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Short Communication

Effect of Pollutant Water on Some Organs and Blood Parameters in Rats

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Abstract

Water pollution causes dangerous problems in our life. The present study aims to determination effect of chemical polluted water on blood parameter and histological changes in rat organs using Wight albino rats. For this study Hilla fabric plant waste water is used as drinking water to the rats for 30 days. Results show that polluted water causes increased in W.B.Cs count and histopathological changes in liver and kidney.

Key words: Polluted water, Histopathological Changes.

Introduction

Water pollution has become worldwide phenomenon. The underground water is polluted by many hazardous pollutants like colored dyes, nitrates, heavy metals, pesticides and fluoride. Fluoride is one of the major concerns among these pollutants.

Pollution is the introduction, by man, into the environment of substances or energy liable to cause hazards to human health (1). Pollution is the most serious of all environmental problems, posing a major threat to the health and wellbeing of people and animals (2). Water pollution occurs as a result of the presence of any objectionable or waste material capable of damaging the water quality (3). It has also been reported that all natural water sources contain one pollutant or another as a result of natural activities such as erosion, leaching and weathering along its course (3). Lack of hygienic water supply has been reported to be a cause of death of many young children in the Third World countries accounting for the death of more than two million children under the age of five years annually (4). The effects of pollution were grouped into three main classes (5):

1- Clinical, which include alterations in the vital signs of temperature, pulse rate, blood pressure amongst others.
2- Sub-clinical, such as damage to the immune system of the affected organisms.
3- Biochemical, such as impairment of enzyme functions, alterations in cell membrane and interference with some metabolic pathways.

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Material and Methods

1- Experimental design: Female rats were used (*Rattus norvegicus*) weighing 300±50 g , 12 weak age , they grouped according to the following order:
   A- Negative control: drinking tap water.
   B- Treatment: The animal treated with polluted industrial waste water collected from Hilla fabric factory for 30 days.
2- Histological studying

After 30 days animals were killed, blood collected by heart puncture in EDTA tube for blood smear preparation. Liver and kidney used to study histopathlogical changes.

Results

Treatment rats by industrial polluted water causes histopathological and hematological changes in experimental animals, Some hematological parameters of rats placed on water over a period of weeks is shown in Table 1 Relative to the control, the test rats exhibit significantly higher (WBC) count as well as significantly higher in neutrophil while no significant increase in monocyte, Eosinophil and basophil liver and kidney sections prepared according to method as seen in Figure (1) showed hemolysis in endothelial glomular and notice glomerulonephritis, Figure (2) infiltration in the liver stroma, Figure (3) aggregation of inflammatory cells with fibroblast proliferation in the liver and Figure (4) 1-sinusoids dilation, 3-Hemolysis in hepatocyte nucleus

Table (1) Comparison of Some Hematological Parameters of Rats.

Parameters	Control rats	Test rats
WBC count (/L) 10	**6.8 ± 0.3**	**13.1± 2***
Neutrophil (%)	**53± 2**	**58± 5***
Monocyte (%)	**45± 3**	**42± 0.1**
Eosinophil (%)	**0**	**2± 0.4**
Basophil (%)	**0**	**0**

Mean ± SE * significant at (P≤ 0.05)

