

Government of India
All India Institute of Hygiene and Public Health
110, C.R Avenue, Kolkata-73

PLACTIC HAZARDS COMMITTEE

No. EPI/BNC /PHC/2015/266

Date: 30.07.2015

From:

Dr D Dutt
Prof and Head Dept Epidemiology
Member Secretary
Plastic Hazards Committee
AIIH & PH, Bidhan Nagar Campus
Kolkata-98

To:

The Director
AIIH & PH
Kolkata-73

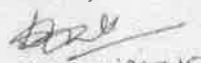
Sub: Report of the Plastic Hazard Committee for five pharmaceutical preparations, packaged in PET bottles for onward submission to the DGHS

Sir,

Please find enclosed the report of the Plastic Hazard Committee for five pharmaceutical preparations, packaged in PET bottles, for content of heavy metals (Lead, Antimony, Cadmium and Chromium) and DEHP (tested by National Test House Kolkata) for onward transmission to the Director General of Health Services (DGHS) New Delhi, under intimation to the undersigned.

Thanking you,

Yours Faithfully


Dr D Dutt 30.7.15

Member Secretary
Plastic Hazards Committee

Copy to

1. Dr G K Pandey Director Professor, Dept Epidemiology – Chairman, Plastic Hazards Committee (PHC)
2. Dr U K Chattopadhyay Director Prof and Head, Dept Microbiology – Member (PHC)
3. Dr A K Verma Director Prof and Head, Dept Statistics – Member (PHC)
4. Dr D Chaudhuri Prof and Head, Dept Biochemistry and Nutrition – Member (PHC)
5. Dr C S Taklikar, Assoc. Prof Dept, Biochemistry and Nutrition– Member (PHC)
6. Supt Student Section to maintain record in file of Plastic Hazards Committee .

Foreword

Polyethylene terephthalate (PET) is widely used as container for packaging of water, soft drinks, oils, soda, fruit juices, alcoholic beverages, pharmaceutical preparations etc. The use of PET is on the rise due to its lower cost in comparison to glass container.

PET is known to contain small amounts of low molecular weight compounds which can leach into the contents and may constitute potential toxicological hazard.

Concerns have been raised about the safety of such packaging by the consumers.

Director General of Health Services during his visit to AIIH & PH, Kolkata on 11th April 2015 had a detailed discussion with the Director National Test House, Kolkata and in the presence of the Director AIIH & PH and other faculty.

Director General of Health Services directed AIIH & PH to carry out testing of different PET bottled samples of soft drinks, oils, soda, fruit juices, alcoholic beverages, pharmaceutical preparations in phased manner.

With this background Plastic hazards committee was formed at All India Institute of Hygiene and Public Health, Kolkata to investigate the presence of DEHP and heavy metals in beverages, pharmaceutical preparation, juice, oils and alcohol packed in PET bottles. A MOU was signed by AIIH & PH with National Test House, Kolkata to undertake the estimation of heavy metals (Lead, Antimony, Cadmium and Chromium) and DHEP content in the PET bottled beverages, pharmaceutical preparation, juice, oils and alcohol

In the first phase five samples of different pharmaceutical preparations were collected and tested. The first report is hereby placed for scrutiny and discussion.

Director
AIIH & PH, Kolkata

ACKNOWLEDEMENTS

The Plastics Hazards committee, AIH & PH, Kolkata sincerely acknowledge the support and guidance provided by the Director General of The Health Services, GOI. Committee is also thankful to The Director and Officers of National Test House, Kolkata for timely conducting the tests.

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REPORT OF PLASTIC HAZARDS COMMITTEE

Background:

In India, as in many developed countries, Polyethylene terephthalate (PET) is widely used as container for commercial bottled water, soft drinks, juice, alcoholic beverages, oils, soda beverages, pharmaceutical preparations etc. and its use is also increasing rapidly due to its lower production costs in comparison with glass containers. PET is synthesized by reacting ethylene glycol with either terephthalic acid or its methyl ester catalysed by antimony oxide.

PET is known to contain small amounts of low molecular weight compounds, ranging from the monomer to pentamer. The levels of these compounds depend on the type of PET. Migration from packaging materials from PET bottles into products may constitute a toxicological hazard ⁽¹⁾ The PET bottles have been clearly correlated with the concentration of phthalates ⁽²⁾ and antimony ⁽³⁾ in the bottled water. Little attention has been paid to the potential changes in quality of these beverages after prolonged storage in plastic containers. Growing literature links many of Phthalates with a variety of adverse outcomes, including increased adiposity and insulin resistance ⁽⁴⁾, decreased anogenital distance in male infants ⁽⁵⁾, decreased levels of sex hormones ⁽⁶⁾ and other consequences for the human reproductive system, both for males and females ⁽⁷⁾ Infants and children may be especially vulnerable to the toxic effects of phthalates ⁽⁸⁾ given their increased dosage per unit body surface areas, immature metabolic system capability and developing endocrine and reproductive system ⁽⁹⁾

