Effect oil contaminated diet with oil palm leaf

EFFECT OF PRETREATMENT OF CRUDE OIL CONTAMINATED DIET WITH OIL PALMLEAF ON LIPID PEROXIDATION AND XANTHINE OXIDASE ACTIVITY IN THE KIDNEY OF RATAchuba , F. I .

Department of Biochemistry, Delta State University, PMB 1, Abraka Nigeria. AbstractThe toxicity of petroleum hydrocarbon across theliving systems is now a common knowledge among the scientific community. Whatis lacking is a mini-scale antidote that can be adopted by the inhabitants ofcrude oil producing areas of the world. This was the reason for this study. Thestudy was comprised forty eight female Wister rats divided into six groups ofeight rats each.

The rats were fed as described thus. Group 1: ((normalControl). Group 2: feed mixed with 5. 0goil palm leaf. Group 3: feed mixed with 10. 0g oil palm leaf.

Group 4: Feedmixed with 4ml crude oil (Crude oil Control). Groups 5 and 6: Contaminated dietmixed with ground oil palm leaf (5. 0 g and 10. 0 g respectively). At the end ofexposure periods (three and six months respectively), the rats were sacrificedand the kidney used to prepare supernatant used for the determinations oxidativestress indices (lipid peroxidation and xanthine oxidase activity).

The resultsshow that pretreatment of crude oil contaminated diet with oil palm leaf tendto restore values of lipid peroxidation and xanthine oxidase activity close tocontrol values. Thus, it is pertinent to state that there exist potentials inthe use oil palm leaf in the treatment of crude oil toxicity. And indeedsetting a fresh agenda for further serious scientific

investigations Keywords: Crude oil, Kidney, Lipid peroxidation, Oilpalm, . Xanthine oxidase, 1. 0 IntroductionTheimpact of crude oil spillage on the ecosystem as a result of oil explorationactivities, equipment failures, corrosion, illegal bunkering, oil theft andillicit refining are well documented 1-3.

Crude oilhas been proved to alter levels of oxidative stress markers in animals 4, 5. These oxidative stress markers include lipid peroxidation and changes in theactivities of xanthine oxidase. Lipid peroxidation precedes oxidative damage inliving organisms and alterations in the level of antioxidants represent ameasure of oxidative stress. Besides, xanthine oxidase activity is an exampleof defense mechanism as well as a measure of oxidative stress 6. Exposure topetroleum hydrocarbons is a risk factor for the impairment of renal functionvia a mechanism dependent on oxidative stress 7. Variousparts of oil palm tree can be used medicinally. The juice squeezed out frompalm leaves can be applied to enhance wound healing while the sap can be usedas laxative 8. Biologically active compounds with known antibacterial andantioxidant properties can be very useful medicinally 9, 10.

It has beenconfirmed that flavonoid, tannin and phenolic are the main phytochemicalconstituents in oil palm leaves; hence its ability to act as an effectiveantioxidant 11. Oil palm fronds extract has 8% higher contents of non-toxicantioxidative phenolic compounds than various green tea extract 12. Oil palmfrond extract may be a potential new source of functional food ingredient, based on reports of its benefit on health 13. The aim of this study was todetermine the effects of palm leave treated crude oil contaminated diet on thelevel of lipid peroxidation and xanthine oxidase activity in the

kidney ofrats. 2. 0 Materials and methodsThe crude oil used for this study was obtained fromNigeria National Petroleum Corporation (NNPC) Warri, Delta State, Nigeria.

Thepalm frond used was obtained from Elaeis guineensis tree in Obiaruku, Delta state, Nigeria Forty eight (48) female albino wistar rats with weightsranging from 0. 088kg to 0. 182 kg obtained from the animal house of Departmentof Anatomy, Delta State University, Abraka were used for this study. The ratswere housed in a standard wooden cage made up of wire gauze, net and solidwoods and left to acclimatize for one week on grower's marsh and tap water at laboratory temperature of 28C and 12 hour day/ nightregime. After the acclimatization period, the rats were weighed andgrouped. 2.

1 Preparation of leaf powder. Theleaves were isolated from the stock and sun- dried. The dried leaf was thenground with domestic kitchen blender into a fine powder and stored in a cleanand sealed plastic container2. 2Treatment of animalsThe forty eight (48) female albino wistar rats wereassigned to six (6) groups according to their weights, with eight rats in eachgroup. Rats in the control group which is Group 1 were fed with grower's marshonly. Rats in Group 2 were fed with grower's marsh and 5g of powdered palmfrond.

