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# Effects of Ingestion of Bonny Light Crude Oil on Sperm Motility and Morphology of Male Wistar Rats

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**Abstract:** ***This study evaluated the effects of Bonny light crude oil (BLCO) on the sperm morphology and sperm motility of young adult male wistar rats. Eighty (80) adult male wistar rats were used for this study, they were divide into four (4) parallel groups A, B, C, and D consisting each of fifteen (15) experimental animals and five (5) control animals. The experimental animals in groups A, B, C, and D received 0.5, 1.5, 2.5, and 3.5ml/kg B.W of BLCO respectively, while the control animals in corresponding groups received the corresponding doses of normal saline via oral gastric intubation for sixty (60) days alternately. At the end of the sixty days, the animals were sacrificed and the spermatozoa was expressed, a homogenate made and used for semen analysis. The percentage motility for normal motility decreased down the group with increase in administered BLCO (A; 79.30%, B; 44.00%, C; 38.00%, D; 15.80% ), while in the control groups, the percentage for both normal motility ( $A_1$; 90.60%, $B_1$; 90.50%, $C_1$; 90.10%, $D_1$; 89.60%) were fairly stable. The total percentage morphology of the defected sperm increased down the group (A; 23.50%, B; 46.80%, C; 59.90%, D; 70.20) with increase in BLCO administered, but despite the varying volume of normal saline administered to each control group, the percentage morphology of normal sperm ($A_1$; 93.80%, $B_1$; 94.60%, $C_1$; 94.20%, $D_1$; 93.00%) remained fairly the stable. This study shows that administration of BLCO, can cause a reduction in the percentage of motile sperm and also abnormal morphology of sperm cells.***

**Keywords:** Crude oil, sperm motility, sperm morphology, wistar rats.

## 1. Introduction

Chemically, crude oil is defined as a complex mixture of thousands of different chemical components, straight and branched chain paraffin, cycloparaffin, aromatic and polynuclear aromatic hydrocarbon, small amounts of sulphur and nitrogen compounds also with trace amounts of metals (Hawley, 1981). Bonny light crude oil (BLCO), is Nigeria's marker crude oil, preferred for its low sulphur content which makes it less corrosive to refinery infrastructures and also for its low specific gravity.

Much dependence on petroleum as a whole has brought with it, cases of environmental pollution, and detrimental effects on human existence and ecosystem ( National Research council, 1985; Ruddel, 1994). Oil spillage during production, exploration and discharge from storage facilities and refineries and bursting of pipelines, is one of the fundamental sources of hazard and pollution in oil producing communities of Nigeria ( Dede and Kagbo, 2002; Peters, 1993; Okereke and Ezeanyina, 1987; Lambert akhonbare and Shaw, 1982).

The devastating consequences of spills of this crude oil in Niger delta region, with its eventual hazards on both aerial and terrestrial environs tantamount to an irreversible chain effect on the biodiversity and human safety ( Akpofure *et al.,* 2000). Ingestion of crude oil and its products either in the raw or bioaccumulated form in marine life, presents a potential hazardto terrestrial species (Shore and Douben 1994). Studies revealed that there are biochemical and cytotoxic impairment associated with ingestion of marine animals exposed to crude oil polluted water (Eyong, 2000; Eyong et al., 2004). Crude oil is ingested as laxative, anti-poisoning agent, anti –convulsion agent, used for treatment of arthritis, snake antidote, especially in rural areas, where the conventional antidotes are not available.

The increasing trend of male reproductive impairment observed in some countries has been associated with possible exposure to chemicals that could interfere with endocrine homeostasis ( endocrine reproductive chemicals EDC) (Bergstrom *et al*., 1996; Moller, 2001). Crude oil is an important environmental industrial pollutant that is composed of a widely depending on the location and source (Briggs *et al.,* 1996). In our environment, these chemicals are capable of mimicking the inherent actions of reproductive hormones and thence, have the ability to disrupt the neuroendocrine system or function of gonads directly (Colborn *et al.,* 1993).