Antimony in conjunction with other metals may biologically alter several cellular defence mechanisms thus potentiating carcinogenesis ⁽¹⁰⁾ Reproductive disorders and chromosome damage may be associated with chronic antimony exposure with consequent mutagenic and oncogenic potential and should be avoided in pregnancy and in patients with hepatic, renal, or cardiovascular disease. ⁽¹¹⁾

The Director General of Health Services, during his visit to AIHH&PH on 11th April 2015 had a meeting with the Director and Officers of NTH and the Director and Officers of AIHH& PH, Kolkata. He emphasised the need to find out the level of toxic chemicals in medicines and other formulations sold in Polyethylene Terphthalate (PET) bottles with respect to the safety limits. With this background Plastic Hazards Committee was formed at All India Institute of

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Hygiene and Public Health, Kolkata to investigate the presence of DEHP and heavy metals in beverages, pharmaceutical preparation, juice, oils and alcohol packed in PET bottles. A MOU was signed by AIH & PH with National Test House, Kolkata to undertake the estimation of heavy metals (Lead, Antimony, Cadmium and Chromium) and BIS(2-ETHYLHEXYL) PHTHALATE (DEHP) content in the PET bottled beverages, pharmaceutical preparation, juice, oils and alcohol.

Methodology:

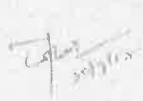

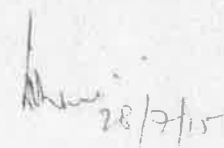
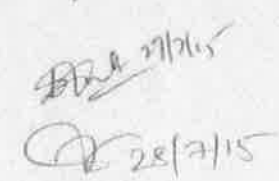
Samples of 5 different pharmaceutical preparations packaged in PET bottles were purchased in sealed condition from the medical shop and submitted for testing at NTH.

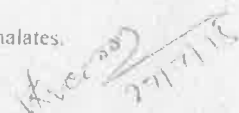
National Test House (NTH), formerly known as Government Test House was established back in 1912 in Kolkata. It is presently a Government Testing House directly under the Department of Consumer Affairs, Ministry of Consumer Affairs, Food and Public Distribution

Samples were estimated for content of Lead, Antimony, Cadmium, Chromium and DEHP at room temperature, 40 degree centigrade for 10 days and 60 degree centigrade for 10 days.

DEHP was estimated by GCMS method and heavy metals by AAS and ICP-OES method. The samples were kept incubated in specific storage conditions i.e. at room temperature, 40 degrees and 60 degrees for a duration of 10 days as per EU 10/2011 for accelerated testing using equipment's like GC-MS, ICP, AAS

These samples were analysed for presence of heavy metals and Phthalates.



Findings:

Table: 1 Heavy metals and DEHP concentrations in Benadryl Syrup

Item description: Sample of Benadryl Syrup in PET bottle (3X50 ml), Batch No. /LOT No. KN4155					
Test Description [National Test House]	Certificate No		Date of Issue	Code No	
	NTH(ER)/CH(S)/2015/ 0050B		03/07/2015	1432617058473	
Storage Parameters	Toxic Substance (mg/L)				
	Antimony	Lead	Cadmium	Chromium	DEHP
Sample in PET Bottle as received by the Lab.	0.020	0.03	Nil	0.018	0.018
40 deg C for 10 days.	0.032	0.03	Nil	0.019	0.023
60 deg C for 10 days.	0.048	0.05	Nil	0.026	0.028
Permissible Limit	NA	NA	NA	NA	NA
Remarks Safety limits available for Bottled water	0.005	0.010	0.003	0.050	0.006
Reference standards (I.S.)	(BIS (IS 13428:2005, IS 14543:2004))	(BIS (IS 13428:2005, IS 14543:2004))	(BIS (IS 13428:2005, IS 14543:2004))	(BIS (IS 13428:2005, IS 14543:2004))	IS - EPA ⁽¹⁾

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Table-2 Heavy metals and DEHP concentrations in Mucaine Gel:

