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Determination of the Presence of Pesticides/Insecticide Residual Concentrations in Serum Blood Samples of Albino Rats Exposed to Mosquito Net Treated Insecticide over a Long Period as a Case Study

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ABSTRACT

The study was designed to experimentally investigate the presence of permethrin and cypermethrin insecticide residue concentrations in serum samples of albino rats. 60 Albino rats were used in this research which were equally divided into three groups, with the first containing Rats placed under no mosquito net as control, the second containing Rats placed under commercially insecticide treated Mosquito net, and the third containing rats placed under experimentally formulated treated insecticide Mosquito net. The presence of the insecticide concentration in Blood serum samples of the Rats were determined after carefully extracting the serum by solvent extraction technique, and analyzing the extracts by Gas Chromatographic method. Permethrin insecticide and cypermethrin insecticide were detected in the serum samples of the albino Rats. ANOVA results of $F(2,57)=9.1, P=0.000$ indicates significant difference in the concentration level of the insecticide in the three groups of the Rats. The Post hoc test indicates that, those Rats housed under experimentally formulated mosquito net, [Mean=0.8,SD=0.02], and those placed under commercially insecticide treated Mosquito net, [Mean=0.5,SD=0.001], experienced higher level of concentration of insecticide as compared to controls, [Mean=0.00,SD=0.00] (those in Group A). The Mean ± S.D for permethrin and cypermethrin insecticides were significantly different from that of controls. 0.9±0.011mg/L of Permethrin was detected in samples of week two and three of the commercially insecticide treated Mosquito net and 0.32.±0.01mg/L in week one of the experimentally formulated treated insecticide Mosquito net, respectively as indicated in Table 1, while cypermethrin has a highest value of 0.1±0.082mg/L in week two, six, and seven of the commercially insecticide treated Mosquito net as well as 0.9±0.082mg/L in the experimentally formulated treated insecticide Mosquito net respectively. The values recorded for both insecticides used in this work are within the WHO recommended permissible limit of 0.05mg/kg-2.0mg/kg.

KEYWORDS: *Albino rats, Insecticide, Gas Chromatography and Mosquito net*

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1. INTRODUCTION

Pesticides is a general term for substances used for controlling insects and rodenticides. The most dangerous pesticides to humans are insecticides and rodenticides (Soomro, *et al.,* 2008). In third world countries, safety procedures for the use of pesticides are almost nonexistent which can pose a serious health problems to its users who applies it without protective masks, and which makes it impossible to avoid direct pesticide inhalation as well as residual neurotoxic response to the insecticide (Anyanwu *et al.,* 2006).

Using treated mosquito net leads to direct exposure to insecticides, and these are absorbed by inhalation, ingestion, and dermal contact. The residue concentrations of these compounds in the exposed can lead to a variety of metabolic and systemic dysfunctions, and in some cases outright disease states (Anyanwu *et al.,* 2006). Common mode of action of the major pesticide products is to disrupt neurological function. In addition to being neurotoxic, these compounds are profoundly injurious to the immune and endocrine systems as well. Such ill health effects are not limited only to those systems, but can cause

a variety of dermatological, gastrointestinal, genitourinary, respiratory, musculoskeletal, and cardiological problems (Soomro*, et al.,* 2008). Biological monitoring provides the basis for estimating an internal chemical doze by measuring pesticide and their metabolite compound concentrations in selected tissues, fluids, or bodily waste (Anyanwu *et al.,* 2006).

Analysis of blood provides evidence of exposure and gives an indication burden of the pesticide residues on the body. Blood measurements provide an estimation of the dose available for the target site, allowing for prediction of dose-response relationships. Furthermore, because blood is a regulated fluid the blood concentrations of toxicants measured at a specific time interval after exposure will remain the same as long as the absorbed amounts are constant; therefore no corrections for dilution are necessary (yohanne *et al.*, 2000).

Malaria is estimated to affect between 350 to 500million people annually and accounts for 1 to 3million deaths per year, though it has been indicated that the use of net impregnated with insecticides prevention (Ikeako *et al.,* 2017) has been an extremely effective method of malaria prevention (Anyanwu *et al.,* 2006). Sub-Saharan Africa has the largest burden of malarial disease, with over 90% of the world's malaria-related deaths occurring in this region (Anyanwu *et al.,* 2006). Twenty-five million pregnant women are at risk of malaria which accounts for over 10,000 maternal and 200,000 neonatal deaths per year (Ikeako *et al.,* 2017), which indicates that the disease's morbidity and mortality is more common among pregnant women, and children less than five years of age (Anyanwu *et al.,* 2006).