The result of this study will thus provide information on the effect of ingestion of BLCO on the motility of sperms and morphology of sperms of male wistar rats.

## 2. Materials and Methods

### 2.1 Bonny Light Crude Oil

The Bonny light crude oil used for this study was obtained from shell petroleum development company, port Harcourt, Rivers state with permission from the Department of petroleum resources, NNPC, Lagos, Nigeria.

### 2.2 Experimental Animals

Eighty (80) male albino rats weighing between 150- 200g and obtained from the Department of pharmacology, University of calabar, were used for this study. The rats were given feed and water ad libitum, they were allowed to acclimatize for a period of three (3) weeks in the animal house of the Department of human anatomy prior to experimentation, they were kept in well ventilated cages at a room temperature of about 25±5°c, and 12 hour light and dark cycle.

### 2.3 Experimental Design

The design consisted of eighty (80) rats divided into four parallel groups consisting of Bonny light treated fifteen (15) animals and five (5) control animals in each pair. The dosages of BLCO administered were determined from previous studies (Eyong, 2000; Fischer *et al.,* 2007). The animals in groups A, B, C, and D were given 0.5, 1.5, 2.5 and 3.5ml/kg B.W of BLCO respectively, while the control animals received corresponding doses of normal saline both once on alternate days for sixty (60) days via oral gastric intubation. At the end of the sixty days, the animals were euthanized under chloroform vapour and sacrificed, spermatozoa was expressed out, a homogenate made which was then used for the semen analysis.

### 2.4 Statistical Analysis

Analysis of variance (ANOVA) was used to compare results from the experimental groups and control groups. P values <0.05 were said to be statistical significant.

## 3. Results

### 3.1 Sperm Motility

Table 1 below represents the mean percentage motility of sperm cells that exhibited normal and retarded motility. The percentage of sperm cells showing normal motility decreased down the group ( A; 79.30%, B; 44.00%, C; 38.00%, D; 15.80%) with increase in the administered dose of BLCO. The percentage motility of sperm cells showing retarded motility increased down the group (A; 20.70%, B; 56.00%, C; 62.00%, D; 84.20%) with increase in administered dose of BLCO. In the control groups, the percentage motility for both the normal motility ($A_1$; 90.60%, $B_1$; 90.50%, $C_1$; 90.10%, $D_1$; 89.60%) and retarded motility ( $A_1$; 9.40%, $B_1$; 9.50%, $C_1$; 9.90%, $D_1$; 10.40%) fairly stable down the group despite varying doses of normal saline administered.

**Table 1:** Mean percentage motility of sperm cells

| Groups | Retarded motility | | | Normal motility | | |
|---|---|---|---|---|---|---|
| | 1+ (%) | 2+ (%) | Total (%) | 3+ (%) | 4+ (%) | Total (%) |
| Control $A_1$ | 1.60 | 7.80 | 9.40 | 30.60 | 60.00 | 90.60 |
| Treated A | 6.70 | 14.00 | 20.70 | 28.00 | 51.30 | 79.30 |
| Control $B_1$ | 1.50 | 8.00 | 9.50 | 31.30 | 59.20 | 90.50 |
| Treated B | 29.80 | 26.20 | 56.00 | 22.80 | 21.20 | 44.00 |
| Control $C_1$ | 1.80 | 8.10 | 9.90 | 30.10 | 60.00 | 90.10 |
| Treated C | 33.30 | 28.70 | 62.00 | 24.60 | 13.40 | 38.00 |
| Control $D_1$ | 1.40 | 9.00 | 10.40 | 32.50 | 57.10 | 89.60 |
| Treated D | 69.40 | 14.80 | 84.20 | 10.40 | 5.40 | 15.80 |

*Values are presented as mean %*
*1+: Spermatozoa moving but not forward progression*
*2+: Spermatozoa moving aimlessly with slow forward progression*
*3+: Spermatozoa moving at moderate speed with forward progression*
*4+: Spermatozoa moving at high speed with straight line forward progression*

