

EXPOSURE TO UPPERCOTT AFFECTS HEMATOLOGICAL INDICES IN MALE ALBINO WISTAR RATS**Modo Emmanuel U.^{*1,2}, Uboh Friday E.², Agiang Margaret A.², Dongo Bright S.², Etim Gabriel O.² and Wopara Iheanyichukwu¹**¹Department of Biochemistry, Faculty of Science, Madonna University, Nigeria. Elele Campus. Rivers State, Nigeria.²Department of Biochemistry, Faculty of Basic Medical Sciences, University of Calabar, Calabar, Cross River State, Nigeria.***Corresponding Author: Dr. Modo Emmanuel U.**

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Article Received on 04/07/2017

Article Revised on 25/07/2017

Article Accepted on 15/08/2017

ABSTRACT

The hematological indices of Albino rats treated with uppercott at 2.5%, 5% and 7.5% of LD₅₀ were assessed. Forty-five male albino rats, divided into 5 groups of nine rats each were used. Group 1 (control) was fed rat chow only; group 2 was used as the vehicle (Control administered only oil); while groups 3-5 (experimental groups) were treated with uppercott at different concentrations. The results as compared to the control groups showed that WBC concentration was significantly higher ($p < 0.05$) in 5%M compared to OCM and other test groups. RBCs were not significantly decreased across all test groups. HGB was slightly decreased in 7.5% M compared to all controls and test groups, while HCT significantly increased in 5%M. No significant difference was observed in the MCV concentration, whereas, MCH and MCHC significantly decreased ($p < 0.05$) in 7.5%M compared to all controls and test groups. Platelets concentration significantly ($p < 0.05$) increased in OCM compared to NCM and other test groups. Lymphocytes decreased significantly ($p < 0.05$) in 7.5%M compared to control and other test groups. Over all data showed that uppercott had a deliterous effect on hematological indices suggesting that uppercott is an environmental pollutant, which should be used with caution.

KEYWORDS: hematology, uppercott, vehicle, environment, olive oil.**1. INTRODUCTION**

A large variety of potential pesticides are now being synthesized and used by different nations replacing the lower toxic and low potency chemicals for the pest control. Pesticides are ubiquitous and global statistics shows increasing use of these chemicals for the control of pests.^[1] Pesticides are usually applied directly to control pests present in both the indoor and outdoor environment where humans spend a considerable amount of time but humans seem to have more of indoor exposure rather than outdoor^[2], hence significant exposure to pesticides can occur in the home.^[3] Indoor air pollution has been shown to pose very high risks to humans, especially infants, the elderly and pregnant women.^[4]

Pesticides play very important role in control of pest such as mosquitoes, which are known to be transmitters of malaria and yellow fever in sub-Saharan Africa.

Uppercott is a pesticide used on a large-scale commercial agricultural processes. It has two main components, cypermethrin (30g/l) and dimethoate (250g/l). Uppercott has wide applications as a pesticide due to its benefits. However, most of the available studies using male rats

are either on cypermethrin or dimethoate separately and since uppercott is the combination of the two chemicals, hence this study was carried out to investigate its toxicological effect on hematological indices of male albino rats.

2. Materials and apparatuses

Refrigerator (thermocool, Nigeria), spectrophotometer (6320D, Jenway), wooden cages, feeding troughs, weighing balance (AE 260, Mettler), cuvette, water bath (Gallenkamp, England), MSE clinical centrifuge, water bottles, heparinized samples, syringes and needles, cannula, test tubes, test tube racks, reagent kits, chloroform and deionized water.

2.1 Chemicals

All hematological tests were done using automated hematology analyzer.

2.2 Procurement of uppercott

Uppercott pesticide was gotten from Agro chemical company in Calabar cross river state, Nigeria.

2.3 Olive oil

Olive oil was used as the vehicle. It is widely accepted as a vehicle in toxicological studies because it does not induce toxicity and is easily absorbed into the body.