In our environment, families absorb a measurable quantity of pesticides due to long term use of mosquito net; therefore most researches concerns have focused on the acute or life threatening effects of such insecticides and therefore little work is reported on the absorbed dose (Soomro*, et al.,* 2008).

The study was designed to experimentally investigate the presence of permethrin and cypermethrin insecticides residue concentrations in serum blood samples of albino rats after exposed to mosquito net treated with insecticide over a long period

2. LITERATURE REVIEW

In 1986-87, 9.2 mg/kg PCBs and 3.7 mg/kg of DDE were detected in the blood samples of residents from large and medium to small urban centers across Ontario (Mathur *et al.,* (2005).In a study from Veracruz, Mexico, maternal adipose tissue, and maternal blood serum from 64 volunteers mothers were analysed for organochlorine pesticide residues- HCB, a, b, g, d- HCH, aldrin, dieldrin, heptachlor, heptachlor epoxide, pp'-DDT, op'-DDT, pp'-DDD, a, b, endosulfan, endosulfan sulfate, chlordane, and methoxychloride. The Concentration of t-HCH in maternal adipose tissue, and maternal serum was 0.17 and 0.22 mg/kg on fat basis respectively, t-DDT was 5.851, and 5.226 mg/Kg respectively, hexachloro benzene was 0.065, and 0.18 mg/kg respectively (Waliszewski *et al.,* 2000). A total of 96 serum and 46 adipose tissue samples collected from infertile women attending centres for reproductive medicine in Belgium from 1996-98 were analyzed for seven organochlorine pesticides and seven polychlorinated biphenyls. There was a strong association between adipose tissue and serum residues. The adipose tissue levels in ng/g of CB-138, 153, 180 and pp'- DDE (68.3 vs. 78.6, 145.7 vs. 90.9, 93.5 vs. 69.1, 470.9 vs. 1274.5) were explained by serum residues. The accumulation pattern for CB-153 and CB –180 in serum and adipose tissue are mirror images of each other (Waliszewski *et al.*, 2000). A survey of 577 whole blood samples from school children in Peninsular Malaysia, extracted and analysed for the residues of 11 organochlorine and 2 organophosphorus pesticides revealed the presence of pesticide residues in blood in ng/g, dieldrin, endrin, nd: 47.6, alpha-endosulfan, nd-0.6; beta-endosulfan, nd; endosulfan sulfate, nd; heptachlor, nd-3.8; lindane, nd-5.7; p,p'-DDT, nd-3.4; o,p'-DDE, nd-1.4; p,p'-DDE, nd; chlorpyrifos, nd-10.3 and diazinon, nd-103.0 (Mathur *et al.,* (2005). In a study from Canada, 251 cord blood samples collected from 1994 through 2001 for plychlorinated biphenyls (PCBs), dichlorodiphenyl dichloroethylene (DDE), hexachlorobenzene (HCB), chlordanes, lead and mercury showed significantly decreasing trends per year at $p<0.001$, for PCBs 7.9%, DDE 9.1%, DDT 8.2%, and HCB 6.6% while no significant trend was detected for chlordanes (Stewart et al., (2012). The residue concentrations of some organochlorine and organophosphorus pesticides were also detected in blood samples of school children (Soomro *et al.,* (2008). This necessitate an experimental investigation of its presence using albino rats as a case study. In a study conducted in USA, plasma samples collected at birth between 1998 and 2001 from 230 mother and newborn pairs enrolled in the Columbia Centre for children's Environmental Health were analysed for 29 pesticides. Seven pesticides were detected in 48-83% of plasma samples (range, 1-270 pg/g) the organophosphates chlorpyrifos and diazinon, carbamates bendiocarb and 2- isopropoxyphenol (metabolite of propoxur) and fungicides- dicloran, phthalimide (metabolite of folpet and captan) and tetrahydrophthalimide (metabolite of captan and captafol) (Whyatt 2003). Maternal and cord plasma levels were similar, except for phthalimide and were highly correlated ($p<0.001$) (Whyatt *et al.,* 2003). Blood and abdominal tissue from 126 adult cadavers submitted for autopsy at the Institute of Forensic Medicine of the University of Veracruz, Mexico were analyzed for HCB, b-HCH, pp'- DDE, op'- DDT and pp'- DDT. The comparison of mean and standard deviation values for all organochlorine pesticides between both sample groups indicated significantly higher values of serum lipids vs. adipose lipids expressed as mg/kg on lipid basis (HCB 0.178 vs. 0.055, b- HCH 0.504 vs. 0.216, pp' DDE 2.789 vs. 1.063, op'- DDT 0.130 vs. 0.062, pp' DDT 0.340 vs. 0.585 and t- DDT – 3.258 vs. 1.706). Only pp' – DDT reveals inverse levels which could be due to higher accumulation in adipose fats. The higher levels in blood serum lipids express that these organochlorines are inclined to blood lipids as a body compartment and that the equilibrium pattern favors blood serum lipids (Waliszewski *et al.,* 2004).

