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Levels of Benzo(a)pyrene (BaP) in Smoked and Barbecued Fish within Benin Metropolis.

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Smoked fishes such as Atlantic Mackerel (Scomber scombrus), Senegal Jack (Caranx senegalus) and barbecued fishes such as BoboCroaker (Psuedotolitus selongatus), Catfish (Clarias gariepinus) sold and consumed in Benin City and obtained in selected markets were screened for the presence BaP. Column chromatography, packed with anhydrous Na2SO4 and silica gel was used for PAH extraction with dichloromethane as the eluting solvent. The identification and concentration of BaP was carried out by liquid chromatography (HPLC) with the aid of 16 standards. Benzo(a)pyrene concentration in smoked Caranx senegalus ranged from 36.23 to 270.48 μg/kg. There was a significant difference (p<0.05) in the mean level of BaP in smoked fish samples across the sampled markets. There were no significant difference p>0.05 in the mean BaP for all samples of Scomber scombrus from the sampled markets. The difference in BaP concentration in barbecued fish among the sampled markets was statistically significant (p<0.05). The BaP levels of all smoked and barbecued fish samples (24) examined in this study were found to be higher than the acceptable limit (5μg/kg) specified by the European Commission and FAO/WHO limits (10μg/kg).

Key words: Benzo(a)pyrene (BaP), Smoked and Barbecued Fish, Nigeria, Scomber scombrus, Caranx senegalus, Psuedotolitus selongatus, Clarias gariepinus

1. INTRODUCTION

Polycyclic aromatic hydrocarbons constitute a large class of organic compounds that have the carcinogenic activity. Traces of PAHs have been detected in many foods (EFSA, 2007) including vegetable oils, fruits, sea food, grilled and roasted meat, smoked fish, tea and coffee (Simko, 2002). In particular, benzo(A)pyrene has been found in these samples at concentration levels between 0.1 and 100mg/kg and hence pose a health risk to consumers (Rey-Salgueiro et al., 2008). Smoking has been used for centuries as a means for food preservation and is still used widely for this purpose. In the developing world up to 70% of the total fish catch is preserved by smoking (Ward, 1995). The process of smoking requires the penetration of food products by smoke resulting from thermal destruction of wood. Research has shown that BaP concentration of charcoal fire cooked meat samples was much higher than gas fire cooked meat (Anderson et al., 2002). However, Rivera et al. (1996) detected BaP concentrations of 4 to 19μg/kg in charcoal grilled meat. The levels of BaP in smoked foods, including turkey, pork, chicken, beef and fish products were found to be between 0.15 and 8.93μg/kg by Gomaa et al. (1993). This study investigated the presence and the levels of benzo[a]pyrene in some smoked and barbecued fish in Nigeria.

2. MATERIALS AND METHODS

Locally smoked fish (Caranx senegalus and Scomber scombrus) and barbecued fish (Psuedotolitus elongates and Clarias gariepinus) (about 5 g) of different species commonly consumed in Benin city, were purchased from three different market centres from local vendors in Benin city, Edo state Nigeria and analysed using Solid phase extraction (SPE) Cartridge, Agilent 6890 series Gas chromatograph, vacuum degasser, liquid chromatography (HPLC), UV diode-array detector.

3. RESULTS

Benzo[a]pyrene Levels in Smoked Fish (Caranx senegalus and Scomber scombrus). Mean BaP levels in smoked fish are presented in (Figure 1). Benzo[a]pyrene concentration in smoked Caranx senegalus ranged from 36.23 to 270.48 μg/kg among the sampled markets. The least BaP concentration was recorded in smoked fish (Caranx senegalus) samples from Oliha Market while the highest was recorded in samples from New-Benin Market. There was a significant difference (p<0.05) in the mean level of BaP in smoked fish samples across the sampled markets. Benzo[a]pyrene Levels in Barbecued Fish (Psuedotolitus elongates and Clarias gariepinus). The difference in BaP concentration in barbecued fish among the sampled markets was statistically significant (p>0.05). The levels of BaP in barbecued fish samples ranged from 128.377 to 206.68 μg/kg, the highest value was...
reported in fish samples (*Psuedotolitus elongates*) from Ekewan Road (Tips Bar) while the least was reported in fish samples from S & T Barracks, Ugbowo. *Clarias gariepinus* had a mean value of 145.25 μg/kg across all stations as seen in figure 1. These levels were significantly higher as compared to the levels in the smoked fish samples as presented in figure 1. The difference between smoked and barbecued groups was significant (p<0.05).

Figure 1: Determination of Benzo(a)pyrene in smoked and barbecued fish in Benin Metropolis.

4. DISCUSSION

The variation in the levels of BaP observed among sampled smoked and barbecued fish from the selected markets in this study could be related to differences in processing (Duration of smoking), differences in the type of wood used for smoking or even differences in construction of smoking kilns. The levels of BaP in barbecued fish samples ranged from 128.377 to 206.68 μg/kg and for the smoked fish 36.23 to 270.48 μg/kg and exceeded the acceptable limit (5μg/kg) specified by the European Commission (E.C, 2005) and FAO/WHO limits (10μg/kg).

levels between 0.1 and 100mg/kg and hence pose a health risk to consumers (Rey-Salgueiro et al., 2008). Variable levels of BaP were detected ranging from 7.46 to 18.79 μg/kg in smoked fish (Muyela et al., 2012). This study however, found much higher values. All smoked and barbecued fish samples (24) examined in this study were found to far above the acceptable limit (5μg/kg) specified by the European Commission (E.C, 2005) and FAO/WHO limits (10μg/kg).

5. REFERENCES