2.4 LD₅₀ determination

The LD₅₀ was determined using the method of Lorke,^[5] and was found to be 14.14mg/kg b.wt.

2.5 Experimental animals

Forty-five (45) male wistar albino rats weighing between 150-180g were used for the experiments. They were

gotten from the animal grooming section of the department of Biochemistry, University of Calabar. All animals were maintained under standard conditions and were given normal pellet diet *ad libitum*. All the animal experiments were carried out using the guidelines of the Institution's Animal Ethical Committee in accordance with the Principles of Laboratory Animal Care.

They were divided into five (5) groups of nine (9) rats each. The groups are shown below:

TABLE 1: Distribution of animals into experimental groups.

Groups	Number of animals	Treatments
Group 1	9 males	Control (untreated) NCM
Group 2	9 males	Control administered only oil (OCM)
Group 3	9 males	2.5% (0.35 mg/kg b.wt) of LD ₅₀
Group 4	9 males	5% (0.71 mg/kg b.wt) of LD ₅₀
Group 5	9 males	7.5% (1.06 mg/kg b.wt) of LD ₅₀

NC= Normal Control Male; OCM= Oil Control Male.

After one week of acclimatization, the rats in groups 3 to 5 were exposed to oral administration of uppercort at the different doses for 28 days. At the end of the exposure, 5 male rats were selected at random from each group and sacrificed and the various hematological analysis were run to check for toxicity effects as compared to the control group. Blood samples were collected by cardiac puncture into EDTA bottles. The plasma was extracted with Pasteur pipette after spinning with MSE model (England) table-top centrifuge at 2000 rpm for 5 minutes. A complete blood count and differential cell count were performed using venous blood containing EDTA as an anticoagulant. All hematological analyses were carried out within 24 hours of plasma collection.

2.6 Statistical analysis

Data obtained was expressed as Mean \pm Standard Deviation and analyzed using the SPSS package 19.0. One-way Analysis of Variance (ANOVA) was used. Values at $P < 0.05$ was regarded as significant in comparison with appropriate controls.

3. RESULT PRESENTATION

White Blood Cells (WBC) concentration was significantly higher ($p < 0.05$) in 5% M compared to OCM and other test groups 2.5% M and 7.5% M. Red Blood Cells (RBCs) were not significantly decreased across all test groups. Hemoglobin (HB) was slightly decreased in 7.5% M compared to all controls and test groups, while Hematocrit (HCT) significantly increased in 5% M compared to 2.5% M and 7.5% M in the test groups. No significant difference was observed in the Mean Corpuscular Volume (MCV) concentration, whereas, Mean Corpuscular Hemoglobin (MCH) significantly decreased ($p < 0.05$) in 7.5% M compared to all controls and test groups. This effect was applicable to Mean Corpuscular Hemoglobin Concentration (MCHC). Platelets concentration significantly ($p < 0.05$) increased in OCM compared to NCM and other test groups. Lymphocytes decreased significantly ($p < 0.05$) in 7.5% M compared to control and other test groups.

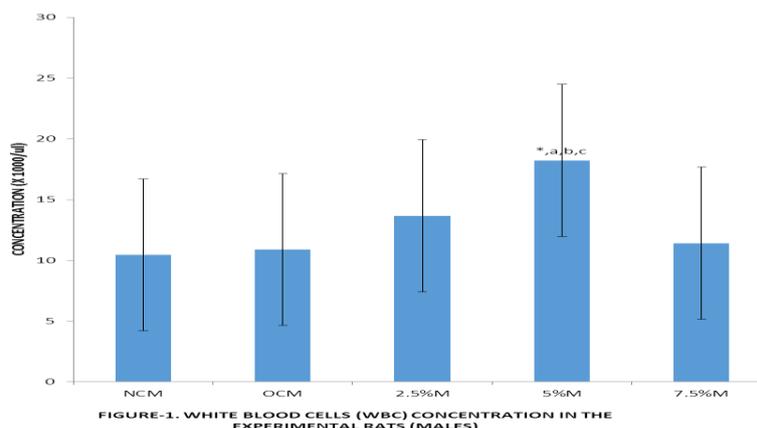


FIGURE-1. WHITE BLOOD CELLS (WBC) CONCENTRATION IN THE EXPERIMENTAL RATS (MALES)

Values are expressed as mean \pm SD, n = 7-8.

