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DETERMINATION OF CHEMICAL TOXICITY AND RADIATION DOSE BY BURNING TIRE AT 'YAN BABBAKA UNGUWA UKU, YAN AWAKI, KANO

[1]Tijjani, R. B., [2]Mansur, S., [3]Abdullahi, B. A., [2]Farida, M., [1]Mannir, I. S. and [1]Sani, M. S.
[1]Biological Science Department Yusuf Maitama Sule University Kano
[2]Physics Department Yusuf Maitama Sule University Kano
[3]Physics Department Gombe State University, Gombe
Email: msaid@yumsuk.edu.ng

ABSTRACT
One of the principal concerns both in industrialized and underdeveloped countries is the health risk assessment of environmental pollution. The health of workers and residents of any environment is impacted by using tires as a source of energy while roasting or preparing food. This study examines the potential health risks associated with the Unguwa-Uku head-skin roaster's operations throughout the course of the three-day Eid-Kabir holiday. The average radiation dose absorbed over a period of 18 hours per day was found to be $213.48 \times 10^{-3} mSv/day$ ***and*** $640.44 \times 10^{-3} mSv/3day$***, respectively, exceeding the U.S. standard occupational radiation limit of*** $136.9 \times 10^{-3} mSv/day$, $410.70 \times 10^{-3} mSv/3day$, ***and*** $50.0 mSv/year$***. The results of both kidney and liver function tests reveal significant levels of urea in samples C and D, which indicates excessive levels of waste product in these samples' blood.***
Keyword: Pollution, Radiation dose, AST, ALT, ALP, Roasting and tires

INTRODUCTION

Pollution has regarded as the introduction of undesirable substances into the environment by human activities in quantities that endanger either the availability of the resource or the health of its inhabitants (Tripati et al., 2007). Environmental deterioration has become one of emerging countries' main concerns in recent decades. Around the world, there is a growing awareness of how urgent it is to address environmental contamination brought on by a variety of chemicals employed in different activities (Palaniappan et al., 2009). The elimination of harmful compounds that have been building up in the soils, water, and system as a result of dump sites over the last few decades as well as the elimination of massive volumes of rubbish that are regularly created. (Hsua et al., 2006). Our health and wellness depend on the quality of the air we breathe. Sadly, air pollution has been an issue since the 1960s, particularly in wealthy countries (Kan, 2009). The removal of dangerous substances that have been accumulating in the soils, water, and system as a result of dump sites over the past few decades as well as the disposal of enormous amounts of garbage that are constantly produced (Hsua et al., 2006). The air we breathe is essential to our health and wellbeing. Sadly, air pollution has been an issue since the 1960s, particularly in wealthy countries (Kan, 2009). Health problems and deaths from both natural and man-made causes are brought by air pollution. Some of the main man-made sources of ambient air pollution include tobacco smoke, solid fuel combustion for cooking and heating, household cleaning products, insecticide industries, cars, power generation, and inadequate environmental regulation, less efficient production technology, congested roads, and old and poorly maintained vehicles (EPHA, 2009). It has been demonstrated that radiation has harmful biological effects on living things. The dose and length of exposure affect these negative consequences.

Burning tyres releases toxic fumes and has detrimental effects on one's health. The bulk of automobile tyres are made of chemicals, including phenolic resins, petroleum waxes, carbon black, fatty acids, steel wire, aromatic oils, silica, synthetic and natural rubber, silica, sulfur, and sulfur compounds.

These chemical and gas exposure and inhalation situations might ultimately result in acute (short-term) and chronic (long-term) health concerns for the community, as well as occupational dangers for those who work in the meat processing industry. According to the World Health Organization (WHO), exposure to environmental pollution over an extended period of time causes around a quarter of the diseases that affect people today (Njagi. 2013).

Particles, dioxins/furans, volatile organic compounds (such as benzene, toluene, and xylene), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), 1,3-butadiene, and heavy/toxic metals/metalloids (such as arsenic, mercury, cadmium, chromium, etc.) are all released when these chemicals burn when ignited (Reisman, 1998). These tires may leak chemicals into the flesh and hide during the meat-singeing process, adulterating the meat and making it unsuitable for human consumption (Obiri-Danso et al., 2008). Human exposure to these chemicals can happen by ingestion of tainted meat, water, or vegetables cultivated in contaminated soil, as well as through inhalation (i.e., breathing air that has been polluted by tire-fire smoke indoors or outside). The community may ultimately be exposed to acute (short-term) and chronic (long-term) health risks from these exposure scenarios, which also present occupational concerns to those who work in the meat processing industry. The community may ultimately be exposed to acute (short-term) and chronic (long-term) health risks from these exposure scenarios, which also present occupational concerns to those who work in the meat processing industry.