### 3.2 Sperm Morphology

Table 2 shows the mean percentage morphology the sperms in each group. The percentage morphology of the normal sperm decreased down the group (A; 76.50%, B; 53.20%, C; 40.10%, D; 29.80) as the dose of BLCO administered increased, while the total percentage of morphology of the defected sperm increased down the group (A; 23.50%, B; 46.80%, C; 59.90%, D; 70.20%), for each form of defect, a gradual increase in the number of defected sperms down the group with respect to increase in BLCO administered. But despite the varying volume of normal saline administered to each control group, the percentage morphology of normal sperm ($A_1$; 93.80%, $B_1$; 94.60%, $C_1$; 94.20%, $D_1$; 93.00%) and defected sperm ($A_1$; 6.20%, $B_1$; 5.40%, $C_1$; 5.80%, $D_1$; 7.00%) remained fairly stable.

**Table 2:** Mean Percentage Morphology of Sperm Cells

| Group | normal sperm | defected sperm | | | | |
|---|---|---|---|---|---|---|
| | NHAT(%) | IH(%) | HOD(%) | TD(%) | FS(%) | TOTAL(%) |
| Control $A_1$ | 93.80 | 1.80 | 2.00 | 2.20 | 0.20 | 6.20 |
| Treated A | 76.50 | 4.80 | 4.60 | 4.70 | 10.40 | 24.00 |
| Control $B_1$ | 94.60 | 1.20 | 2.10 | 2.10 | 0.00 | 5.40 |
| Treated B | 53.20 | 11.60 | 9.50 | 10.80 | 14.90 | 46.80 |
| Control $C_1$ | 94.20 | 1.90 | 1.80 | 2.00 | 0.10 | 5.80 |
| Treated C | 40.10 | 14.50 | 12.70 | 16.30 | 16.40 | 59.90 |
| Control $D_1$ | 93.00 | 1.80 | 2.20 | 2.80 | 0.20 | 7.00 |
| Treated D | 29.80 | 16.80 | 12.50 | 20.80 | 20.10 | 90.20 |

*Values are presented as percentage, NHAT= normal head and tail, HOD = head only defect, IH = isolated head, TD= tail defect, FS= fused sperm.*

## 4. Discussion

Several researches carried out in both laboratory and non-laboratory animals with crude oils of different geologic origins have pointed out the toxic effects of this important commodity ( Ellenton and Hallet, 1981; Mckee et al., 1994; Eyong, 2000; Didia etal., 2003). For normal fertility, a man requires normal spermatogenesis, successful epididymal storage, and normal sperm transport. The fertility in males depends on normal linear progressive sperm motility and normal morphology. This study showed a significant dose dependent reduction in the percentage of normal motility and normal morphology of sperm cells of rats exposed to BLCO, this is an indication that crude oil interfered with testicular spermatogenesis.

It was proposed that environmental exposure to harmful compounds may cause a variation in sperm quality. Crude oil is a known environmental pollutant and contains polyaromatic hydrocarbons (PAH's) which is a known toxic compound. In this study, the most predominant abnormality was fused sperm 10.40% (least dose) and 20.10% (highest dose) and tail defect 4.70%(least dose), and 20.80 (highest dose), it could be suggested that crude oil decreases the synthesis of sperm membrane coating protein which in turn results in the production of morphologically abnormal sperms (Wang *et al.,* 1997, Dada *et al*., 2001).

Increase in the number of morphologically abnormal sperms results in impaired motility as normal intact sperm morphology is a prerequisite for high speed with straight line forward progressive motility. It is postulated that sperm function is strictly correlated with sperm morphology and that sperm motility is the least predictor of fertility potential in man (Gandini *et al*.,2000).

## 5. Conclusion

Ingestion of BLCO by male wistar rats showed significant reduction in percentage sperm motility and sperm morphology.

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