* $p < 0.05$ vs NCM, ^a $p < 0.05$ VS OCM, ^b $p < 0.05$ VS 5% M, ^c $p < 0.05$ vs 7.5% M.

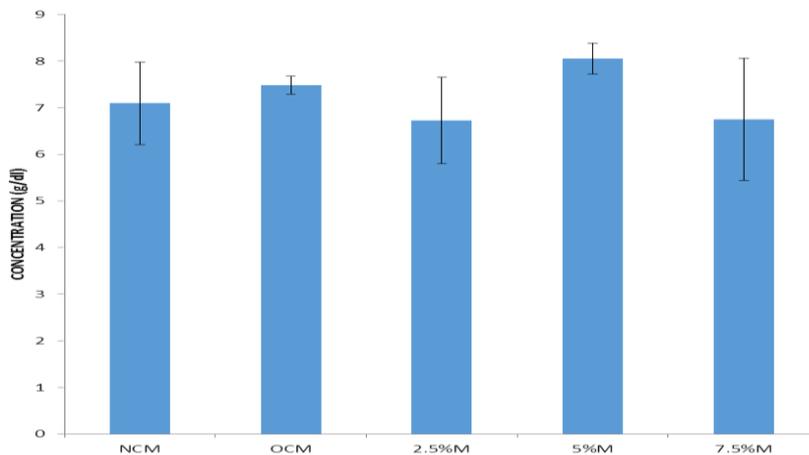


FIGURE-2. CONCENTRATION OF RED BLOOD CELLS (RBC) IN THE EXPERIMENTAL RATS (MALES)

Values are expressed as mean \pm SD, n = 7-8. (P>0.05).

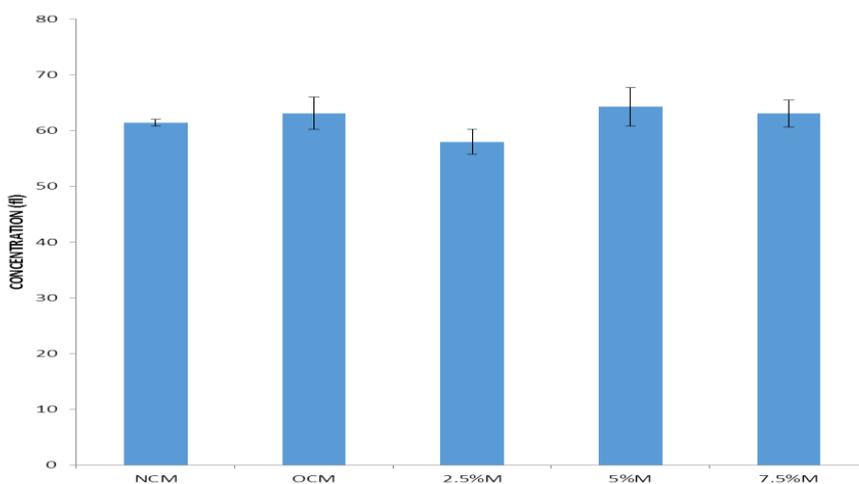


FIGURE-3. MARKED CELL VOLUME CONCENTRATION (MCHC) IN THE EXPERIMENTAL ANIMALS (MALES)