Animal research is one of the first steps in medical discovery. In order to understand how a disease works in the body. Animal testing is essential to understand the safety and proper dosage of new medicines and treatment. Animal testing shows whether or not a drug is safe in animal.

During the Eid-Kabir large number of Muslims observed sacrifices as act of worshiping. Some part of skin, legs and head of their sacrifices were usually roasted: they use tyres as source of fires as a cheaper option. This research is aimed at determining the level of chemical toxicity and radiation dose absorbed by the workers during the three to four days exercise. This work employs the rabbit and dosimetry device to measure the toxicity level and radiation dose exposures respectively.

Study Area

'Yan awaki market with coordinate 11.94510, 8.57179 is a facility or premises for the selling of animals, hygienic slaughtering, roasting and inspection of animals, and processing for human consumption. It has several furnaces for roasting locally made from scrap tyre which is the major source of fuel used in the furnaces. Each furnace has at least six employees involved in roasting and cleaning of the animal skin. At initial stage before roasting process the animal's skin is cut into pieces. The roasting procedure consists of two different stages. The first which is also called "retouching"; where, the animals' skin are roasted evenly from both sides.

MATERIALS AND METHODS

Equipment; Weighing Balance, Centrifuge, Incubator, Semi-automatic biochemistry analyzer, Microplate reader, Cuvette, Micropipette, Test-tubes, Syringe, Razor blade, Plane serum bottle, Cotton wool, Laboratory glassware, Spectrophotometer

Reagents; Aspartate Aminotransferase (AST) kit (Randox laboratory, United Kingdom). This is commercially prepared AST kit with following composition

Contents	**Initial concentration of solutions**
R1 Buffer	
Phosphate buffer	100mmol/l pH 7.4
L –aspartate	100mmol/l
α– oxoglutarate	2mmol/l
R2. 2,4 – dinitrophenyl hydrazine	2mmol/l

Alanine Aminotransferase (ALT) kit (Randox laboratory, United Kingdom). This is commercially prepared ALT kit with following composition.

Contents	**Initial concentration of solutions**
R1 Buffer	
Phosphate buffer	100mmol/l pH 7.4
L –aspartate	200mmol/l
2 – oxoglutarate	2.0 mmol/l
R2. 2,4 – dinitrophenyl hydrazine	2.0mmol/l
Sodium hydroxide	0.4mol/l

Alkaline phosphatase (ALP) kit (Randox Laboratory, United Kingdom). This is commercially prepared ALP kit with following composition:

Contents	**Initial concentration of solutions**
R1a Buffer	
Diethanolamine buffer	1mol/l PH 9.8
Mg Cl2	0.5mmol/l
R1bsubstrateP- Nitropheny phosphate	10mmol/l

Sample collection and Exposure

A total of 4 healthy experimental animals (Rabbit) of almost the same weight were used for the study. The animals were purchased from Sabon Gari Market Kano. Samples were labeled sample A-D. Sample A was used as a control while samples B, C and D were exposed to heat source and black smoke of tire burning at Unguwa Uku 'Yan Awaki for about 5 hours. Sample A (control) and sample B were dissected at the day of exposure, there internal organs (lung, liver and heart) were observed. While sample C and D were kept at laboratory for 7 days and their behavior and feeding habit were observed. At day 7 they were slaughtered and dissected; heir internal organs were also observed. Blood samples of all the samples were taken after slaughtering for further biochemical analysis.

Physical parameters

colour, weight and shape of some internal organs of the sample (lung, liver and kidney) were observed, weighed and recorded.

Radiation

The radiation alert inspector was placed at set distance from the heat source over a given time. The distance was initially set at 1m, and the reading was taken for 5, 10, 20 and 30 minutes. In similar pattern, the distance was adjusted to 1.5m, 2m, 2.5m and 3m for the same time as the initial set up. The result of the measurement was recorded in table 1.

Aspartate Amino Transferase Assay (AST)

Sample and sample blank labels were placed on five test tubes. Each tube received 0.5 cm3 of reagent R1, which was added. The sample tube was pipetted with serum (0.1 cm3). After that, they were mixed and incubated at 37°C for exactly 30 minutes. The sample blank was then filled with 0.1 cm3 of serum after (cm3) reagent R2 was added to both tubes. After mixing them, they were let to stand at 25oC for exactly 20 minutes. Following the pipetting of sodium hydroxide (5 cm3) into both tubes, the samples' absorbance in comparison to the sample blank was measured and recorded after 5 minutes at 546 nm.

