BIOCHEMICAL CHANGES INFLUNCED BY A HORMONE MIMIC COMPOUND DRAINED IN ISMALIA CANAL - STUDY ON MALE ALBINO RATS

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Many phenolic xenoestrogens have been reported to mimic estrogen effects, and may adversely affect the health and reproduction of animals and humans. The aim of this study is to estimate the concentration of 4-tert-octylphenol (4-t-OP), as an example of xenoestrogens, in different areas and seasons in Ismailia canal and to evaluate the effect of 4-t-OP on prolactin, FSH, LH and testosterone levels and to investigate the potential toxic effects of 4-t-OP exposure on liver, kidney and testis, in male albino rats treated with low dose (10 µg/kg/day) and high dose (450 mg/kg/day) of 4-t-OP by oral administration for 4 weeks.. After 4 weeks of treatment, the liver, kidney and testis were investigated histopathologically. The results indicated that 4-t-OP concentrations at all 5 chosen areas of Ismailia canal during the 4 seasons of the year were highly increasing in comparison to values obtained from mineral water (aqua or baraka water 0.04 $\mu g.L^{-1}$). The data also indicated that area of intake of Mostorod drinking water showed maximum concentration (2.5 $\mu g.L^{-1}$) in the level of 4-t-OP in the summer season followed by Abo za`abal area (1.9 $\mu g.L^{-1}$) in the spring season.

The average concentration of 4-t-OP in the different chosen areas among the four seasons (winter, spring, summer and autumn) arranged in descending order as follows; intake of Mostorod (1.95 $\mu g.L^{-1}$) > Abo za`abal (1.64 $\mu g.L^{-1}$) > at 10 km (after oil companies and detergent factor, 1.44 $\mu g.L^{-1}$)> at 65 km effect of dilution (1.40 $\mu g.L^{-1}$) > out take of Mostorod (1.37 $\mu g.L^{-1}$).

The administration of 4-t-OP resulted in a significant elevation in serum prolactin and FSH levels. On the other hand, there was a significant decline in serum LH and testosterone levels, after administration of both low and high doses. The obtained data also revealed a significant decrease in sperm count in all treated groups and this was confirmed by

the histopathological study. The administration of 4-t-OP resulted in a significant elevation in serum urea and creatinine levels after administration of both low and high doses. The obtained data also revealed a significant increase in liver enzymes (AST & ALT) in all treated groups and this was confirmed by the histopathological study. Histopathologic changes in liver, testis and kidney revealed deteriorated architecture with increasing doses and duration, the findings of the present study raise the possibility of hepatic and renal effects exerted by the 4-t-OP

In summary, the findings of the present study raise the possibility that consumption of 4-t-OP in drinking water may adversely influence male reproductive hormones and in turn its fertility and have hepato-renal damages

Keywords, 4-tert-octylphenol, testosterone, LH, FSH, Prolactin

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List of Abbreviations

ΔA/min	Variation of. absorbance per minute
°C	Cellesius
3β-HSD	3β-hydroxy-steroid-dehydrogenase
4-NP	4- nonylphenol
4OP	4-octylphenol
4-t-OP	4-tert-octylphenol
Ah receptor	Aromatic hydrocarbon receptor
ALT	Alanine aminotransferase
APs	Alkylphenols
APEs	Alkylphenol ethoxylates
APEOS	Alkylphenol polyethoxylates
APG	Anterior pituitary gland
AST	Aspartate aminotransferase
BPA	Bisphenol-A
DES	Diethylstilbestrol
ED	Endocrine distruptor
EDCs	Endocrine disrupting compounds
ELISA	Enzyme-linked immunosorbant assay
ER	Estrogen receptor
EV	Estradiol valerate
FLU	Flutamide
FSH	Follicle stimulating hormone
g/l	Gram/liter
H&E	Hematoxyline and Eosin
hCG	Human chorionic gonadotropin

HCl	Hydrochloric acid
IFCC	International federation of clinical chemistry
LH	Luteinizing hormone
M	Molar
mg/dl	Milligram/deciliter
mg/kg/day	Milligram/kilogram/day
ml	Milliliter
mm	Millimeter
mmol/l	Millimol/liter
mol/l	Mol/liter
N	Normal
nm	Nanometer
NP	Nonylphenol
NPE_2	Nonylphenol diethoxylates
NPES	Nonylphenol ethoxylates
OP	Octylphenol
OPES	Octylphenol ethoxylates
PCBS	polychlorinated biphenyls
PR	Progesterone receptor
PRE	Prolacting releasing factor
PRL	Prolactine hormone
ROS	Reactive oxygen species
StAR	Steroidogenic acute regulatory protein
Std	Standard
TcDD	2,3,7,8-tetrachlor-o dibenzo-P-dioxin
U/L	Unit per Liter

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The River Nile is subjected to pollution in some areas from wastewater of industry or agriculture origin but this pollution is limited compared with that in other canals such as Ismailia canal which is considered to be highly polluted because of the presence of many factories which drain their industrial wastewater into the canal **(Tarek and Osama 2007).**

Discharging of petroleum and petroleum derivatives of industrial wastewater to Ismailia canal pollutes the canal water with hydrocarbons, polyaromatic hydrocarbons (PAH), alkanes and aromatic hydrocarbons. These are hazardous, toxic and carcinogenic compounds that are present due to petroleum fractionation **(Tarek 2008).**

In the last few years, many phenolic xenoestrogens have been reported to have mimic estrogen effects, and may adversely affect the health and reproduction of animals and human **(Sonnenschein and Soto 1998, Völkel *et al*., 2002).**

Alkylphenols (APs) and their metabolites are lipophilic substances exerting apparent estrogenic action *in vitro* and *in vivo* testing systems. With the widespread industrial use of alkylphenols, these are disseminated in the environment with sewage sludge. There is evidence showing that alkylphenols can accumulate *in vivo*, at least in fish. Domestic animals and human are likely to be exposed via the food chain **(Bian *et al*. 2006).**

Among them, 4-tert-octylphenol (4-t-OP), 4-nonphenol (4NP) and bisphenol A (BPA) deserve particular attention because of their estrogenic activity **(Kuch and Ballschmiter 2001, Petrovic and Barcelo 2001, Lee and Peart 2002, Meesters and Schröder 2002).**

4-t-OP is an important intermediate in the production of a number of commercial materials. The major use of 4-t-OP is the production of