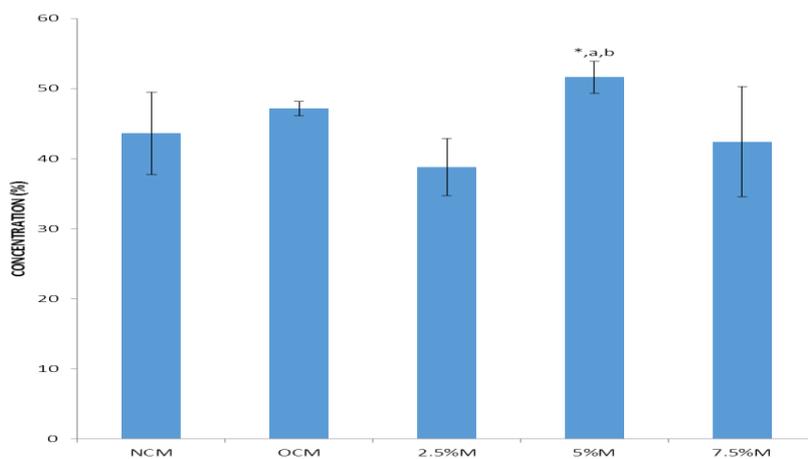


FIGURE-4. HEMATOCRIT (HCT) CONCENTRATION IN THE EXPERIMENTAL RATS (MALES)

Values are expressed as mean \pm SD, n = 7-8.

*p<0.05 vs NCM, ^ap<0.05 VS 2.5%M, ^bp<0.05 VS 7.5%M.

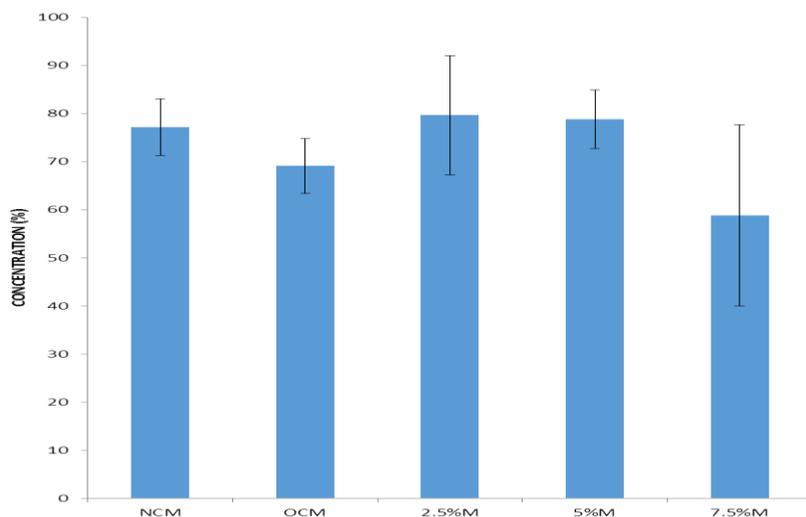


FIGURE-5. LYMPHOCYTE CONCENTRATION IN THE EXPERIMENTAL RATS (MALES)

Values are expressed as mean ± SD, n = 7-8. $p > 0.05$.

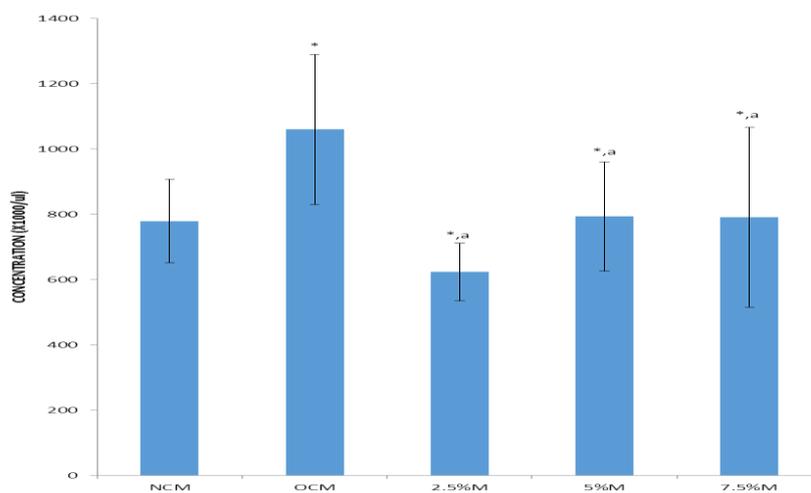


FIGURE-6. PLATELET CONCENTRATION IN THE EXPERIMENTAL RATS (MALES)

Values are expressed as mean ± SD, n = 7-8. * $p < 0.05$ vs NCM, ^a $P < 0.05$ VS OCM.

