.

Heavy metals have negative effects on the environment in general and on humans in particular. Lead has negative effects on the liver on both the cellular and molecular levels. Through many mechanisms, lead is associated with glutathione in addition to the accumulation of lead in the liver, thus leading to oxidative stress, which in turn has the greatest impact on liver damage, and the accumulation of lead in the liver leads to Enhancement of lipid peroxidation and reactive oxygen species (ROS) as well as inflammatory responses in the liver ⁽⁹⁾. There are changes and physiological and histological indicators that appear due to liver poisoning with lead acetate ⁽¹⁰⁾. Lead acetate poisoning has effects on the organs of rats ⁽¹¹⁾. Lead acetate leads to a decrease in the rate of proliferation in the fibrous tissues of the kidneys and the liver, as it causes major damage, including congestion of blood vessels and necrosis in the cells of the liver and kidneys, and it also has a fundamental role in oxidative damage and liver infections ⁽⁵⁾. Lead poisoning leads to many structural and functional changes in the kidneys ⁽¹²⁾, and lead acetate poisoning has many negative effects and side effects for the kidneys of rats ^(13, 14). Rats' proximal tubular dysfunction is one of the strong indicators of chronic exposure to high doses of lead acetate ⁽¹⁵⁾. The current study indicated the positive effects of tea against lead acetate through the remarkable improvement of the tissue structure of the liver, as well as the effective role of onion powder in reducing the effects of lead acetate on the tissue structure of the kidneys.

Conclusions:

Through the results of the current study, we find that lead acetate has great negative effects on the histological structure of the liver and kidney tissues of Sprague–Dawley Rats, that meaning this mineral has toxic and cumulative effects, and it is possible to minimizing or reducing them through the diet by relying on leafy plants as is the case in the current study. When adding tea and onion powders against lead acetate had a great effect in reducing the negative effects of lead acetate, we conclude that onion powder has the best results in terms of reducing the negative effects of lead acetate on the tissue composition of kidney cells. The best results are in terms of resistance to the effects of lead acetate on tissue. Cells to the liver were to powder the tea.

Conflict of Interest: None

Funding: Self

Ethical Clearance: This study was conducted within university laboratories (University of Tehran, Iran) & Iranian National Standardization Organization.

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