EFFECT OF CRUDE OIL POLLUTION ON FOOD TO THE SAFETY OF PEOPLE OF ILAJE COMMUNITY IN ONDO STATE

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Abstract
The damaging effect of oil exploration to their host communities is of great concern. As a result of the abundant crude oil in Ilaje community of Ondo State, the safety of the people in the areas led to this research work, where animals were used as a case study. The raw materials used for the research were sourced from the community in order to properly ascertain the effect of oil on their agricultural products.
Physical and chemical observation/analyses were carried out on the test rats fed with the test samples produced from the raw materials sourced from the community. Rats fed with the control samples had the highest weight gain of 44.76% while the animals feed with the treated samples had low weight gains, which was 33.73%.
The study equally revealed the presence of high concentrations of heavy metals in the tissues such as the liver, kidney, and intestine. Iron, Nickel and lead were significantly higher than the other metals such as zinc, copper, cadmium, manganese and chromium, while arsenic and mercury were very minute in one or two places.
The results confirmed or revealed the potential environmental problems prevalent in the area and by extension, other areas where crude oil is being explored.

Keywords: Oil Spillage, Human Health, Pollution, Processed Food, Rat organs, Human safety.

Submitted: 29.05.2016 Reviewed: 15.07.2016 Accepted: 02.09.2016

1. INTRODUCTION

Man's foods are from both plants (through photosynthesis) and animals (which depends on plants). The process of photosynthesis requires that water is transpired through the root hairs (of the plant) to the leaves where they are stored (in the cells).
During transpiration processes, water is absorbed alongside some toxic constituents from chemically polluted soil which are bio-accumulated and built up into complicated substances used as food by man. Nutrients, which are vital to the growth and development/health of man, are consumed in these plants. While consuming these nutrients, man consume along it toxicants which can cause serious damage to the cells, and result in cell lyses and eventual death. Toxic constituents from this crude oil exploration could be referred to as accumulated poison (Clugsten *et al.*, 2001) which sometimes leads to gradual death of liver cells. The oral route is perhaps the most important way through which most toxicants enter the human tissues. When environmental media such as soil, air and water are contaminated with heavy metals, for example, the impacts on the adult man largely depends on the extent to which the metals get into human food items (Onianwa, 2015). Also, it was reported that lead, one of the heavy metals, could be more fatal in children less than five years, and in adults, it is known to cause high blood pressure, muscular and joint pains, decline in mental functioning, memory loss, reduced sperm count, and miscarriages in pregnancy (Onianwa and Fakayode, 2000).
Food and environmental interaction could be both positively and negatively (Enujiugba, 2001). Soil, water and organism positively produced food for survival of man, while on the negative side, its benefits to man has been devastated through pollution, which release end product (pollutant) into the air, water and the land. These pollutants lead to destruction of wildlife and biodiversity. It equally affects human health and loss of fertile soil for agricultural purposes. It should be noted that

though that some elements could be essential at trace levels, and toxic above certain thresholds. But some element such as lead and cadmium has no essential nutritional importance even at trace levels. In some local foods, heavy metals such as lead, cadmium, nickel, copper, aluminium, etc and in some cases estimated the dietary intake from the consumption of these foods. The data exposes the risk of these heavy metals (Onianwa et al, 1997; Ketiku et al., 1999; Onianwa et al., 1999a, 1999b; Onianwa et al., 2000a, 2000b).

Crude oil is processed to produce other useful chemicals. It is a source of energy containing among other components: aliphatic, aromatic, poly-aromatic hydrocarbons and heavy metals that may be toxic to plant and animals if they come into contact. The earth surface is composed of over 70% and most precious natural resources that exist on the planet. Water can be made polluted by adding large amount of unwanted minerals into it, which makes it bad or unclean. Sewage, fertilizers and debris could cause clogs on water ways thereby affecting respiratory ability of fish and water organisms (Krants and Kiffestein, 2002). Also, much of the available freshwater is not fit for purpose due to pollution related to discharge of sewage, agricultural wastes, industrial effluent, municipal runoffs and wastes, domestic/kitchen wastes and oil spills (UN Water, 2005).

Petroleum often pollutes water bodies in the form of oil, resulting from oil spills during transportation or pipeline vandalization. Estimated oil spills have been much and the end result being devastating effect on marine ecosystem. Other water pollutants could be radioactive substances such as uranium and thorium mining and refining where the waste is dispersed with the radioactive component into the sea. Heat, as a result of cooling water from factories and power plants are equally a source of pollution, which results in deaths of many aquatic organisms.

The release of pollutants into bodies of water or directly into soils or through pesticides or fertilizers could result in very serious health problem. The pollution of water by heavy metals resulting from mining, industrial activities, and irrigation is also important. The most serious element in this category is mercury contamination (Khayat, 2002). They affect water bodies on account of discharge of industrial waste into flowing streams, and of course the fish and other sea foods/animals which are organisms of such ecosystem are seriously affected. These sea foods may be consumed by humans, which could lead to serious health safety.

