RESEARCH PAPER

TOBACCO INDUCED PRIAPISM IN WISTER RAT: A CASE REPORT

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ABSTRACT

In an eight-week study on the effect of potash-tobacco dust ingestion on rats, a persistent penile erection for days was observed amongst some of the rats under study. This study involved a total of 42 Wister rats of weights ranging between 150-300g and grouped into four groups (A, B, C and D). Group A served as control, while groups B – D served as test groups and received 2g, 4g, and 6g of tobacco-dust, as well as 0.4g, 0.8g, and 1.2g of potash respectively, with water given ad libitum. By the 4th week, a persistent penile erection was observed in one of the rats in group C, and by the 6th week, a similar incident occurred in group C and D respectively, prompting serial observation. By the 8 week, gangrenous changes were observed, followed by necrosis and death of the rats on the 10th day from onset. The control rats (group A), which received normal feed and water, remained normal.

Keywords: Priapism, Rat, Tobacco, Potash, Penile erection

INTRODUCTION

Persistent penile erection, often unrelated to sexual stimulation, is a pathologic condition called Priapism (Burgu et al., 2007). Two distinct forms of Priapism have been described as ‘veno-occlusive’ and ‘arterial’. In contrast to the arterial form, erection is always painful in veno-occlusive cases. The veno-occlusive form is associated with hypoxia and therefore, can cause fibrosis of the cavernous bodies which often leads to erectile dysfunction. The arterial form however, is not considered an emergency since the functional outcome is better (Burgu et al., 2007). Generally, Priapism is a rare entity with a different etiology in humans than in animals, and may be idiopathic, drug induced, or related to some medical problems like sickle cell disease or leukemia. This case report presents an incidence of Priapism in rats subjected to potash-tobacco dust combination diet for eight weeks.

CASE PRESENTATION

A research work on the effects of oral tobacco dust mixed with potash on liver protein enzymes and cellular architecture of Wister rats was conducted at Anthonio Research Centre, Ekpoma, Edo State, Nigeria. A total of 42 Wister rats of weights ranging between 150-300g were involved. The research work was designed to last for eight weeks but was sub-divided into early acute (2 weeks), late acute (4 weeks), early chronic, (6 weeks), and late chronic (8 weeks). The animals were grouped into A, B, C and D. Group A (n=6) served as the control, while groups B-D (n=12 respectively) served as test groups. Test groups B, C, and D, received 2g, 4g, and 6g of tobacco-dust (as recommended by Bagchi et al., 1994), as well as 0.4g, 0.8g, and 1.2g of potash respectively.

At the 4th week of the experiment, a persistent penile erection was observed in one of the rats in group C as shown in figure 1A below. The rat was however, sacrificed the next day following experimental design. At 6 weeks also, a
similar incident occurred in group C and in group D and were observed on the same day as shown in figures 1B and 1C. While the affected rat in group C was sacrificed following experimental design, that of group D was subjected to serial observation.

On day eight (8) from onset of persistent penile erection, gangrenous changes appeared as shown in figure 1D below. This was followed by tissue necrosis and eventual death of the rat by day ten (10). The rats in group A (control) remained normal till the end of the experiment.

Figure 1: A, B, and C showing persistent penile erection (Priapism), Group D as at the 8 days of the onset of persistent penile erection (Priapism) with gangrenous changes.

