Assessment of the Health Risks of the Exposure to Environmental Estrogen among Males

Thesis

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Abstract

A major challenge for life scientists in the 21st century is to understand how a changing environment impacts all life on earth. Over the past 20 years, a great deal of attention has focused on the impact of endocrine disruptors released in the environment on animal and human health. Generally, endocrine disruptors have estrogenic activity. These products interfere with hormone biosynthesis, metabolism, or action resulting in a deviation from normal homeostatic control or reproduction. **Aim**: Our primary aim was to evaluate the possible role of environmental estrogen on sexual disturbance among males. **SUBJECTS & METHODS:** A cross-sectional cohort community based study that recruited 26 apparently healthy males that agreed to participate in the study after explained details about the study and investigation that will be done and signed the informed consent for the study. We surveyed their characteristics of life style, symptoms covering various systems, general examination including blood pressure measurements, body mass index, waist line, resting blood pressure, Venous blood samples were used for detection of both total testosterone & plasma BuChE activity that is measured with a Test-mate ChE Randox kit from the hydrolysis of butyrylcholine iodide, and data were expressed as micromoles per minute per milliliter of plasma (U/ml). Evaluation of Test-mate ChE results was based on AChE and BuChE inhibition associated with different degrees. **RESULTS:** the mean age was (36.54 ± 6.04) years with mean BMI of (28.98 ± 5.16) kg/m2. , mean waist (102.78 ± 11.18) cm. 66.7% of the cases were married and 13.3% have fertility problem & 20% with sexual problem. 66.7% of the studied group use pesticide at home. The mean serving intake of fruit & vegetables /week were (2.65 ± 2.90) serving.

CONCLUSION: Nearly all studied group had hormonal values and AChE within the reference range. There is a negative association between OP pesticides exposure assessed by the AchE as indicator and serum total testosterone levels as well as with fruit & vegetables consumption/week; whereas there is a positive association with age. Taken together, the epidemiologic data on the environmental EDCs suggest that there may be associations between exposure and adverse health outcomes in men. However, the limited human data, and in many instances inconsistent data across studies, highlight the need for further research on these chemicals. Future longitudinal molecular epidemiology studies with appropriately designed exposure assessments are needed to determine potential causal relationships, to identify the most important time windows/life stages of exposure, and to define individual susceptibility factors for adverse effects on men's health in response to exposure.

Exposure to environmental chemicals which have major risks for human by targeting different organs in the body has significant impacts on biological systems. For several years there have been a great amount of interest on the environmental endocrine disruptors (EEDs) and their relation with human health. A wide range of substances, both natural and man-made, are thought to cause endocrine disruption. They arise from many different sources, including pesticides among them organophosphates (OPs). Exposure to OPs may occur in four different ways: occupational exposure, residential use, environmental exposure for communities living in areas with intensive agricultural production or community pest control programs, and dietary exposure of the general population. OP inhibit acetylcholinesterase (AChE), an enzyme located in the post synaptic membrane that degrades acetylcholine (ACh) into choline and acetic acid .

Human male fertility is a complex process and therefore a great variety of sites may be affected by exogenous harmful mediators. Lifestyle factors as well as various environmental and occupational agents may impair male fertility. In the past years, there has been increased interest in assessing the relationship between impaired male fertility and environmental factors. Many studies have been published reporting on reproductive dysfunctions in male animals and humans. However, relevant epidemiology studies in men are limited.
In the present study, we examined the potential association between serum AchE biomarkers of OP insecticide exposure and serum reproductive hormones on 26 apparently healthy males in reproductive age.

As regard male sex hormones we found no association between total testosterone and anthropometric or clinical variables. When evaluating AchE as indicator of OPs exposure there were negative association with Total testosterone & with fruit & vegetables consumption/week ,while no association with LH .

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List of Abbreviations

AChE	Acetylcholinesterase
BMI	Body Mass Index
BPA	Bisphenol A
BuChE	butyrylcholinesterase
ChE	Cholinesterase
DBP	di-n-butyl phthalate
E2	Estradiol
EDC	Endocrine-disrupting chemical
EEDs	Environmental endocrine disruptors
EPA	Environmental Protection Agency
ER	Estrogen receptor
ER alpha (α)	Estrogen receptor alpha
ER beta	Estrogen receptor Beta
GAPDH	Glyceraldehyde 3-phosphate dehydrogenase
kDa	Kilo Dalton
LH	Luteinizing Hormone
NHL	Non-Hodkin's lymphoma
OCPs	Organochlorine pesticides
OPs	Organophosphorus pesticides
PAEs	Phthalic acid esters
PAHs	Polycyclic aromatic hydrocarbons
PON	Paraoxonase
TDS	Testicular dysgenesis syndrome TDS
αERKO	Estrogen α-receptor knockout