

EFFECT OF TRANSFLUTHRIN AND OCIMUM OIL ON BLOOD COMPONENTS OF ALBINO RATS

M. Preety, Saloni and R. Sudesh*

Department of Zoology, Maharshi Dayanand University, Rohtak, Haryana, India

*Author for Correspondence

ABSTRACT

This study was focused on effects of synthetic and herbal mosquito repellent on blood components of male albino rats. In this rats were kept under exposure (8 hrs and 18 hrs/day) of synthetic (transfluthrin as a main component) and herbal mosquito repellent (Ocimum oil) through inhalation route for a period of 90 days. Inhalation of synthetic repellent showed the signification alterations in hematological indices/blood components, WBC count declined, RBC count inclined and hemoglobin level was first inclined then declined in the rats exposed under synthetic mosquito repellents. But no significant differences in these parameters were seen in the rats exposed under herbal mosquito repellent. From this we can conclude that transfluthrin showed adverse effects on blood components of albino male rats.

Keywords: *Tranfluthrin, Blood, RBC, WBC, Albino Rat*

INTRODUCTION

Now a day's synthetics pyrethroids are being used as a substitute for pest control thus approximate 30% of insecticides used globally (Saka *et al.*, 2011). Due to change in environment and increase in population; mosquito's population in developing countries are also increased and make people susceptible for diseases (Akhigbe *et al.*, 2011).

People in low communities tend to apply cheap and easy measures to get rid of these risks and the preference goes to these mosquito repellents and it become famous in many countries. Some mosquito repellents are having synthetic compounds and some others are having herbal compounds. But the mosquito repellent having synthetic compounds are more common to use due to their higher efficacy. These synthetic mosquito repellents (SMR) are available in different forms as like coil, mat, vaporizers, lotion etc. in the market. The liquid mosquito repellent (LMR) containing synthetic pyrethroids like allethrin, transallethrin, S-bioallethrin are using in most of mosquito repellents (Shafter *et al.*, 2005).

The continuous use of these mosquito repellents containing synthetic pyrethroids; overnight during sleeping quarters leads to insertion of their small particles (1 micrometer), metal fumes and vapor to get entered in various parts of the lungs which creates a number of allergies and other problems in the body such as irritation in upper respiratory tract and many more (Bradberry *et al.*, 2005). Pyrethroids have high actions on living organisms and can apply with low dose; these are generally insoluble in water (Antwi & Reddy 2015). The exposure of Transfluthrin occurs via oral pathway with fewer possibilities but mainly gets entered via the contamination of the environment through air (Pauluhn & Ozaki, 2015). Today, these chemicals are majorly used in homes as well as in form of chemicals to resists pests in agricultural practices too (Rodríguez *et al.*, 2016).

In the context of the health concerns leads to release of smoke and minute particulate matter and the breakdown of compounds by the heat get attention, Liu *et al.*, (2003); Krieger *et al.*, (2003); (Pauluhn and Mohr 2006). As general functional ingredient in these chemicals is pyrethroid. This pyrethroid is similar as that of natural Pyrethrins, which can get from the flowers of pyrethrum (*Chrysanthemum*

cinerariaefolium and *C. coccineum*). These pyrethroids are most widely use now a days in form of pesticides (Hahn et al., 2010). These chemicals are lesser toxic to the mammals as compared to the chemical pyrethroids (Horton et al., 2011; Vesin et al., 2013). So present study was done to observe effect of herbal and synthetic mosquito repellent on albino rats.

MATERIALS AND METHODS

Chemical

In present study synthetic mosquito repellent containing transfluthrin as main component (0.88% w/w) and Ocimum oil diluted in ethanol (10%) were used (Padilha et al., 2003).

Experimental Animals

Experiment was performed on 20 Albino rats (3-4 months). These animals were obtained from animal house of DFSAH, LUVAS, Hisar, Haryana. Animals were separated in the groups and were placed in the different polypropylene plastic cages. Proper temperature and aeration was provided to the rats along with other required favorable conditions with 12 hr. light/dark condition. Rats were fed with lab food twice a day.

Apparatus Used

Haemocytometer for RBC and WBC analysis and Hemoglobinometer for Haemoglobin analysis were used.