According to Chemical Trespass: Pesticides In Our Bodies And Corporate Accountability report by Pesticide Action Network North America (PANNA) and partner groups in more than 20 cities many U,S. residents carry toxic pesticides in their bodies above government assessed "acceptable" levels. Analyzing pesticide residue data collected by the US Centres for Disease Control and Prevention (CDC) on levels of chemicals in 9,282 people

nationwide revealed that government and industry have failed to safeguard public health from pesticide exposures. CDC found that among the people who had their blood and urine tested, 100 per cent showed pesticide residues. The average person carried a toxic cocktail of 13 of 23 pesticides analyzed. Two insecticides chlorpyrifos and methyl parathion- were found at levels up to 4.5 times higher than what U.S government deems acceptable. Children, women and Mexican Americans shouldered the heaviest pesticide burden. Children, the population most vulnerable to pesticides are exposed to a higher level of nerve damaging organophosphorus pesticides (Schafer *et al.,* 2004). According to a WWF report, 2004 analysis of blood samples of 14 European ministers from 13 European countries, for 103 different manmade chemicals from 7 different chemical families organochlorine pesticides, polychlorinated biphenyls, synthetic musks, per fluorinated chemicals, brominated flame retardants, phthalates and anti-bacterial, revealed that 55 of the 103 chemicals analyzed were detected. A cocktail of hazardous chemicals contaminated every volunteer tested and six of the 7 chemical groups were detected. 25 of the same chemicals were detected in every individual – including pp'- DDE and HCB. The chemical found in highest concentration in whole blood was Diethyl hexyl phthalate (endocrine disrupter) at concentrations of 160 ng/g and in blood serum it was pp'- DDE (a DDT metabolite), at a concentration of 3300 pg/g and deca BDE, a neurotoxic chemical used as flame retardant was found at the highest concentration of 45 pg/g of all the flame retardants analysed (Mathur *et al.,* 2005) Therefore, the tremendous usage of pesticides has promoted toxicological studies in our community

3. MATRIALS AND METHOD

3.1. Materials

The materials used are: Computer, Refrigerator, Rotatory evaporator, Thermometer, Test tube, Volume metric flasks, measuring cylinders, Magnetic stirrer, Hot plates, Centrifuge, Electric, homogenizer, Mixer, Gas Chromatographs (Thermoquest-Trace GC) with 63Ni selective Electron-Capture Detector with advanced software (Chromcard-32 bit Ver 1.06 October 98) was used for the analysis.

Reagents

Standards insecticides (permethrin and cypermethrin) with 99% Purity, 97% pure *n*-Hexane, Florisil, lauric acid, Magnesium silicate, 98% pure Methanol, 92% pure Diethyl Ether, 98% pure Sulfuric, Anhydrous Sodium Sulfate Na_2SO_4, methylpolysiloxane, 50% phenyl methylpolysiloxane, 5% diphenyl, and 95% dimethylpolysiloxane 10-ml syringe from Hamilton Company, 90% pure Acetone, 97% pure Diethyl ether, Detergent, and Chromic acid were used in this research.