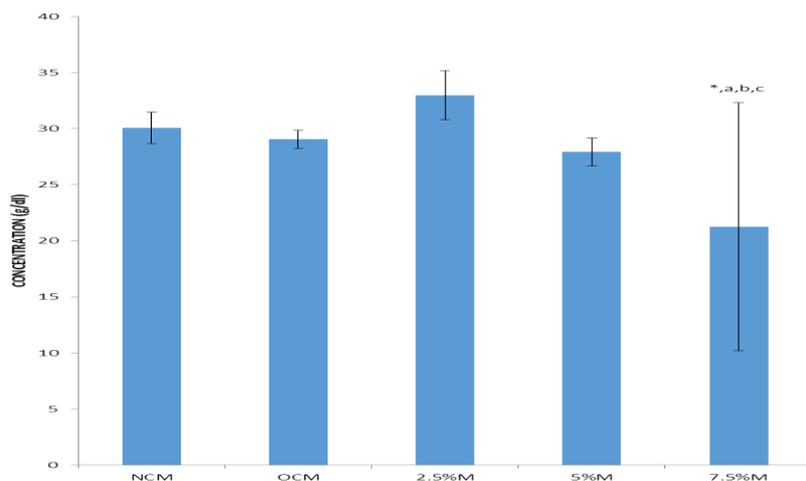
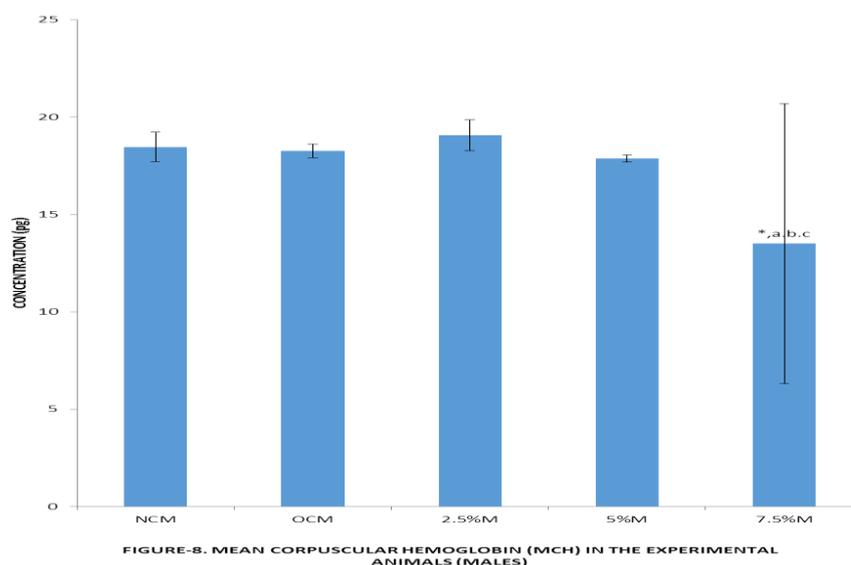