Alanine Aminotransferases Assay (ALT)

After labeling five test tubes as samples and one as a blank, solution R1 (0.5 cm3) was added to each tube. The sample tubes were pipetted with serum (0.1 cm3). They were then combined and incubated at 37°C for precisely 30 minutes. Each test tube received 0. 5ml of reagent 2, which was added, mixed, and left to stand for 20 minutes at 25oC. To each tube, 5.0ml of sodium hydroxide was added before everything was combined. After 5 minutes, the absorbance was measured at 546 nm against a reagent blank.

Alkaline Phosphatase (ALP)

Alkaline phosphatase was added to each sample in an amount of 0.5 ml, and it was then allowed to acclimate to 37 oC for three minutes. Deionized water was used as the sample for the reagent blank. At scheduled intervals, 0.01ml (10U/l) of each standard, control, and sample were added to their appropriate test tubes and gently mixed. At 37oC, incubate for precisely 10 minutes.

2.5 ml of alkaline phosphates color developer were added at scheduled intervals and well mixed in the same manner as in step 2. The spectrophotometer's wavelength was adjusted at 590 nm, and reagent blank was used to zero it (wavelength range 580-630nm). The sample's absorbance was read and recorded.

RESULTS

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The internal organs shows that there is an increase in all the parameters in sample C and D, but sample B doesn't show a significant different when compare with the control, this is because the toxicity is not likely to manifest at the day of exposure (Plates 1 and 2).

Plate1: Dissected sample

Plate 2: Observing Internal Anatomy

Calculation

Despite the fact that most workers used a distance of less than 1 meter to roast skin (Table 1) the total radiation dosage that Yan Babbaka The absorbed dosage in 30minutes was $= 5.93 \times 10^{-3} mSv/h$ while in 1hour the total absorbed dose is$= 2 \times 5.93 \times 10^{-3} = 11.86 \times \frac{10^{-3} mSv}{h}, =$ $the\ one\ day\ absorbed\ dose = 18 \times 11.86 \times 10^{-3} = 213.48 \times 10^{-3} mSv/day$ (18 working hours), Three days absorbed dose$= 3 \times 213.48 \times 10^{-3} = 640.44 \times 10^{-3} mSv/3days$ (18 Working hours).

The standard occupational radiation exposure limit as stated by United State of America is $50 mSv/year$ equivalent to $136.9 \times 10^{-3} mSv/day$ and$410.7 \times 10^{-3} mSv/3days$. (Mansur et al., 2021).

The above result shows that the works were exposed to have $213.48 \times 10^{-3} mSv/day$ and $640.44 \times 10^{-3} mSv/3days$ which exceed the maximum limit expected per day and per 3 days respectively. This indicate that the lives of the workers are at great danger and the need to be oriented and enlighten on the heath rick implications.

The diverse mixes of toxicants contained in burning tire fumes have been shown in tests by Mannahan (2002) to function to inhibit physiological pathways, elicit strong multiplicative effects, or result in anomalies as a result of the absorbed was calculated at a 1-meter distance. This is so because the research's instrument and sample cannot sustain temperatures above one meter.

aggregate of individual impacts. There are several targets that each chemical in hazardous mixtures is thought to affect, and some of them are known to interact with other compounds in the body to either intensify or lessen their toxic effects. A more comprehensive strategy that involves the direct measurement of human biomarkers of exposure and effect as well as indirect examination of environmental data is typically advocated in human exposure studies, especially in industrial contexts.

Alkaline phosphatase (ALP), Alanine transaminase (ALT), and Aspartate aminotransferase (AST) tests are frequently used to look for liver problems (ALP). In addition to the heart, liver, and muscles, the body also contains the enzymes AST, ALT, and ALP. These enzymes are released into the bloodstream when the liver is injured. An issue with the liver or muscles is indicated by a high level of these enzymes. From Table 2, it was observed that there is lower level of enzymes in sample A (control) and B and higher level in sample C and D. the different observed in sample B may be due to the fact that the toxic chemical has a long-term effect and may not be expressed at the day of exposure.

