Review

Lead Content of Three Common Suya Meats Sold on Major Streets in Sokoto Metropolis, Nigeria

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Abstract

This study was carried out to evaluate the lead (Pb) contents of three common consumed suya meats (Beef, Chevon and Mutton) sold on the major streets of Sokoto metropolis, in Sokoto, North Western Nigeria. Lead was determined using atomic absorption spectrophotometer (AAS) and sample selected included fresh and roasted meats at the same suya points. The results showed the presence of lead in all the tested meats. Three (3) meat samples were randomly collected from two major streets in the city of Sokoto; Abdullahi Fodio road (AFr) and Gawon Nama road (GNr). The meats were procured in two batches; one was procured fresh on arrival to the suya point at about 11:00am in each road/street (control) and the second batch after being processed at around 7:00pm (ready to eat), at the same suya points. The mean concentration and standard deviation of lead in Beef FAFr 0.070±0.005, Beef RAFr 2.10±0.10, Chevon FAFr 0.090±0.0002, Chevon RAFr 2.05±0.044, Mutton FAFr 0.06±0.006, Mutton RAFr 2.06±0.020 while in Beef FGNr 0.050±0.010, Beef RGNr 2.00±0.010, Chevon FGNr 0.080±0.008, Chevon RGNr 2.10±0.020, Mutton FGNr 0.040±0.002, Mutton RGNr 1.75±0.080 in mg/kg respectively. Although, the concentrations observed were below limited levels, but with gradual and steady accumulation and biomagnifications of this non-biodegradable element, a risk of rise to lethal level with it inherent health risk could be envisaged in man in urban and peri-urban areas of Sokoto.

Key Words: Suya Meats; Lead (Pb); Bioaccumulation; Sokoto Metropolis

Introduction

Suya (Agashe/Balangu), is a spicy meat which is a popular food item in various parts of Nigeria and is enjoyed as a delicacy in West Africa. It is traditionally prepared by the Hausa people of Northern Nigeria, Cameroon, Niger, and some parts of Sudan. It is generally made from beef, ram or chickens. Innards such as kidney, liver, intestine and tripe are also used [1].

Suya is a mass consumer fast food, called a street food, because preparation and sales are often done in small stalls along local streets, sometimes under dubious hygienic conditions [2,3]. Concern have been raised about the hygienic standards of processing and safety of roadside suya, as normally sold wrapped in old newspapers which has been criticized for serving as a possible source of contamination [4,5].

Cases of haemolytic anaemia have been described after ingestion of suya, possibly as a result of adulteration of food additives, as well as particulates from the atmosphere deposits on the surface of exposed meats before and after processing.

Most of the discharged lead from vehicles exhaust lands on the soil, in water, street fast food (including suya meat), and on living organisms. Therefore, plants are the second main dietary source of lead and meats are usually third. Consumption of these possibly contaminated meats could cause pronounced dangers to the health, as they are prone to contamination with environmental metal pollutants [6].

Lead (Pb) has been shown to have effects on many biochemical processes in both adults and children by various authors. Anaemia has been observed in children blood at lead level (BLL) above 1.92µmol/litre [7]. The developing nervous system of a child can be affected adversely at blood lead levels of less than 10µg/dl. Children suffer neurological effects at much lower exposure levels, this cause decrease in intelligence

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quotient (IQ) performance and other neuropsychological defects with lead exposure [8]. Lead (Pb) exposure may lead in increased risk of hypertension and its consequences in adult, while pregnant women are at risk of spontaneous abortion and potential damage to the foetus [9].

There is paucity of data on the lead levels of suya consumed in Sokoto, North Western Nigeria. The aim of this research work is to evaluate the lead (Pb) contents of three (3) commonly consumed suya meats (beef, mutton and chevon) sold on the major streets of Sokoto metropolis with a view to having base line information on their lead (Pb) contents. The specific objectives of this study were to; determine the concentration of lead in three (3) most commonly consumed suya meats (beef, mutton and chevon) sold on the two major streets of Sokoto metropolis and compare the lead contents between the fresh and roasted meats sold on the two major streets of Sokoto metropolis.

Materials and Methods

Study Area

The study was conducted within Sokoto metropolis in North Western, Nigeria. Annual rainfall ranges from 500 to 750 mm falling between May and September. Average temperature is about 32°C during wet season and up to 40°C in the dry seasons [10].

Method

Three (3) meat samples were randomly collected from two major streets in the city of Sokoto; Abdullahi Fodiyo road (AFr) and Gawon Nama road (GNr), which include Beef, Mutton and Chevon. The meats were procured in two batches; one was procured fresh on arrival to the suya point at about 11:00am in each road/street (control) and the second batch after being processed at around 7:00pm (ready to eat), at the same suya points. After oven dried, a known quantity was washed, wet digested and filtered. The filtrates were later analyzed for lead (Pb) using atomic absorption spectrophotometer following the standard addition method [11]. The analysis was carried out at Agricultural Physical Laboratory of Animal Science Department of the Usmanu Danfodiyo University Sokoto, Nigeria.

Statistical Analysis

Data collected was analyzed using statistical package for social sciences (SPSS version 20). The mean values and standard deviation were calculated. A p-value of ≤0.05 was considered significant in all statistical analysis.

Results

Lead (Pb) concentration (mg/Kg) in all the meats collected along Abdullahi Fodiyo and Gawon Nama roads, Sokoto is shown in table 1. Lead (Pb) concentration (mg/Kg) in all the meats collected along Gawon Nama road is shown in table 2.