Item description: Sample of Mucaine (Mint)Gel received in PET bottles(2X200ml)having Batch No./Lot No.055TM					
Test Description [National Test House]	Certificate No.	Date of issue	Code No.		
	NTH(ER)/CH(OE)/2015/ 0092B	03/07/2015	1432620771869		
Storage Parameters:	Toxic Substance (mg/L)				
	Antimony	Lead	Cadmium	Chromium	DEHP
Sample in PET Bottle as received by the Lab	0.014	0.05	0.008	0.011	0.036
40 deg C for 10 days.	0.014	0.05	0.008	0.011	0.044
60 deg C for 10 days.	0.029	0.05	0.008	0.012	0.045
Permissible Limit	NA	NA	NA	NA	NA
Remarks					
Safety limits available for Bottled water	0.005	0.010	0.003	0.050	0.006
Reference standards (12.13)	(BIS (IS 13428:2005, IS 14543: 2004))	(BIS (IS 13428:2005, IS 14543: 2004))	(BIS (IS 13428:2005, IS 14543: 2004))	(BIS (IS 13428:2005, IS 14543: 2004))	US - EPA

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Table-3 Heavy metals and DEHP concentrations in Polybion Syrup:

Item description: Sample of Polybion LL syrup received in PET bottle (3 X 100 ml) having Batch No /Lot No C15311614					
Test Description [National Test House]	Certificate No		Date of Issue	Code No.	
	NTH(EP)/CH(OF)/2015/ 0092A		03/07/2015	1432620271869	
Storage Parameters	Toxic Substance (mg/L)				
	Antimony	Lead	Cadmium	Chromium	DEHP
Sample in PET Bottle as received by the Lab	0.012	0.03	Nil	0.008	0.031
40 deg C for 10 days.	0.012	0.03	Nil	0.008	0.045
60 deg C for 10 days.	0.036	0.03	Nil	0.020	0.048
Permissible Limit	NA	NA	NA	NA	NA
Remarks Safety limits available for Bottled water	0.005	0.010	0.003	0.050	0.006
Reference standards (12.13)	(BIS (IS 13428:2005, IS 14543: 2004))	(BIS (IS 13428:2005, IS 14543) 2004))	(BIS (IS 13428:2005, IS 14543) 2004))	(BIS (IS 13428:2005, IS 14543) 2004))	US - EPA

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Table-4 Heavy metals and DEHP concentrations in Hemfer Syrup:

Item description: Sample of HEMFER Syrup received in a PET bottles(4x200ml) having Batch/LOT No. HMS/4162C					
Test Description [National Test House]	Certificate No.		Date of Issue	Code No.	
	NTH(ER)/CH(S)/2015/0050A		03/007/2015	1432617058473	
Storage Parameters	Toxic Substance (mg/L)				
	Antimony	Lead	Cadmium	Chromium	DEHP
Sample in PET Bottle as received by the Lab	0.039	0.03	0.007	0.011	0.011
40 deg C for 10 days	0.046	0.04	0.007	0.011	0.017
60 deg C for 10 days	0.047	0.04	0.009	0.011	0.025
Permissible Limit	NA	NA	NA	NA	NA
Remarks Safety limits available for Bottled water	0.005	0.010	0.003	0.050	0.006
Reference standards (I2.13)	(BIS (IS 13428:2005, IS 14543: 2004))	(BIS (IS 13428:2005, IS 14543: 2004))	(BIS (IS 13428:2005, IS 14543: 2004))	(BIS (IS 13428:2005, IS 14543: 2004))	US - EPA

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Table-5 Heavy metals and DEHP concentrations in Alex Cough Syrup:


Item description: Sample of ALEX+SF received in PET bottles (4 X 100ml) having Batch/LOT No. 11141783


Test Description	Certificate No.	Date of Issue	Code No.		
	NTH(ER)/CH(S)/2015/0050C	03/07/2015	1432617058473		
Storage Parameters	Toxic Substance (mg/l)				
	Antimony	Lead	Cadmium	Chromium	DEHP
Sample in PET Bottle as received by the Lab	0.016	0.01	Nil	0.020	0.009
40 deg C for 10 days	0.020	0.02	Nil	0.022	0.016
60 deg C for 10 days	0.048	0.02	Nil	0.030	0.029
Permissible Limit	NA	NA	NA	NA	NA
Remarks					
Safety limits available for Bottled water	0.005	0.010	0.003	0.050	0.006
Reference standards ^(12,13)	(BIS (IS 13428:2005, IS 14543:2004))	(BIS (IS 13428:2005, IS 14543:2004))	(BIS (IS 13428:2005, IS 14543:2004))	(BIS (IS 13428:2005, IS 14543:2004))	IS-EPA

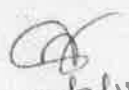
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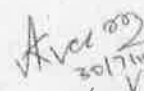
Conclusion:

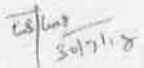
- Findings from the analysis of 5 samples of pharmaceutical preparations for heavy metals and DEHP, show that
 1. Antimony, Chromium, lead and DEHP were present even at room temperature in all the five samples. Cadmium was present at room temp in Mucaine Gel and Hemfer Syrup.
 2. Concentration of Antimony, Chromium, lead and DEHP increased on exposure to higher temperature in the Laboratory. (except for lead in Mucaine gel and Polybion syrup and for Chromium in Hemfer Syrup). Cadmium was absent in Alex. Benadryl syrup and Polybion syrup.
- This increase is apparently on account of leaching when exposed to higher temperatures.
- The safety limit for these heavy metals and DEHP are readily available for packaged drinking water^(12,13) which are not comparable with Pharmaceutical preparations.
- In the present study the effect of exposure on various population groups has not been studied.
- As a large number of food items, beverages, pharmaceutical preparations are commercially sold in PET packaging, cumulative exposure from multiple sources is likely. The issue of cumulative exposure need to be addressed through large-scale toxicological / toxicokinetic studies.