Table 1: Equivalent dose absorbed in 1 meter

S/N	Time (min)	Radiation dose (CPM)	Radiation dose (mR/h)	Radiation dose (mSv/h)
1.	5	331	0.0951	9.51×10^{-4}
2.	10	571	0.1721	1.72×10^{-3}
3.	20	1240	0.4100	4.10×10^{-3}
4.	30	2018	0.5932	5.93×10^{-3}
		Equivalent dose absorbed in 1.5 meter		
1.	5	283	0.0832	8.32×10^{-4}
2.	10	545	0.1772	1.77×10^{-3}
3.	20	1210	0.3510	3.51×10^{-3}
4.	30	2001	0.5211	5.21×10^{-3}
		Equivalent dose absorbed in 2 meters		
1.	5	265	0.0751	7.51×10^{-4}
2.	10	530	0.1553	1.55×10^{-3}
3.	20	1110	0.3101	3.10×10^{-3}
4.	30	1920	0.5312	5.31×10^{-3}
		Equivalent dose absorbed in 2.5 meters		
1.	5	248	0.0738	7.38×10^{-4}
2.	10	519	0.1440	1.44×10^{-3}
3.	20	1090	0.3100	3.10×10^{-3}
4.	30	1562	0.4621	4.62×10^{-3}
		Equivalent dose absorbed in 3.0 meters		
1.	5	121	0.0601	6.01×10^{-4}
2.	10	498	0.1439	1.43×10^{-3}
3.	20	1076	0.3110	3.11×10^{-3}
4.	30	1445	0.4202	4.20×10^{-3}

Table 2: Liver and kidney function of the test samples

SAMPLE/ ABSORBTION	ALP (µmol/l)	ALT (µmol/l)	AST (µmol/l)	SAMPLE/ ABSORBTION	UREA (mg/dL)	CRETININE (mg/dL)
SAMPLE A (CONTROL)	9.3	0.03	0.07	SAMPLE A (CONTROL)	27.25	0.035
SAMPLE B	10.2	0.05	0.10	SAMPLE B	30.82	0.939
SAMPLE C	16.2	0.16	0.16	SAMPLE C	58.88	0.977
SAMPLE D	18.8	0.14	0.17	SAMPLE D	33.91	0.984

The blood urea test also checks for waste products in the blood. For both Liver and Kidney function tests, the results show high amount of urea in samples C and D, which indicate high waste product in the blood of these samples see Plate 3 and also table 2 &3.

When we look at the lungs of samples A and B, we will see that they possess a normal colour of the lung according to physiologists, but lung of sample C and D have the appearance of reddish colour on their lung which indicate some problem and this support the finding of Aguilera (2013), that chronic exposure to fumes from burning tires is seen to have affected the lung function of the butchers.

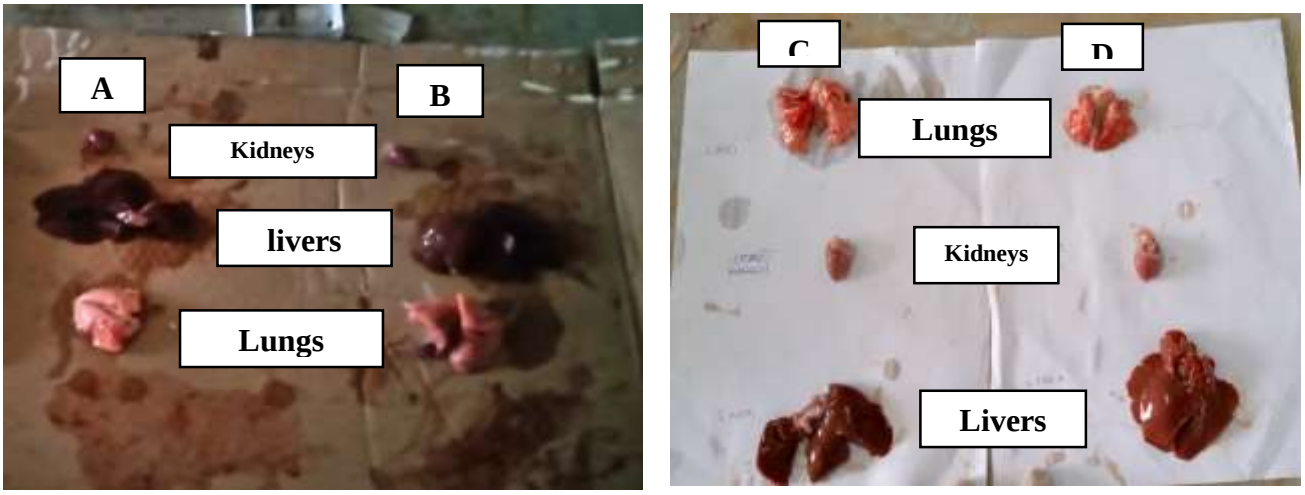

Plate 3: Some internal organs of sample A, B, C and D

CONCLUSION

The result obtained revealed that workers in the station are at the risk of having biological effect which manifest in the whole body or eggs and sperm which could subsequently affect their reproductive systems due to the amount of radiation they are exposed to which is above standard limit. The result for the liver function and kidney function also shows that there is an increase in all the parameters in sample C and D, but sample B doesn't show a significant different when compare with the control, this is because the toxicity is not likely to manifest at the day of exposure.

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