The mean comparison of the roasted meats between Abdullahi Fodiyo and Gawon Nama roads, Sokoto is shown in table 4.

### Table 1: Lead (Pb) concentration (mg/Kg) in all the meats collected along Abdullahi Fodiyo Road

<table>
<thead>
<tr>
<th>Meats</th>
<th>Fresh Meat (Mean ± SD)</th>
<th>Roasted Meat (Mean ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>0.07 ± 0.005</td>
<td>2.24 ± 0.100</td>
</tr>
<tr>
<td>Chevon</td>
<td>0.09 ± 0.002</td>
<td>2.50 ± 0.044</td>
</tr>
<tr>
<td>Mutton</td>
<td>0.06 ± 0.006</td>
<td>2.04 ± 0.020</td>
</tr>
</tbody>
</table>

### Table 2: Lead (Pb) concentration (mg/Kg) in all the meats collected along Gawon Nama Road

<table>
<thead>
<tr>
<th>Meats</th>
<th>Fresh Meat (Mean ± SD)</th>
<th>Roasted Meat (Mean ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>0.05 ± 0.010</td>
<td>2.00 ± 0.180</td>
</tr>
<tr>
<td>Chevon</td>
<td>0.08 ± 0.008</td>
<td>2.10 ± 0.020</td>
</tr>
<tr>
<td>Mutton</td>
<td>0.09 ± 0.002</td>
<td>1.75 ± 0.080</td>
</tr>
</tbody>
</table>

### Table 3: The mean Lead comparison between the fresh and roasted meats along Abdullahi Fodiyo and Gawon Nama Roads

<table>
<thead>
<tr>
<th>Meats</th>
<th>Fresh</th>
<th>Roasted</th>
<th>P – Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef AFr</td>
<td>0.070</td>
<td>2.10</td>
<td>0.005</td>
</tr>
<tr>
<td>Chevon AFr</td>
<td>0.090</td>
<td>2.05</td>
<td>0.002</td>
</tr>
<tr>
<td>Mutton AFr</td>
<td>0.060</td>
<td>2.06</td>
<td>0.006</td>
</tr>
</tbody>
</table>

### Table 4: The mean Lead comparison of the roasted meats between Abdullahi Fodiyo and Gawon Nama Roads.

<table>
<thead>
<tr>
<th>Meats</th>
<th>Roasted AFr</th>
<th>Roasted GNr</th>
<th>P – values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>2.10</td>
<td>2.00</td>
<td>0.100</td>
</tr>
<tr>
<td>Chevon</td>
<td>2.05</td>
<td>2.10</td>
<td>0.435</td>
</tr>
<tr>
<td>Mutton</td>
<td>2.06</td>
<td>1.75</td>
<td>0.020</td>
</tr>
</tbody>
</table>

Legend

AFr – Abdullahi Fodiyo Road
GNr – Gawon Nama Road
Discussion

This present study indicates the presence of lead, a non-biodegradable element in the suya consumed in Sokoto, North Western, Nigeria. This finding agrees with the earlier reports of [12] (2010) that heavy metals are components of the natural ecosystems. This report is also in harmony with the finding of Zuruyk et al. [13] that various kinds of heavy metals are present in urban environment due to mainly intense human and industrial activities. The values (0.05mg/kg) obtained from our findings from fresh beef agrees with the finding of Fathy et al. [14] who recorded 0.04mg/kg on the fresh beef meat, but inconsistent with the finding of Iweala et al. [6] who reported 0.02mg/kg obtained on roasted beef meat. The reason for the low value obtained in previous study may be linked to the facts that the meat was not exposed to the atmosphere and not sold by the road side. There is a significant difference (p < 0.05) in levels of lead between fresh and roasted meats in all the locations. This could be from petroleum product pollution by vehicular exhausts and atmospheric particulates. But, there is no significant difference in roasted samples as the value obtained are closely related irrespective of sample location (p>0.05) except that of mutton which was significant (p= 0.05). There are several reported cases of heavy metals especially lead (Pb) in Nigeria [15-16]. Although the mean amounts of lead observed in this study were within the tolerable limits of lead in foods which is 5mg/kg set by FAO and WHO [17]. This indicates that lead emitted from automobile exhausts tend to deposits and absorbed on the meats as it remains at the suya point. With gradual and steady accumulation and bio-magnification of this non-biodegradable element, a rise to lethal levels with it inherent health hazards could be envisaged in man and his animals. There is need for every suya point to have a protecting means against atmospheric particulates, following the current rise in population and industrialization in urban areas. Possible bio-accumulation of metals in the liver and kidney of man and his pet animals arouses a significant interest since man has the ability of bio-concentrating small doses of deleterious chemicals in harmless quantities would eventually build-up to dangerous level [12].

Conclusion

The study evaluated the lead (pb) contents of three common suya meats (Beef, Chevon and Mutton) sold on the major streets of Sokoto metropolis, Nigeria. It was found out that time taken and vehicular exhausts increase the concentration of lead in suya meats at the suya points.

Recommendations

We observed that the lead concentrations observed were below limited levels, but with gradual and steady accumulation and biomagnifications of this non-biodegradable element, a risk of rise to lethal level can occur with inherent health risk. We recommended that meats sold in Sokoto metropolis should be masked with certain heat resistant materials in the course of processing and selling to ensure that this element do not increase to lethal levels of potential health risk.

References