3.2. Experimental Designed

60 Albino rats were used in this research which were equally divided into three groups, with the first containing Rats placed under no mosquito net as control, the second containing Rats placed under commercially insecticide treated Mosquito net, and the third containing rats placed under experimentally formulated treated insecticide Mosquito net, for determining the presence of the insecticide concentration using the Blood serum samples of the Rats after careful extraction using solvent extraction techniques in accordance with USEPA method 8081A for organochlorines by Gas chromatography and USEPA Method 8141A for organophosphorus compounds using gas chromatography-capillary column technique as stated in (Mathur *et al.,* 2005). The blood serums of the Rats were collected at an interval of seven days for a period of three months.

3.2.1. Commercially Insecticide Treated Mosquito Net

The commercially treated mosquito net was purchased and used in this work without further treatment after it was dried under shed as stated in the user guides.

3.2.2. Formulation of Insecticide Used for Treating Mosquito Net for the Experiment

The fabric was first thoroughly washed to remove unwanted dirt, and completely dried before treated with the formulated insecticides as follows.

3.3. Calculation of the surface area and the amount of reagent used for treating the cotton netting materials with insecticides

The surface area of the rectangular Bocholt was calculated using $S = 2(a\ X\ c) + 2(b\ X\ c) + (b\ X\ c)$, where the parameters in the formula represent the sides of the Bocholt.

The amount of water needed to completely soak the fabric depends on the nature of the materials used as mosquito net. In this work, cotton was used and the formulation is presented in table 1.

Table 1: Insecticide formulation

Size of netting material (cm^2)	Amount of water (ml) for the cotton Material	Amount of 55% Permethrin used as insecticide (ml)	Amount of 10% cypermethrin used as insecticide (ml)
1500	6500	45.5	30.5

The bowl was partially filled with water and the said amount of Permethrin (45.5ml), and Cypermethrin (30.5ml) was added to the water and was stirred untilled thoroughly mixed. The water was added to 6500ml completely.

1500cm^2 fabric was soaked in the formulated insecticide, squeezed and allowed to finish dripping to dryness.

3.4. Sampling methodology

10ml composite blood samples from each group of Rats, those placed under no mosquito net, those placed under commercially treated mosquito net, and those placed under the formulated treated mosquito net (as labeled group A, group B and group C) were collected at an interval of 7 days for a period of three months using micro syringe, and was placed in to a separate sampling residue free heparinized of 20ml glass vessels containing 200 USP units of heparin in 0.2 ml solution with the help of sterilized syringe. The Blood samples were transported in dried ice to the laboratory, and stored at -200°C for the analysis.

3.5. Sample extraction

The serum was extracted using solvent extraction in accordance with. 5ml of Blood was diluted with 25ml distilled water and 2ml of saturated brine solution added and transferred to 125ml capacity separatory funnel and

was extracted by shaking the separatory funnel vigorously in 20ml of 9:1 ratio n-hexane: acetone mixture for 2-3 minutes, and releasing the pressure intermittently. The separatory funnel with the content was allowed undisturbed until the three layers were separated. The extracts collected were passed through anhydrous sodium sulfate and concentrated to about 1-2ml using rotary vacuum evaporator.

3.5.1. Clean up:

Cleanup was done by USEPA Method 3620B- Florisil clean up by column chromatography. Florisil was activated at 1300 ^{0}C overnight and cool in a dessicator before using.

The weight of florisil was predetermining by calibration using lauric acid. 1g of florisil was packed in to 20cm length and 12mm ID glass chromatographic column, anhydrous sodium sulfate was added to the top of the florisil 0.5cm column and the column was pre-eluted with hexane.

3.5.2. Calibration of GC system.

The GC system was calibrated using external standard technique. Were 1000mg/l Individual Stock standard solution was prepared by weighing appropriate amounts of active ingredients in a brown bottle with a Teflon-lined screw cap and dissolved in HPLC grade hexane. Stock standard solution was used to prepare primary dilution standards at different concentrations by dilution of the composite stock standard solution with hexane, corresponding to the expected range of concentrations found in samples and it was used to calibrate (retention time, and area count) the instrument response with respect to analyte concentration in accordance with Soomro, *et al.,* (2008) techniques.

