BISPHENOL - A LEVELS IN FOOD AND FEED AND ITS HORMONAL DISRUPTION IN MALE AND FEMALE RATS

By

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B.Sc. Agric. Sci. (Agricultural Biochemistry), Fac. Agric., Cairo Univ., 2010
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APPROVAL SHEET

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Title of Thesis: Bisphenol - A Levels in Food and Feed and Its Hormonal Disruption in Male and Female Rats**.**
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ABSTRACT

Bisphenol A (BPA) is a pollutant which causes negative effects on human health. The aim of the present study is to determine BPA levels leaching of several kinds of canned foods, beverages, baby bottles and feed in local Markets by using gas chromatography-mass spectrum (GC/MS/MS). Also it was carried out to perceive the biological effects of administration of BPA on reproductive organs and hormonal levels in male and female albino Spargue-Dawely rats. The protective effect of rose water and clove oil on BPA was also investigated. In More than 130 different samples taken from Egyptian markets, the highest mean BPA level was found in chicken cocktail sausaged (710.59 ppb) which was given highly significant results with regard to all other food samples result, whilst the lowest was for tomato ketchup at (5.75 ppb). The leaching of BPA from baby bottles to milk was found to be highest (123.53 ppb) compared with other baby drinks. The thermal effect on number of uses on BPA migration indicated a positive relationship between them. The concentration of BPA in milk has reached 1046.79 ppb after baby bottles were used 100 times at 90℃. Ninety rats were divided in to 9 groups of males and 9 for females. Rats were exposed to different oral gavage route 3 times a week by doses of BPA (20 µg, 20 mg, 200 mg) /kg b.wt for 6 weeks BPA. BPA induced significant decrease in total and free testosterone (T) in male rats, in contrast of significant increase in thyroid stimulating hormone (TSH), Follicle stimulating hormone (FSH), progesterone, estrogen (E2) and prolactin (PRL) compared to control groups. Histopathological examination revealed that rose water or clove oil reduced testes and ovary damages induced by BPA. Rose water and clove oil components were scanned using GC/MS which showed that rose water and clove oil contain phenols , flavonoids and these inevitably confirms that a prominent role in preventing the damage during treatment.

Key words: Baby bottles, Bisphenol A, Clove oil, Feed, Food, Thermal effect, Numbers of use, Ovary, Rose water, Testes, TSH, Sex hormones.

DEDICATION

I dedicate this thesis to my lovely Parents, my brothers who support me in everything and my special friends who helped me to finish my Ph. D. thesis.

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LIST OF ABBREVIATIONS

NO.	Abbreviation	
1	***acaca***	*acetyl-CoA carboxylase*
2	**ALP**	alkaline phosphatase
3	**AR**	androgen receptor
4	**BADGE**	bisphenol A diglycidyl ethers
5	**BMDL**	benchmark dose lower-confidence limit
6	**BMI**	body mass index
7	**BMP-2**	bone morphogenic protein-2
8	**BPA**	Bisphenol A
9	**BPA-DME**	bisphenol A dimethyl ether
10	**BPA-G**	bisphenol glucuronide
11	**BPA-MME**	bisphenol A monomethyl ether
12	**BPF**	bisphenol-F
13	**BPS**	Bisphenol-S
14	**bw**	body weight
15	**BW/d**	body weight/ day
16	**CAT**	catalase
17	**CEF**	Food Contact Materials, Enzymes, Flavourings and Processing Aids
18	***cpt1α***	*carnitine palmitoyltransferase 1α*
19	**d16-BPA**	marked bisphenol A
20	**DNMTs**	DNA methylatransferases
21	**E2**	Estradiol
22	**EAOPs**	Electrochemical advanced oxidation processes
23	**EC**	European Commission
24	**ECB**	European Chemicals Bureau
25	**ECHA**	European Chemical Agency
26	**EC SCF**	European Commission Scientific Committee on Food
27	**EDCs**	Endocrine disrupting compounds
28	**EDs**	European Chemicals Bureau
29	**EFSA**	European Food Safety Authority
30	**ELISA**	enzyme-linked immunosorbent assay
31	**EPA RfD**	Environmental Protection Agency Reference dose

ABBREVIATIONS (Continued)

32	**ERγ**	estrogen related receptor-gamma
33	**ERs**	estrogen receptors
34	**ESCs**	embryonic stem cells
35	**EU**	European Union
36	***fasn***	*fatty acid synthase*
37	**FDA**	Food and Drug Administration
38	**FSH**	Follicle Stimulating Hormone
39	**GC-MS**	Gas chromatography - mass spectrometry
40	**GH**	growth hormone
41	**GIT**	gastrointestinal tract
42	**GnRH**	Gonadotropin releasing hormone
43	**GSH**	glutathione
44	**GSI**	gonadosomatic index
45	**HED**	human equivalent dose
46	**HDPE**	High density polyethylene
47	**hPa**	hectoPascals
48	**INFOSAN**	International Food Safety Authorities Network
49	**LDPE**	Low-Density Polyethylene
50	**LH**	Luteinizing hormone
51	**LOAEL**	lowest observed adverse effect level
52	**LOD**	limit of detection
53	**LOEC**	Lowest-Observed-Effect Concentration
54	**MDA**	Malondialdehyde
55	**MOFs**	multiple oocyte follicles
56	***nf-kb***	nuclear factor kappa-light-chain-enhancer of activated B cells
57	**NMDRCs**	non-monotonic dosage reaction bends
58	**NO**	nitric oxide
59	**NOAEL**	no observed adverse effect level
60	**NOEC**	No-Observed-Effect Concentration
61	**NOS**	nitric oxide synthase
62	**OECD TG**	Economic Co-operation and Development test guideline
63	**8-OHdG**	8-hydoxydeoxyguanosine