As a result these toxic problems through oil spillage and other contaminants, there is the need to seriously pay attention to the health safety of people living in these areas and other areas with similar problem. This study was put in place to evaluate, using animal bio-assay, and the possible effects of chemical pollutants present in crude oil polluted foods on some selected haematological parameters of the rat. Also, the study tends to identify the chemical pollutants present in the samples of polluted foods.

2. MATERIAL AND METHODS

Harvested yam tubers from the sampling sites were processed by roasting (feed A), the other feed consists of fried yam (Feed B). Feed C was normal rat feed (control feed) purchased from an established animal feed seller.

Fish was used to supply protein to the meal was equally sourced from the same vicinity and dried.

The feed formulations are as shown below (table 1).

After weighing the correct quantities for each feed, each feed was thoroughly mixed inside a vortex mixer to ensure proper blending before drying. Each diet was packed, labeled, sealed and kept properly to prevent insect or mould infestation.

Feeding Regime

Animals were divided into three groups of six (6) each. Each group was placed on test feed A and B, while the third group was placed on the normal rat ration to serve as the control.

Table 1: Feed composition

Composition	Feed A	Feed B
Roasted white yam (kg)	5.0	
Roasted yellow yam (kg)		5.0
Fish (kg)	1.5	1.5
Groundnut Oil (kg)	0.5	0.5
Vitamin premix (g)	65	65
Minerals premix (g)	40	40

a- Roasted white yam
2a- Roasted yellow yam

Animal Treatment

Two months old healthy wistar rats (18 in number) were purchased for the experiment. The weight range of the rats at the point of purchase was between 110 and 120g. The rats were kept in cages and fed with normal meal of rats for three (3) weeks for adaptation to the new environment.

The weight range of the rats after three weeks was 150 – 165g. The rats in cages 1 and 2 respectively were fed with the compounded feeds, while the rats in cage 3 continue with the normal ration. They all had equally access to water. The body weight and food intakes were measured weekly and clinical observation made daily.

Analytical Procedure

At end of seven (7) weeks treatment period, animals were sacrificed by decapitation after chloroform treatment in desiccators. A 2cm^3 blood was let into centrifuge tubes placed in ice for an hour, centrifuged to obtain serum, and analysed using assay kits obtained from Quinica Conica Aplicada S.A. to make working standard. Doubly distilled deionized water was used to dilute samples and standards.

Sample preparation

The samples from the animal parts were reduced to small pieces and where necessary, oven dried at 80^{0}C to constant weight. Each was pulverized in a coffee mixer mill 800 to less than 200 mesh (<74μm) using aluminum ceramic cylinders.

Sample Digestion for Atomic Absorption Determination

About 2.5g ovens dried, ground sample was placed in a 50cm^3 long neck digestion flask. About 10cm^3 of concentrated acid mixture was added with occasional stirring to obtain a homogenous mixture and digested slowly at 70^{0}C using a hot plate. 5cm^3 portion of the acid mixture was later added and the temperature was increased to 100^{0}C and maintained until approximately 5cm^3 solutions remained.

The solution, either colourless or yellowish, was allowed to cool and a few drops of hydrogen peroxide added and again heated gently until clear colour observed. The final digested solution was transferred into 50cm^3 calibrated flasks and diluted to volume deionized water. A blank digest was carried out in the same way.

Analysis

Aliquots of the digest were analysed for the trace elements and heavy metals by flame Atomic Absorption Spectrometry using the standard addition method. Copper was analysed by using NBS certified reference materials that were digested together with the samples and analysed quantitatively using the same procedure.

3. RESULTS AND DISCUSSION

Tables 2 gave the result of the weekly weight gain of the experimental rats. It could be inferred from the table that the groups of animals fed with Feed A and Feed B recorded lower weight gains of 33.73% and 35.22% over the period of the experiment, as compared to the control Feed C that recorded 44.76%.

Table 2: Weekly Gain by Rats

Weeks	1	2	3	4	5	6	7	Gain (%)
Feed A	212.12 ±3.23	234.11 ±2.33	240.56 ±1.33	249.09 ±2.93	260.51 ±9.41	265.43 ±6.11	283.66 ±4.56	33.73
Feed B	209.35 ±7.70	228.30 ±10.00	241.44 ±3.90	254.80 ±7.31	268.00 ±5.13	276.11 ±4.11	283.09 ±3.77	35.22
Feed C	213.11 ±5.33	236.22 ±5.80	251.88 ±6.55	265.44 ±10.90	278.10 ±3.66	285.76 ±10.11	308.50 ±9.11	44.76