Experimental design for study

Animals were divided into 3 groups; 2 were experimental groups (group I, group II) and one was control group. In Group I, 8 animals were allowed to inhale synthetic mosquito repellent containing transfluthrin. Half of the animals from this group were allowed to inhale synthetic mosquito repellent for a period of 8 hrs. continued for a period of 90 days (Shrivastva et al., 2006). Other half of animals from this group were exposed for a period of 18 hrs. (Gupta et al., 1999) for 90 day duration. Methodology of Group II was same as that of group-I except animals under this group were allowed to exposed herbal mosquito repellent. Blood was collected from each suspect and hematology was done with each case. In hematology, studies of RBC and WBC count along with the amount of hemoglobin were done (Mona Al-Damegh, 2013)

Analysis

Collection of Blood Sample- All the rats were dissected after giving them exposure to the chemical transfluthrin and Ocimum oil. On termination of experiment blood sample were taken from all rats. The blood was collected in the EDTA tubes into appropriate specimen bottles because EDTA does not allow the blood to coagulate.

Hematological Indices- Hemoglobin, number of RBC and WBC etc. of the experimental group as well as the control group were calculated.

RESULTS AND DISCUSSION

Inhalation of 0.88% transfluthrin chemical for long term duration causes alteration in blood components. There was a remarkable change in WBC count, RBC count and hemoglobin level of albino rats in comparison to control group. WBC count was first increased up to exposure of 30 Days in both 8 hrs. and 18 hrs. group; it was increased in group exposed for 60 days for a period of 8 hrs. but decreased in 18 hrs. group exposed for 60 days; it was decreased in group exposed up to 90 days in both 8 hrs. and 18 hrs.

exposed groups. Dose dependent increased in level of hemoglobin was observed in all groups except the group exposed up to 60 days for 8 hrs. exposure, in this it was slightly decreased but increased in comparison to control group. RBC count was first increased up to the exposure 60 days then decreased in both the 90 days groups according to dose level (Table-1).

Table 1: Effects of ejection of particles from the mosquito repellent on hematological Framework in male albino rats in contact with Synthetic pyrethroids

Parameters	30 days exposure 8 hrs.	30 days exposure 18 hrs.	60 days exposure 8 hrs.	60 days exposure 18 hrs.	90 days exposure 8 hrs.	90 days exposure 18 hrs.	Non exposed groups
WBC (thousands/mm ³)	17.3±0.1	17.4±0.5	17.45±1.0	16.2±0.25	15.3±0.1	14.1±0.25	16.5±1.0
RBC(million/mm ³)	7.25±0.1	7.40±0.25	8.55±0.25	9.4±1.0	9.15±0.1	9.0±0.25	6.85±0.15
Hb(g/dL)	12.3	12.6	14	13.8	14	14.7	12-14

All the values in table are ± of S.E

Table 2: Effects of ejection of particles from the mosquito coil on hematological Framework in male albino rats in contact with Herbal mosquito repellent

Parameters	30 days exposure 8 hrs.	30 days exposure 18 hrs.	60 days exposure 8 hrs.	60 days exposure 18 hrs.	90 days exposure 8 hrs.	90 days exposure 18 hrs.	Non exposed groups
WBC (thousands/mm ³)	16.8±0.25	17.1±0.1	17.4±0.50	16.8±0.1	17.1±0.25	15.9±1.0	16.5±1.0
RBC(million/mm ³)	7.20±0.25	7.18±1.0	6.90±0.50	7.25±0.25	7.4±0.1	6.4±0.25	6.85±0.1
Hb(g/dL)	12.9	13.1	13.6	12.4	12.2	10.5	12-14

All the values in the table are ± of S.E

No remarkable changes were observed in WBC and RBC count of rats exposed under herbal mosquito repellent. But hemoglobin level was slight increased first then decreased but no so much changes were seen (Table 2).

Transfluthrin is a synthetic pyrethroid which is the main component of liquid mosquito repellent. 0.88% transfluthrin used to control mosquito as a liquid vaporizer; from previous studies it has analyzed that these type of pyrethroids are harmful to human health. From different hematological indications we can detect the toxicity of different chemical because these play a vital role. Both activation and resistance of the system that involves the formation of red blood cells and white blood cells occurs after applying the pyrethroids to the albino rats. As Blood is very crucial component of the body as it is responsible for the transportation of gases as well as food from one part of the body to the other so the evaluation of toxicological effects of Pyrethroids on the Blood Components is mandatory to check any accumulation of these Compounds in Blood leads to Clinico-Pathological Conditions (Forshaw *et al.*, 1983). Estimation of hematological indices plays very important role in computing the toxic effects caused by exogenous compounds. Their Toxicological effects has been seen by the accumulation or deficiency of any enzyme, hormone or any other crucial endogenous compounds from the Blood and which can lead to the imbalance between the formation and Destruction of Blood Cells (Haratym-Maj, 2002). Platelets are the blood cells that are responsible for the blood coagulation when they are in sufficient size and number so it

has been confirmed that the number of Platelets get fall when animal is in exposed to these chemicals but mainly depends upon the dose of the chemical (Saka *et al.*, 2011).