DISCUSSION

Priapism has been noted as an adverse effect of both first- and second-generation anti psychotic medications, which accounted for 15-26% of cases of priapism induced by medications (Sood et al., 2008; Thompson et al., 1990) with majority of the reported cases in boys with sickle-cell disease and in new born. Thirteen newborn cases of Priapism have been reported since the 1st case in 1876 and peripheral alpha-1 adrenergic blockage has been considered as another main cause of Priapism (Segraves, 1989), while trazodone with its alpha-1 antagonistic properties, has been reported to induce Priapism (Du Toit et al., 2004).
Literatures reveal that many cases of Priapism are induced and according to Seyed et al (2012), drug (quetiapine) induced Priapism has been observed in a 30 year old single unemployed man addicted to tobacco cigarette smoking. Ruan et al (2007) also reported a case of Priapism in a 49 year old male with intractable chronic low back pain due to diffuse lumbar degenerative disc disease, lumbar spondylosis under epidural morphine, and bupivacaine infusion chemotherapy. Sildenafil has also been implicated in inducing Priapism in 25 year old married healthy male (Aggarwal et al., 2010). Interestingly, the incidence of priapism was arrested in all the cases, within days of discontinuing the intake of the drugs.

Available evidence shows that smokeless tobacco contains nicotine, nitrosornicotine (NNN), and 4-(methyl-N-nitrosamino)-1-(3-pyridyl)-1-butanone (NNK), which mediates the substantial release of nitric oxide in the body (Lam et al., 2003). Meanwhile, nitric oxide (NO) is believed to play an important regulatory role in penile erection. Several studies have found the enzymatic activity generating NO (NO synthase; NOS) in the penile erectile bodies, located in both nerve fibres and endothelial cells (Burnett et al. 1992 and Dail et al. 1995). The relaxation of cavernous smooth muscle, a prime requirement for the initiation and maintenance of penile erection (Saenz de Tejada et al., 1991), is highly susceptible to pharmacological manipulations of NO.

Specifically, it has been established that nitric oxide mediates penile erection as neuronal nitric oxide synthase (Burnett, 2006; Ignarro, 2002; Burnett et al., 1993; Stanarius et al., 2001; Lugg et al., 1995; Gonzalez-Cadavid and Rajfer, 1996; Burnett, 1995) as reported in dog (Trigo-Rocha et al., 1993), rabbit (Holmquist et al., 1991), cat (Wang et al., 1993), and rat (Burnett et al., 1992). The nitric oxide is formed during the conversion of L-arginine into L-citrulline, catalyzed by the enzyme nitric oxide synthase (NOS) (Lowenstein et al., 1994; Forsterman et al., 1994), which has been found almost exclusively in the penile cytosol (Burnett et al., 1992; Garban et al., 1995a; Vernet et al., 1995; Lugg et al., 1995 and Garban et al., 1995b). Only one NOS isoform - the constitutive neuronal type (nNOS), has been identified in the penis and localized in the nerve terminals (Lugg et al., 1995; Gonzalez-Cadavid and Rajfer, 1996; Burnett, 1995; Burnett et al., 1992; Burnett et al., 1993; Keast, 1992).

Scientists have observed that the mechanism of this principal neurotransmitter for erection, involves its release by both nerve terminals and endothelial cells. The smooth muscle relaxation during erection depends upon the promotion of Ca2+ efflux. This relaxation of smooth muscle cells is mediated mainly by nitric oxide, which activates the enzyme guanylate cyclase. This cytoplasmic enzyme increases formation of the second messenger, cGMP. Elevated levels of peripheral cGMP in turn promote the efflux of Ca2+ ions from the cavernosa smooth muscle cells. This induces muscle relaxation, facilitates blood flow into the corpora cavernosa, and thereby helps to maintain penile erection (Burnett, 1995).

Our finding suggests therefore, that the ingestion of mild or high dose potash-tobacco dust combination can induce Priapism in a dosage dependent manner. It also indicate that males who are severely addicted to smokeless tobacco (often mixed with some quantity of potash), are likely vulnerable to Priapism and its attendant consequences, especially if the addiction to tobacco is not checked.

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REFERENCES


AUTHORS' CONTRIBUTIONS

Ugbor C.I., was responsible for the design of this work and supply of some literature material. Eloka CCV was responsible for organization of the manuscript. All authors (Ugbor CI., Eloka CCV., Okonkwo LO., Ugwu MC., Ogbodo LA) contributed to the completion of this study and were actively involved in the presentation of this manuscript.