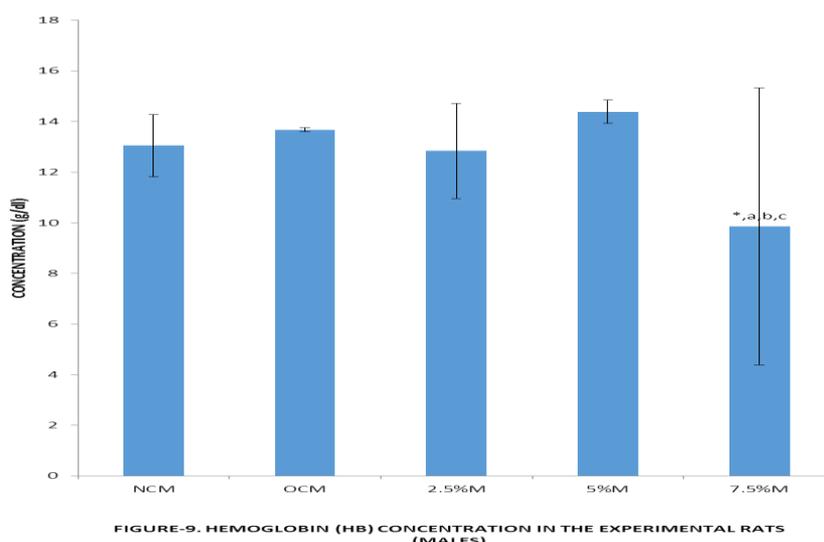
FIGURE-7. MEAN CORPUSCULAR HEMOGLOBIN CONCENTRATION (MCHC) IN THE EXPERIMENTAL ANIMALS (MALES)

Values are expressed as mean ± SD, n = 7-8.
 * $p < 0.05$ vs NCM, ^a $P < 0.05$ VS OCM, ^b $P < 0.05$ VS 2.5%M, ^c $p < 0.05$ vs 5%M.



Values are expressed as mean \pm SD, n = 7-8.

*p<0.05 vs NCM, ^ap<0.05 vs OCM, ^bp<0.05 vs 2.5%M, ^cp<0.05 vs 5%M.



Values are expressed as mean \pm SD, n = 7-8.

*p<0.05 vs NCM, ^ap<0.05 vs OCM, ^bp<0.05 vs 2.5%M, ^cp<0.05 vs 5%M.

4. DISCUSSION

Due to the role in the defense of organism against infections, any environmental factors that can cause the reduction in hematological indices is strongly discouraged. The exposure of the rats to Uppercott for 28 days caused significant decrease in the Hematological indices in a dose dependent manner compared to the control groups. The reduction in hemoglobin could be related to the reduced size of red blood cells or to the impaired biosynthesis of heme in bone marrow.^[6]

Uppercott pesticide led to a decrease in Red Blood Cells (RBC), Hemoglobin (Hb) and Hematocrit (HCT), which might possibly be due to the effect of pesticide on blood-forming organs suggesting the anaemic condition of the treated animals.^[7] The anemia could be as a result of inhibition of erythropoiesis and hemosynthesis and increase in the rate of erythrocytes destruction in

hemopoietic organs. The reduction in size and number of RBC, Hb and PCV may be a consequence of severe hemorrhage which results in the dilution of blood caused by the influx of cells and fluids from body stores.^[8]

^[6] Was of the opinion that the “decrease in RBC counts is either indicative of excessive damage to erythrocytes or inhibition of erythrocyte formation in rabbits exposed to toxic insecticides”. Yousef *et al.*,^[9] reported same in rabbits hence it could be asserted that the reduction in PCV levels in the experimental animals in this study is due to the decrease in the blood cellular count after uppercott exposure.

Decrease in MCV, MCH and MCHC was also observed in rats treated with Uppercott. This agrees with the work of^[10] where he reported same thing with fish exposed to various pesticides. Leukocyte counts increase during

treatment with uppercort could be as a result of an activation of defense mechanism and the immune system of the rats. Also, it has been suggested to be due to stimulated lymphopoiesis and/or enhanced release of lymphocytes from lymph myeloid tissue.^[11] Such lymphocyte response is possibly due to the presence of toxic substances associated with the pesticide leading to the body producing more leukocytes or White Blood Cells. Several authors have noticed an increase in WBC in animals repeatedly treated with sub-lethal doses of insecticides^{[12];[13];[14];[15]}

4.1 CONCLUSION

It may be concluded from this study that the exposure of humans to uppercort can affect the immune system, by inducing the reduction in the PCV, HB and RBC. There was also decrease in the platelet counts indicating possible effects in blood clotting when humans are exposed to uppercort. Uppercort should therefore be used with caution by humans.

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