From the present study it was examined that WBC count in the albino rats of group I which were exposed under synthetic mosquito repellent containing transfluthrin was declining continuously according to the exposure increasing up to 90 days. RBC count was inclining during complete exposure in comparison to unexposed group. Hemoglobin (Hb) level was first inclined then declined and again inclined. Somewhat similar results were seen in the study done by Al-Damegh (2013). It means the mosquito repellent containing transfluthrin can cause hematological alterations. In group II animals which were exposed under herbal mosquito repellent some alteration were seen the WBC and RBC count and hemoglobin level but there were no significant difference between readings of exposed and unexposed group of albino rats. More alteration in hematological indices was seen in albino rats exposed under synthetic mosquito repellent as compared to herbal exposed group.

Number of alterations in the immune system as well as changes in blood is done by these pyrethroids (Al-Damegh., 2013). This chemical can cause number of effects which are related to the toxicity in animals. Transfluthrin is almost decomposed into the rats in which 50-70% get metabolized and remove from the body through urine in form of (TFBA) and the remaining get released as the glucuronide of the alcohol (Yokohira *et al.*, 2011). Studies done by different Scientists have concluded that effects are evidenced by the enhancing the normal level of blood cells as well as other components (Haratym-Maj, 2002).

Increased amount of W.B.C, lymphocytes, RBC, hemoglobin packed cell volume, platelets, mean corpuscular volume and mean corpuscular hemoglobin were reported after 24, 48, and 72 hours continuous inhalation of parathrin 1.6% w/w. But depreciation in neutrophils and in monocytes reduction in 24, 48 and 72 hours but after 72 hours they became normal (Al-Damegh., 2013). Due to exposure of electric liquid mosquito repellent neutrophil amount declined, WBC amount, packed cell volume were enhanced (Benedict *et al*, 2017). Biochemical changes developed in erythrocytes membrane of humans due to allethrin (Narendra *et al*, 2008). They also noticed reduction in phosphatidyl serine (PS) in human blood and decrease in membrane cholesterol. However, information regarding hematological alterations following exposure to pyrethroids is inconsistent (Khan *et al.*, 2012).

So, use of that type of repellent which are natural and eco- friendly is more beneficial instead of using synthetic repellent. It has been proven from literature that the essential oil from different plant species can be used as mosquito repellent. It also has been found that interest of researchers is increasing toward finding the herbal repellent. Most of the studies has been done for diptera species specially belonging to genus *Aedes*, *Anopheles* and *Culex* which cause a number of diseases like malaria, yellow fever, dengue etc. Essential oil from different plant species are using as mosquito repellent because of having good repellency power against mosquito for e.g. *Ocimum* oil, *Eucalyptus* oil, and *Cymbopogon* oil etc. The repellent activity of these have been demonstrated and tested. The work done on herbal liquid mosquito repellent is not so much available in literature. Hence the present study is planned to show the effect of mosquito repellent (containing transfluthrin as a main component) as well as herbal liquid mosquito repellent.

CONCLUSION

Although the liquid mosquito repellents are easy to use and abundantly available but from above all the points we can conclude that the pyrethroid containing liquid mosquito repellent may affect adversely due to their long term exposure. From this study we can depict that inhalation of synthetic mosquito repellent containing transfluthrin as a main component which cause hematological alteration in albino rats when they were exposed to this for long time (90 days). It is need to educating the peoples about the risk and problems by long term use of pyrethroid containing liquid mosquito repellent and we should keep the things in mind regarding their recommendation, dose and time of exposure. Pyrethroids are more toxic

than herbal mosquito repellent which are safer to use. So, herbal mosquito repellents can be the alternatives of synthetic pyrethroids because these are having good insect repellency also and safer for human health.

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