Group 3 rats were fed with grower's marsh and 10g of powdered palm leaves. Group 4 rats were fed with grower's marsh contaminated with crude oil (4ml per100g of feed). Rats in Group 5 were fed grower's marsh

contaminated with crudeoil (4ml per 100g of feed) plus 5g of powdered palm fronds.

While rats in Group6 were fed with crude oil contaminated marsh (4ml per 100g of feed) plus 10g ofpowdered palm leaves. The rats in each group were allowed access to cleandrinking water while the experiment lasted. The feeds were prepared fresh dailyand stale feed remnants were discarded regularly.

The animals in each groupwere exposed to their respective diets for three and six months respectively. The National Institute of health guidefor the care and use of laboratory animals (NIH, 1985) wasadopted all through the experiment 2. 3 Collectionof samplesAfter the exposure period, all the rats weresacrificed and the kidneys were harvested. Five grams (5. 0 g) of the kidneyswere weighed in chilled conditions and homogenized with 5ml of normal saline ina mortar. The mixture was diluted with known amount ofbuffered saline before being centrifuged and the supernatant was transferred intoplastic tubes and stored at – 4C before used for analysis within forty eighthours.

2. 4 Determination of lipid peroxidation and xanthineoxidase activityThe activity ofxanthine oxidase in the kidney of rats was measured using the method of Bergmeyeret. al. 14, based on the oxidation of xanthine to uric acid, a molecule thatabsorbs light maximally at 290 nm. A unit of activity is that forming onemicromole of uric acid per minute at 25oC. Lipid peroxidationin the kidney of rats was measured by the thiobarbituric acid reactingsubstances TBARS, method of Gutteridge and Wilkins 15. 2.

5Statistical AnalysisAnalysisof variance (ANOVA) and postHoc Fisher’s test for multiple comparison was performed using statisticalpackage for social science (SPSS), version 20 to determine statistical significantdifferences between means.

P values <0. 05 were taken as being significantlydifferent 3. 0 Results and DiscussionThe effects of Elaeisguineensis leaf on kidney lipid peroxidation and xanthine oxidase activityagainst crude oil induced nephrotoxicity in rats after three and six months areshown in tables 1 and 2.

Lipidperoxidation in the kidney rats exposed to crude oil contaminated (group 4)was significantly (P <0. 05) higher in comparison with the control (group 1). Rats fed palm leave pretreated diets (Group 2 and 3) showed significantly lowerkidney levels of lipid peroxidation when compared with the control (group 4).

Moreover, rats fed crude oil contaminated diets that was pretreated withvarious amounts of oil palm leaves (Group 5 and 6) exhibited significantlylower kidney lipid peroxidation level when compared with the control (group 1)and rats fed crude oil contaminated dietalone (group 4) . Lipid peroxidation, which is a potential markerof oxidative stress, induce disturbance of cell membrane, and functional lossof biomembranes, that results in inactivation of membrane bound receptors andenzymes 16, 17, 18. The present study shows that the consumption of crude oilcontaminated diet increased the level of lipid peroxidation in rats. This study shows that exposure tohydrocarbons present in crude oil can lead to oxidative damage of the kidney asevident by the rise in renal level of lipid peroxidation. This is

based on thepremise that metabolism of hydrocarbonspresent in crude oil generate free radicals 19. This is in consonance withprevious studies by 5, 6, 7, 20.

Oil palm (Elaeis guineensis) frond is richin bioactive phytochemicals such as polyphenols and these polyphenoliccompounds are considered to have antioxidant activity that is several foldshigher than that of vitamins C and E 21, 22, 23. This may be the basis for thedecreased level of lipid peroxidation in the kidney of rats exposed to crudeoil that was treated with oil palm leafThe kidney xanthine oxidase activities weresignificantly (P <0. 05) lower in therats fed crude oil contaminated diets (group 4) in comparison with all theexperimental groups(Tables 1 and 2). Rats fed with oilpalm leaf treated crude oil contaminated diet (Groups 5 and 6) have significantly higher xanthine oxidase activitiesin the kidney when compared with rats fed with crude oil contaminated diet only(group 4). However, rats fed with only oil palm leaf treated diets (Groups 2and 3) have significantly higher kidney xanthine oxidase activity when comparedwith rats fed with only crude oil contaminated diet (group 1).