3.5.3. For Permethrin Base and cypermethrin insecticides

The insecticides were analysed with Gas Chromatograph (Thermoquest-Trace GC) with 63Ni selective Electron-Capture Detector with advanced software (Chromcard-32 bit Ver 1.06 October 98). The carrier gas and the makeup gas was nitrogen with a 1.0ml/min and 40ml/min-flow rate respectively employing the split less mode. The area under the peak was directly proportional to the concentration of the analyte.

2.0ml of the final extracts was injected at a temperature of 2700 ^{0}C. The oven temperature was kept at 1200^{0}C with a hold time of 1 minute, then from 1200^{0}C to 2050^{0}C at a rate of 250^{0}C/minute with a hold time of 1 minute then finally from 205 to 2900 ^{0}C at a rate of 20 ^{0}C/minute with a hold time of 60min. The total run length was 15minutes. The detector was maintained at 290^{0}C and the Peaks were identification with GC software (Chromcard-32 bit Ver 1.06 October 98) calibration table set up with a relative retention time window of 0.65%.

3.6. Data Analysis

The data obtained were statistically analysed using one way analysis of variance (ANOVA), and the Post hoc comparison test.

4. Result and Discussion

4.1. Result

The concentration of permethrin, cypermethrin detected in the extracted serums of the experimental animals (Albino - Rats), those placed under no mosquito net as control, those placed under commercially insecticide treated Mosquito net, and those placed under experimentally formulated treated insecticide Mosquito net are presented here for discussion. The data obtained were analysed at P-value ($p<0.05$). Values are mean ± SD and the significant data accepted were compared with the data of p-value.

Table 1: Permethrin level detected (mg L^{-1}) in the serum of the Albion Rats within the experimental

Group of experimental animals	Permethrin level detected (mg L^{-1}) in the serum of the experimental animals within the period of experiment											
	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week	9th week	10th week	11th week	12th week
A	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
B	1.2±0.02	0.9±0.01	0.9±0.01	0.89±0.01	0.82±0.03	0.7±0.08	0.7±0.08	0.6±0.08	0.6±0.06	0.6±0.02	0.6±0.09	0.6±0.04
C	0.32.±0.01	0.27±0.08	0.27±0.09	0.23±0.08	0.23±0.01	0.2±0.01	0.2±0.03	0.2±0.03	0.2±0.03	0.2±0.03	1.9±0.07	0.2±0.06

Key: Group 'A' containing Rats placed under no mosquito net as control, Group 'B' containing Rats placed under commercially insecticide treated Mosquito net, and Group 'C' containing rats placed under experimentally formulated treated insecticide Mosquito net

Table2: Cypermethrin level detected (mg L^{-1}) in the serum of the Albion Rats within the experimental

Group of experimental animals	Cypermethrin level detected (mg L^{-1}) in the serum of the experimental animals within the period of experiment											
	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week	9th week	10th week	11th week	12th week
A	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
B	0.1±0.06	0.1±0.08	0.1±0.04	0.1±0.02	0.1±0.03	0.1±0.08	0.1±0.08	0.1±0.02	0.1±00.4	0.1±0.02	0.1±0.07	0.1±0.04
C	0.2.±0.07	0.2±0.04	0.3±0.09	0.3±0.02	0.3±0.02	0.2±0.01	0.2±0.08	0.2±0.09	0.2±0.08	1.9±0.03	1.9±0.09	0.9±0.08

Key: Group 'A' containing Rats placed under no mosquito net as control, Group 'B' containing Rats placed under commercially insecticide treated Mosquito net, and Group 'C' containing rats placed under experimentally formulated treated insecticide Mosquito net

Table 3 Calibration data for the retention times (tR), limits of detection (LOD), and limits of quantification (LOQ) in mg L^{-1} of insecticide analyzed by G C

Standard Insecticide	Calibration data				
	t_R, min	Equation	R^2	mg/L	
				(LOD)	(LOQ)
Permethrin	6.82	y = 11.388x + 1.682	0.9994	0.0017	0.0058
Cypermethrin	7.74	y = 6.7901x + 2.8332	0.9993	0.0008	0.0027

The residues concentration of permethrin and cypermethrin in the extracted serum samples were detected in the albino rats at limits of detection (LOD) as in Table 4.3. The concentration of these insecticides (permethrin and cypermethrin) were identified by comparing the retention time/peak areas of unknown samples with those of standards through calibration curves.