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 Dir. Post (Epid)
 CHAIRMAN.


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 (M. D. Chandhuri)
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 (A. K. Velamuri)
 HOD (STAT)


 30/3/15
 (D. C. Sankar)
 Assoc. Prof. PH

References:

1. Mehdi F, Zara ED, Ehsani MR, Oromiehie A. Effect of environmental conditions on the migration of DEHP from PET Bottles in yogurt drinks; Influence of time temperature, and food stimulant. *Arabian J for Science and Engineering*. 2008 (33) 2 B: 281-287.
2. Montuori P, Jover E, Morgantini M, Bayona JM, Triassi M: Assessing human exposure to Phalic Acid and Pthalate Estrers from Mineral Water stored in polyethylene terephthalate and glass bottles. *Food additives and contaminants*. 2008 (25) 4: 511-518
3. Shotyk S, Krachler M. Contamination of bottled waters with antimony leaching from polyethylene terephthalate (PET) increases upon storage. *Environ Sci Technol*. 2007;41(5):1560-1563.
4. Grün F, Blumberg B. Endocrine disruptors as obesogens. *Mol Cell Endocr*. 2009;304(1):19-29
5. Swan SS, Main KM, Liu F, Stewart SL, Kruse RL, Calafat AM, et al. Decrease in anogenital distance among male infants with prenatal phthalate exposure. *Environ Health Perspect*. 2005;113:1056-1061
6. Pan G, Hanaoka T, Yoshimura M, Zhang S, Wang P, Tsukino H, et al. Decreased serum free testosterone in workers exposed to high levels of di-*n*-butyl phthalate (DBP) and di-2-ethylhexyl phthalate (DEHP): a cross-sectional study in China. *Environ Health Perspect*. 2006;114:1643-1648
7. Hauser R, Calafat AM. Phthalates and human health. *Occup Environ Med*. 2005;62(11):806-818
8. Sathyanarayana S. Phthalates and children's health. *Curr Probl Pediatr Adolesc Health Care*. 2008;38(2):34-49.
9. Neeti Rustagi, Pradhan SK, Sing R, "Public Health Impact of Plastics: An overview" . *Indian journal of occupational and environmental medicine* 2011(15)3:100-102
10. Fowler BA, Yamauchi H, Conner EA, Akkerman M. Cancer risks for humans from exposure to the semiconductor metals. *Scand J Work Environ Health*. 1993; 19:101-3. [PubMed: 8159952]
11. Winship KA. Toxicity of antimony and its compounds. *Adv Drug React Acute Poisoning Rev*. 1987;6:67-90.

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- 12. Bureau of Indian Standards: *Indian Standard*, Packaged natural mineral water specification (*second revision*), first reprint December 2006, I.S. 13060:2006, BIS 2006, Bureau of Indian Standards, Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002, IS 13428 : 2005
- 13. United States Environmental Protection Agency 2009, National Primary Drinking Water Regulations EPA 816-F-09-004 May 2009.

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Plastic Hazard Committee , All India Institute of Hygiene and Public Health, Kolkata

Sl.No.	Name & Designation	Signature
1	Dr. G.K. Pandey , Director Professor, Dept. Epidemiology , Chairman	<i>G.K. Pandey</i> 20/7/15
2	Dr. U.K. Chattopadhyay, Director Professor & Head, Dept. Microbiology, Member	<i>U.K. Chattopadhyay</i> 28/7/15
3	Dr. A.K. Verma, Director Professor & Head, Dept. Statistics , Member	<i>A.K. Verma</i> 27.07.15
4	Dr. Debashis Dutt, Professor & Head , Dept. Epidemiology, Member Secretary	<i>Debashis Dutt</i> 27/7/15
5	Dr. Debnath Chaudhuri, Professor & Head, Dept. Biochemistry & Nutrition , Member	<i>Debnath Chaudhuri</i> 28/7/15
6	Dr. C.S. Taklikar, Associate Professor , Dept. Biochemistry & Nutrition, Member	<i>C.S. Taklikar</i> 30/7/15

Date: 28/7/15