Xanthineoxidase is involved in phase one process in the inactivation of xenobiotics inanimals 24. The increase in the activity ofxanthine oxidase in rats exposed to oil palm leaf treated diet indicatesresponse of the enzyme to enhance the metabolism of endogenous xanthine. Thisis in a bid to increase the production of uric acid, a potent antioxidant 7, 24, 25. The decrease in activity of xanthine oxidase in rats exposed to crude oilcontaminated diet alone shows that the metabolism of crude oil hydrocarbonsleads to a reduced ability to produce uric acidNevertheless, the increase in the activity

of oxidative enzymes had been reported as ameasure of oxidative stress 26. However, addition of ground oil palm leavesresulted in decrease in toxic effects of crude oil. This is exhibited in thedecrease in xanthine oxidase activity in rats fed with crude oil contaminateddiets that were pretreated with oil palm leaves. This is due to the ability ofoil palm leaves to act as an antioxidant, protecting endothelial cells of thekidney against reactive free radicals thereby decreasing the level ofantioxidant enzymes 11, 13. Substances with antioxidant potentials possesshealth promoting properties, since they quench free radicals which are involvedin many diseases processes 13, 27, 28, 29 Thisstudy has indicated that the consumption of crude oil contaminated diet canresult in increase in oxidative stress which causes corresponding increases inlipid peroxidation levels and xanthine oxidase activity.

However, the crude oiltoxicities were reversed by the consumption of diets that were pretreated withoil palm leaves. This study, therefore, shows the protective role of oil palmleaf against crude oil induced nephrotoxicity. References1. Otitoju O, Onwurah . INE (2007)Preliminary investigation into the possible endocrine disrupting activity ofbonny light crude oil contaminated diet on wistar rats. Biokemistri J. 19(2): 23-282. Ovuru SS, Ekweozor IKE.

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BarnhamKJ, Masters CL, Bush AI (2004). Neurodegenerative diseases and oxidative stress.

Nat Rev Drug Discovery. 3: 205-214 Table 1. Theeffect of Elaeis guineensis leafon the level of lipid peroxidation and xanthine oxidase activity in the kidneyof rats after three months of exposure to crude oil contaminated diet. Groups Lipid peroxidation (nmol/g tissue) Xanthine oxidase activity (units/g tissue) Group 1 0. 35± 0. 05 a 60. 04 ± 4.

28 a Group 2 0. 14 ± 0. 02 b 60. 83 ± 1. 76 a Group 3 0. 10 ± 0. 03 b 69.

28 ± 3. 34 b Group 4 0. 76 ± 0. 10 c 42. 43 ± 1. 78 c Group 5 0.

52 ± 0. 01 d 51. 09 ± 2. 70 d Group 6 0.

34 ± 0. 01 a 57. 05 ± 5. 89 a Each value represents mean ± standard deviation. n = 4 in each group. Values not sharing a common superscript letter in the samecolumn differ significantly at (P < 0. 05).

Group 1: ((Normal Control). Group 2: feed mixed with 5. 0g oil palm leaf. Group 3: feed mixed with 10. 0g oil palm leaf. Group 4: Feed mixed with 4ml crude oil(Crude oil Control).

Group 5: Contaminated diet mixed with 5. 0 g of oil palmleaf. Group 6: contaminated diet mixed with 10. 0 g of oil palm leaf. Table 2. Theeffect of Elaeis guineensis leaf on the level of lipid peroxidation andxanthine oxidase activity in the kidney of rats after six months of

exposure tocrude oil contaminated diet. Groups Lipid peroxidation (nmol/g tissue) Xanthine oxidase activity (units/g tissue) Group 1 0. 42± 0.

08 a 62. 04 ± 3. 80 a Group 2 0. 22 ± 0. 01 b 61. 41 ± 2.

64 a Group 3 0. 11 ± 0. 04 b 68. 24 ± 2. 22 b Group 4 0. 89 ± 0. 11 c 38.

43 ± 2. 66 c Group 5 0. 66 ± 0. 12 d 54. 11 ± 3.

50 d Group 6 0. 53 ± 0. 06 a 55. 44 ± 6. 70 a Each value represents mean ± standard deviation. n = 4 in each group.

Values not sharing a common superscript letter in the samecolumn differ significantly at (P < 0. 05). Group 1: ((Normal Control). Group 2: feed mixed with 5. 0g oil palm leaf. Group 3: feed mixed with 10.

0g oil palm leaf. Group 4: Feed mixed with 4ml crude oil(Crude oil Control). Group 5: Contaminated diet mixed with 5. 0 g of oil palmleaf.

Group 6: contaminated diet mixed with 10. 0 g of oil palm leaf.