4.2. Discussion

Permethrin insecticide and Cypermethrin insecticide were detected in the serum blood samples of the albino Rats. . ANOVA results of $F(2,57) = 9.1, P = 0.000$ indicates significant difference in the concentration level of the insecticide in the three groups of the Rats. The Post hoc test indicates that, those Rats housed under experimentally formulated mosquito net, $[Mean = 0.8, SD = 0.02]$, and those placed under commercially insecticide treated Mosquito net, $[Mean = 0.5, SD = 0.001]$, experienced higher level of concentration of insecticide as compared to controls, $[Mean = 0.00, SD = 0.00]$ (those in Group A) as indicated in both Table 1 and 2. The Mean ± Standard Deviation for permethrin insecticide and cypermethrin insecticide was significantly different than the controls means. 0.9±0.011mg/L of Permethrin was detected in samples of week two and three of the commercially insecticide treated Mosquito net and 0.32.±0.01mg/L in week one of the experimentally formulated treated insecticide Mosquito net, respectively as indicated in Table 1, while cypermethrin has a highest value of 0.1±0.082mg/L in week two, six, and seven of the commercially insecticide treated Mosquito net as well as 0.9±0.082mg/L in the experimentally formulated treated insecticide Mosquito net respectively as indicated in Table 2.

The world health organization (WHO) recommends a permissible limit of 0.05mg/kg-2.0mg/kg for both permethrin and cypermethrin even though permethrin is slightly more effective than cypermethrin (Agnieszka *et al.,* 2018).The values recorded for both insecticides used in this work are within the WHO recommended permissible limits. These insecticides are several times more toxic to insect than to vertebrate due to insects' small size, lower body temperature, and its more sensitivity to sodium channels. Yet, these insecticides are recommended for home use to control insect because they are considered relatively non-toxic to human. However, the insecticides are not completely harmless as they may enter the body by absorption, through skin contact, by inhalation, and through food or water. Absorption levels of these insecticides depend on the duration of exposure, and if found present above the permissible limit, may have an adverse effect on the fertility, the immune system, the cardiovascular and the hepatic metabolism as well as the enzymatic activity (Agnieszka *et al.,* 2018).

These results agree with the work of Soomro *et al.,* (2008), who found a concentration of 0.009, 0.005, 0.05 and 0.08 mg/kg endosulfan, monocrotophos, carbaryl and cypermethrin respectively in the blood serum samples of spray-workers in their related work. Also, Yawar *et al.,* (2012) found Chlorpyrifos, endosulfan, 1,1,1-trichloro-2,2-bis (p-chorophenJyl) ethane (p,p'-DDT) and parathion residues at the alarming rate in most of blood samples of the agro professionals volunteers used in their experiment. In support of this work, Mathur *et al.,* (2005) also reported to have analyzed 14 organochlorines and 14 organophosphorus pesticides, where 0.057 mg/l of α β γ and δ HCH were detected in the whole blood samples they considered while γ isomer of HCH 0.0227 mg/l (lindane) was detected in some of the blood samples. Also 0.0652 mg/l of DDD, DDE and DDT were detected in blood samples. Also 0450 mg/l, 0.0046 mg/l, 0.0948, 0.0662, 0.0301and 0.0366mg/l of pp'- DDE isomers endosulfan Monocrotophos, chlorpyrifos, malathion and phosphamidon were respectively detected in serum blood samples showing an evidence of absorption of pesticide and insecticide by the body.

5. Conclusion and Recommendation

5.1. Conclusion

The residual concentration of the insecticides studied in the serum extracts of the albino rats appears at very low concentrations within the permissible level. This however proved evident of absorption of insecticide in the body system of the experimental Rats. In most cases, the concentration decreases over some periods of the exposure of the experimental Rats to the insecticide due to metabolic activity, and also possibly due to the reduction of the concentration of the insecticide on the experimental mosquito nets owing to environmental factors such as rise in temperature. However, the low concentration of these insecticides detected indicates toxicological impact on exposed animals. Hence there is need for further toxicological studies particularly on the metabolites formed by this insecticide to ascertain its effect even at low concentration.

5.2. Recommendation

Government should investigate the reason for the poor usage of insecticide treated nets for the purpose of its improvement.