Table 3: Metal Ion Concentration (ppm) Bioavailability in the Intestines

Feeds	Zn	Cd	Cu	Pb	Ni	Fe	Cr	Mn	As	Hg
A	89.45 ±4.36	23.11 ±1.22	32.21 ±4.45	287.33 ±10.32	492.33 ±11.11	1052.23 ±2.33	4.12 ±1.01	4.04 ±1.12	Tr	ND
B	112.21 ±3.67	22.11 ±1.22	44.41 ±4.33	280.77 ±9.87	498.66 ±11.12	1146.33 ±8.55	4.09 ±0.02	3.68 ±1.13	Tr	ND
C	268.41 ±6.22	ND	58.98 ±3.21	ND	ND	524.44 ±3.43	ND	4.59 ±2.02	ND	ND

Tr = Trace Concentration (<2ppm). Mean ± SD (of 6 values). ND = Not Defected

Table 4: Metal Ion Concentration (ppm) Bioavailability in the Kidneys

Feeds	Zn	Cd	Cu	Pb	Ni	Fe	Cr	Mn	As	Hg
A	54.07 ±1.36	14.22 ±1.56	16.49 ±2.97	123.53 ±3.33	298.55 ±3.56	748.22 ±1.34	8.33 ±1.32	4.78 ±0.45	2.07 ±1.25	ND
B	71.43 ±1.67	16.22 ±1.32	68.60 ±1.96	142.33 ±3.34	302.44 ±4.33	543.29 ±5.55	7.75 ±2.09	3.92 ±0.21	Tr	ND
C	178.78 ±6.32	ND	69.06 ±4.28	ND	ND	336.54 ±2.45	ND	5.64 ±1.23	ND	ND

Tr = Trace Concentration (<2ppm). Mean ± SD (of 6 values). ND = Not Detected

It was equally observed from the table that the rats that consumed the rat rations gained more weight than those that consumed the compounded/experimental feeds, even when placed under same condition. It could be that the experimental feeds contain some anti-nutritional factor which could be attributed to the effect of toxicants resulting from oil spillage. This could have been the reason why the rats that consumed the experimental feeds gained less than those that consumed the normal ration. This result is similar to what Enujiugha and Nwanna, 2001 reported that increase in hydrocarbon of plants and animals, oil pollution also raise heavy metal content of the water and use of such water for domestic purposes could lead to health hazard. Also, ITOPF, 2001 reported that adult fishes living hear the shore and younger ones in shallow nursery ground may be at greater risk to exposure from dispersed or dissolved oil, while WRI, 1994 reported that ingestion of food contaminated with heavy metals over extended period of time can cause serious effect which may lead to irreversible health damage.

As we know, absorption of food nutrients takes place in the small intestine. Tables 3, 4, and 5 respectively show the results of the metal ion concentration in the intestines, kidneys and the liver. Of the three organs analysed, higher concentrations of the metals were noticed in the liver, which might be due to fact that the liver is biologically, the pool detoxification of chemicals, drugs and toxicants.

Table 5: Metal Ion Concentrations (ppm) Bioavailability in the Liver

Feeds	Zn	Cd	Cu	Pb	Ni	Fe	Cr	Mn	As	Hg
A	145.22 ±2.51	23.44 ±2.43	25.21 ±2.04	56.74 ±0.34	103.34 ±4.90	826.53 ±10.09	8.43 ±1.33	1.67 ±1.00	ND	ND
B	152.32 ±2.34	19.23 ±1.34	23.12 ±0.98	58.67 ±0.54	92.09 ±1.87	878.09 ±11.03	8.42 ±1.33	2.07 ±0.54	ND	ND
C	1185.23 ±1.45	ND	28.76 ±1.01	ND	ND	362.22	ND	1.89 ±1.01	ND	ND

Tr = Trace Concentration (<2ppm). Mean ± SD (of 6 values). ND = Not Detected

The small intestine, as we know, is the main digestive and absorption organ and absorbed about 90% of the ingested food stuffs pass through it. Since the liver receives and store more than 75% of the total blood, this function allows a longer residence time, which invariably enhances the ability of the liver to bio-concentrate the metal ions. Although the levels of these metal ions in the liver are in most cases lower than that of the intestine but higher than values obtained for the kidney.
In all the analyses, it was noticed that the control fed did not show the presence of toxic metals except for the experimental feeds. This shows that the soil from which the yams were harvested might have been contaminated either directly or through water outlet to the soil.

4. CONCLUSIONS

The likely bioaccumulation of the heavy metals in the feed could have subsequently led to the enlargement of organs such as the liver and kidney in some animals which could have ultimately affect the proper functioning of these organs. It might also have led to the loss in weight recorded for the animals that were fed with the experimental feeds. Although proper medical examination and evidence was not sourced, the possibilities of health defects could not be completely ruled out.

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