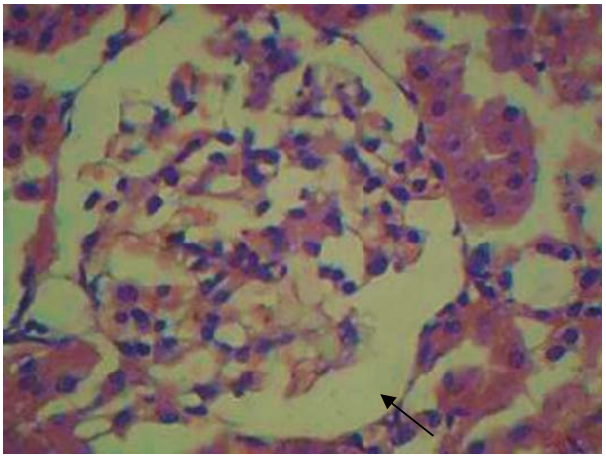

Figure (1) Hemolysis in Endothelial Glomular and Notice Glomerulonephritis

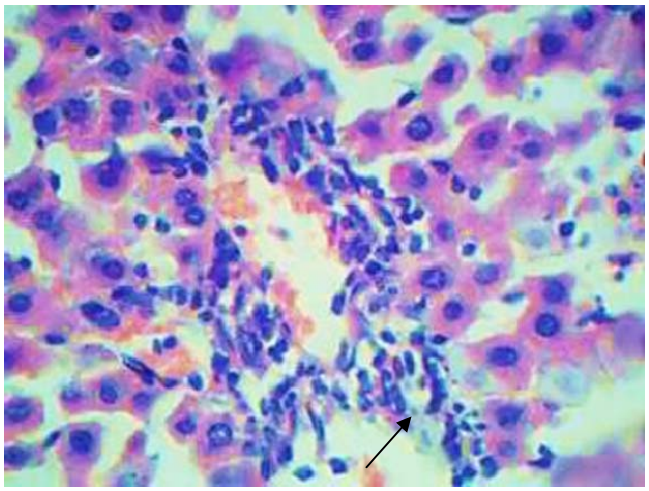

Figure (2) Infiltration in the Liver Stroma

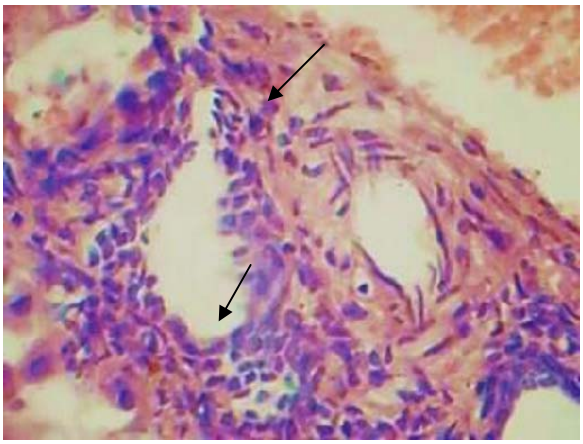

Figure (3) Aggregation of Inflammatory Cells with Fibroblast Proliferation in the Liver

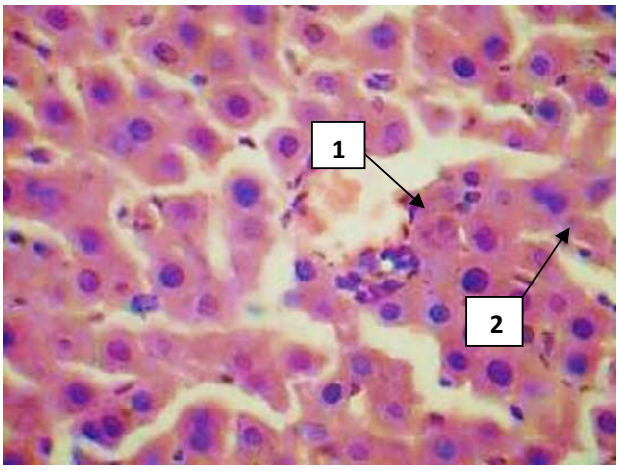

Figure (4) 1- Sinusoids Dilate, 2- Hemolysis In Hepatocyte Nucleus.

Discussion

Neutrophils are matured leucocytes that control many biochemical infections. The observed increase in the concentration of neutrophils of the test rats may be due to the presence of pathogens in the polluted water This suggestion is supported by the significant increase in the white blood cell (WBC) count in test rats relative to the control rats ($p<0.05$). WBC fights against infections therefore the increase observed in the WBC of test rats may be as a result of infection arising from ingestion of polluted water. Previous study (6) reported reduced RBC in flounders exposed to heavy metal polluted water. Additionally, the increase in concentration of neutrophil and WBC in blood of the rats placed on contaminated water samples may also be as a result of nutritional and / or pathological factors arising from ingestion of contaminated water. The nutritional factors may be due to the presence of hazardous chemicals in the groundwater samples while the pathological factor may arise from the bacteria present in the contaminated groundwater (7) had also reported that factors such as environmental, nutritional and pathological can elevate concentrations of WBC and neutrophil in the blood. Liver is considered to be the principal target organ for toxicity (8). The present study results agreed with results obtained by many investigators who studied the effect of contaminated water on liver; (9); (10) (11) (12) Showed that contaminated water an important toxic effect on kidney tissue that polluted water causes significant oxidative stress. In the hepatocytes of the exposed animals, suggests the presence of hepatotoxic substances most data concerning the toxic effects of pollutants on the structure and function of organs come from experiments in laboratory animals exposed to a single compound, such as heavy metals (13; 12) and less frequently to complex mixtures, such as rivers. Contaminated rivers often contain a wide variety of organic and inorganic pollutants, including potentially toxic metals such as Pb, Cd, Fe, Zn, Cu, Mn, Mo, and Cr (14). Oxidative stress may be attributed to these elements, producing a variety of alterations in tissues (15). However, tissue damage can occur by means of several mechanisms and our findings suggest that the liver and kidney damage observed in the exposed animals. The incorporation of ecologically relevant biomarkers into routine environmental management programs has been advocated as a pragmatic means of linking environmental degradation with its causes (16).

Humans, aquatic life and other living organisms are constantly exposed to contaminants from factories, refineries, sewage treatment plants, fertilizers and pesticides washed into rivers, or urban water supplies. Therefore, the assessment of the effects of contaminated water on the liver, kidney and colon of rats is of great importance for a possible prediction of such effects on humans. Human exposure to contaminated water, at high levels, may result in damage to several tissues, leading to death at excessive levels. At low levels, heme synthesis and other biochemical processes, such as bilirubin and albumin, may be affected, and psychological and neurobehavioral functions may be impaired, as well as a wide range of other effects (17).

The use of a group of biomarkers covering different levels of biological organization provides knowledge about at what level pollutants interact with the body and at what level the body is more susceptible to the action of pollutants. The results of studies such as the present one are essential to the design of effective strategies targeting the rehabilitation of biodiversity in aquatic ecosystems.

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