There should be a public awareness program on the effective use of insecticides, especially on the treatment of Mosquito net as most of the insecticides are carcinogenic.

A timely alternative method for the use of insecticide treated mosquito net in controlling malaria, and other mosquito related diseases, such as fumigation, should be adopted on the side of both the government, and all the stake holders.

Government should fund more research and encourage on the synthesis of insecticide that are environmentally friendly and non-toxic to human, as well as regulating the importation of these insecticides

REFERENCES

[1] Agnieszka C., Iga H., Inga D., Joanna B., Marcin W., Anna C., and Dorota O. (2018). Current Research on the Safety of Pyrethroids Used as Insecticides. *Medicina (Kaunas)* v. 54 (4) pp. 61. Published online 2018 Aug 28. doi: 10. 3390/medicina54040061 2PMC6174339

[2] Anyanwu, E. C., Ehiri, J. E., Kanu, I., Morad, M., Ventegodt, S., and Merrick, J. (2004) Assessing the health effects of long-term exposure to insecticide-treated mosquito nets in the control of malaria in endemic regions. *The Scientific World JOURNAL* 19(4), 978–988.

[3] Anyanwu, E. C., Ehiri, J. E., Kanu, I., & Merrick, J. (2006). Health effects of long-term exposure to insecticide-treated mosquito nets in the control of malaria in endemic regions, revised. *The Scientific World JOURNAL*, *6*.

[4] Ikeako LC, Azuike EC, Njelita IA, Nwachukwu CC, Okafor KC, Nwosu C, Agbanu CM, Ofomata U. C (2017). Insecticide treated nets: perception and practice among pregnant women accessing antenatal services at a tertiary hospital in Awka, Nigeria Volume 5 Issue 4 - 2017

[5] Mathur, H. B., Agarwal, H. C., Johnson, S., & Saikia, N. (2005). Analysis of pesticide residues in blood samples from villages of Punjab. *CSE Report, India*, 1-15.

[6] Righi, D. A. and Palermo-Neto, J. (2003) Behavioral effects of type II pyrethroid cyhalothrin in rats. *Toxicol. Appl. Pharmacol.* 191(2), 167–176.

[7] Stewart, P. W., Reihman, J., Lonky, E., & Pagano, J. (2012). Issues in the interpretation of associations of PCBs and IQ. *Neurotoxicology and teratology*, *34*(1), 96-107.

[8] Soomro, A. M., Seehar, G. M., Bhanger, M. I., & Channa, N. A. (2008). Pesticides in the blood samples of spray-workers at agriculture environment: The toxicological evaluation. *Pakistan Journal of Analytical & Environmental Chemistry*, *9*(1), 6.

[9] Schafer, K., Reeves, M., Spitzer, S., & Kegley, S. E. (2004). Chemical trespass: Pesticides in our bodies and corporate accountability. *Pesticide Action Network North America*.

[10] Waliszewski, S. M., Aguirre, A. A., Infanzón, R. M., & Siliceo, J. (2000). Carry-over of persistent organochlorine pesticides through placenta to fetus. *salud pública de méxico*, *42*, 384-390

[11] Whyatt, R. M., Barr, D. B., Camann, D. E., Kinney, P. L., Barr, J. R., Andrews, H. F., . . . & Ramirez, J. (2003). Contemporary-use pesticides in personal air samples during pregnancy and blood samples at delivery among urban minority mothers and newborns. *Environmental health perspectives*, *111*(5), 749-756.

[12] Yawar L., Syed T. H. S., Muhammad I. B., and Shafi N. (2012). Evaluation of Pesticide Residues in Human Blood Samples of Agro Professionals and Non-Agro Professionals *American Journal of Analytical Chemistry*, 3, 87-595 http://dx. doi. org/10. 4236/ajac. 2012. 38077 Published Online August 2012 (http://www. SciRP. org/journal/ajac)

[13] Yohannes, K., Dulhunty, J. M., Kourleoutov, C., Manuopangai, V. T., Polyn, M. K., Parks, W. J., Williams, G. M., and Bryan, J. H. (2000) Malaria control in Central Malaita, Solomon Islands. I. The use of insecticide-impregnated bednets. *Acta Trop*. 75(2), 173–183.