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# ASSESSMENT OF THE EXCRETION LEVELS OF HEAVY METALS THROUGH THE LITTERS OF CHICKENS FED VARYING PREPARED CONCENTRATIONS OF SELECTED HEAVY METALS IN THEIR FEEDS

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**ABSTRACT**: *Studies were carried out to assess the excretion levels of selected heavy metals (Pb, As, and Cd) through the litters when varied prepared concentrations (10ppm, 20ppm, 30ppm) of the metals were administered to the poultry chickens ( Broilers and Layers) for eight weeks period. The poultry litter samples were digested accordingly and spectrometric analysis was followed. The analysis indicated that heavy metals once ingested into the system are not easily excreted. This bio-accumulative capability of the heavy metals in the specific organs in the body system underpines their reactivity and toxicity. The mean excretion level of the selected heavy metals in the litters was in the following decreasing order: As> Pb> Cd. Finally, the study observed that increased exposure of poultry chickens to heavy metals in the environment also increases the risk of its bioaccumulation and biomagnifications in the system.*

**KEYWORDS**: Heavy Metals, Poultry litters, Bioaccumulation and Poultry Chickens.

## INTRODUCTION

Heavy metals pollution is posing a serious problem in Nigeria, threatening the animal and human health and quality of the environment [1]. Heavy metal pollution has become a global concern as of late as a result of farming advancement. Heavy metals of industrial bio-waste contaminate drinking water, food and air. The toxic heavy metals of great concern are Cadmium, Lead and Arsenic which are usually associated with harmful effects in man and animals [1][2][3]. It is recognized that heavy metal may exercise a definite influence on the control of biological function, affecting hormone system and growth of different body tissues. Many heavy metals accumulate in one or more body organs with differing half lives [3][4]. Food accumulation with heavy metals is a serious threat because of their toxicity, bioaccumulation and biomagnifications in the food chain [5][6][7]. These pollutants often have direct physiological effect because they are stored or incorporated in tissues, sometimes permanently [8][9]. The main sources of heavy metals in chickens arises from contamination of poultry feeds, drinking water and processing [10][11]). The toxic elements present in the feeds pose serious health hazard to primary and secondary consumers due to magnification [6]. Abdulahhi et al.[11], demonstrated that trace of heavy metals involved in the manufacture of feeds accumulate in the body and cause harmful impact on animal life. Meyer et al.[12], reported that increased Cd intake by poultry chickens results to various symbiotic toxicity



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effect like decreased feed intake, poor functioning of liver and kidney, low body weight gain e.t.c.

Hassan et al.[13], observed that birds fed between 10- 30ppm of leads in their diets experienced poorer growth rate, low appetite, weight loss and low hatchability. According to National Research Council [14] and Hassan et al.[13], acute toxicities of arsenic and mercury to poultry chickens include decreased feed intake, loss of weight , increased percentage of embryonic mortality , decreased egg weight , starvation and sometimes death.

Heavy metals are bioaccumulative and the body does not have the metabolic mechanism and capability to completely excrete it from the body system. Heavy metals does not perform known metabolic function in the body .This research was undertaken to assess the excretion level of selected heavy metal (Pb, As, Cd) prepared at varying concentrations and fed to the chickens through their feed for specific period.

## MATERIAL AND METHOD

The chemicals and instruments used are of analytical grade.

### Procedure

Weighed 1500g each of the feed brands were contaminated with varied prepared concentration of Pb, As, and Cd fed to the chickens (broiler and Layers) raised by the researchers for a period of two months. The chickens were segregated and raised based on the concentrations of heavy metals administered to their feeds for that period. 0ppm,10ppm,20ppm and 30ppm of the heavy metals(Cd, Pb and As) were respectively prepared and $20cm^3$ each of the metal concentrations was mixed with the feed brands fed to the chickens at each period. Hence, $60cm^3$ of the heavy metals of each concentration were administered to the feeds fed to the chickens at each period. At the end of the eight weeks period, the litters of the chickens raised for each administered metal concentration were analyzed to determine possible excretion rate for the selected heavy metals. The chicken litter samples were digested in accordance with the standard analytical procedure AOAC,[15].The heavy metal were analysed by aspirating the digest through the acetylene atomic adsorption spectrometer.

## RESULT AND DISCUSSION

**Table 1.** Mean Concentrations Of Cd, Pb, and As in the Litters of the broiler Chickens after two months of heavy metal administration in their feeds at different Concentrations (µg/g)



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| Sample | Lead | cadmium | Arsenic |
|---|---|---|---|
| $BLT^0$ | 0.011±0.001 | 0.009±0.001 | 0.033±0.001 |
| $BLT^{10}$ | 0.106±0.001 | 0.098±0.000 | 0.312±0.000 |
| $BLT^{20}$ | 0.147±0.002 | 0.125±0.001 | 0.341±0.001 |
| $BLT^{30}$ | 0.166±0.001 | 0.158±0.001 | 0.403±0.001 |

*BLT* = Broiler Litter

**Table 2.** Mean Concentrations Of Cd, Pb, and As in the Litters of the layer Chickens after two months of heavy metal administration in their feeds at different Concentrations (µg/g)

| Sample | Lead | Cadmium | Arsenic |
|---|---|---|---|
| $LLT^0$ | 0.004±0.001 | 0.005±0.001 | 0.114±0.001 |
| $LLT^{10}$ | 0.108±0.002 | 0.103±0.001 | 0.266±0.001 |
| $LLT^{20}$ | 0.121±0.001 | 0.115±0.001 | 0.292±0.001 |
| $LLT^{30}$ | 0.190±0.001 | 0.166±0.001 | 0.329±0.001 |

*LLT* = Layer Litter

Table 1 and 2 showed that the heavy metals once absorbed are not easily excreted from the system. The metals increased in the chickens as the concentrations of the heavy metals in the feeds were increased. For the chickens administered 10ppm of the heavy metals through their feeds, the range of mean metal concentration in the litters were between 0.098-0.312 µg/g.When the chickens were administered 20ppm, the range of mean concentration of the heavy metals in the litters at the end of the administration was between 0.115-0.341 µg/g.When the chickens were administered 30ppm , the range of mean concentration of the heavy metals in the litters at the expiration of the eight weeks were between 0.158- 0.403 µg/g.

The order of increase of the heavy metals in the litters of the chickens were As> Pb> Cd. From the analysis of the chicken litters, less than 2% of the Pb and Cd concentration fed to the chickens were excreted. About 3-4% of the As concentration administered to chickens were excreted at the end of the period.

## CONCLUSION

The study has shown that heavy metals are very bio accumulative in the body system hence is poorly excreted. Of the three heavy metals selected for the study, Pb and Cd were respectively least excreted from the system while As was the most excreted from the system. Arsenic is usually methylated in the liver and is usually slowly excreted through the kidney. Finally, the research showed that one way of increasing the heavy metal load in the soil is consistent application of organic fertiliser which for example includes poultry litters e.t.c


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