SJIF IMPACT FACTOR: 5.416 CRDEEP Journals
International Journal of Environmental Sciences Rawda M. Elsheikh Vol. 5 No. 4 ISSN: 2277-1948
International Journal of Environmental Sciences. Vol. 5. No. 4. 2016. Pp. 188-195

Full Length Research Paper

University Accommodation's Food Handlers; Knowledge, Attitude and Practice (KAP) about using of selected Plastic Type Foods Contact Materials

Rawda M. Elsheikh
Assistant Professor of Occupational Health & Industrial Medicine, Faculty of Medicine for Girls, Al-Azhar University, Egypt.

Article history
Received: 24-12-2016
Revised: 26-12-2016
Accepted: 29-12-2016

Corresponding Author:
Rawda M. Elsheikh
Assistant Professor of Occupational Health &Industrial Medicine, Faculty of Medicine for Girls, Al-azhar

Abstract
This study assessed levels of food handler KAP related to using Plastic type foods Contact materials (PTFCMs) with reference to their publicity to Endocrine Disrupting chemicals (EDCs) and EDC type, as well as modulating factors affecting each exposure and use. A cross-sectional study that involved 300 food handlers from 4 university students' accommodations located in Egypt and it was applied between January and April 2014. Outcome confirmed that 83.9% of food handlers had low knowledge levels even as 91.1% had a fair attitude classification. Most respondents at the majority of the time used polypropylene (PP) as either liquid or foods containers. The greatest modulator used to be much less price. Food handler advantage, attitude and practice with consider to EDCs and PTFCMs require development to curb adverse health effects. For that reason, government agencies will have to deal with the necessity for public education packages regarding EDCs contained in PTFMCs to enhance advantage, attitude and follow, and thereby help prevent adversarial developmental results.

Keywords: *University, Accomodation, Knowledge, Attitude, Practice.*

Introduction

The study knowledge of assessed food handler KAP to examine their understanding of a specific topic additionally to beliefs that influence observable actions (observe) and health popularity (FAO, 2014). The authors also investigated abilities routes of EDC exposure as well as EDC type with the aid of citing to earlier studies of conditions that facilitate EDC migration of from PTFCMs. The _international Program on Chemical safety (IPCS) outlined endocrine disruptors and capabilities EDCs as follows:

An endocrine disruptor is an exogenous substance or mixture that alters perform(s) of the endocrine system and for this reason factors opposed effects in an intact organism, or its progeny, or (sub) populations. A knowledge endocrine disruptor is an exogenous substance or mixture that possesses properties that might be expected to result in endocrine disruption in an intact organism, or its progeny, or (sub) populations‖ (IPCS, 2002). EDCs firstly received awareness as reasons for reproductive and developmental anomalies. They have also got much more discover due to considerations for deleterious results that also intent cardiovascular ailment, weight problems, diabetes, cancers and neurological issues (Muncke, 2011).

There is further proof indicating that EDCs no longer best negatively have an impact on an exposed individual but in addition the latter's offspring and subsequent generations (Patisaul and Adewale, 2009). Sources of EDC publicity are internationally endemic and various, noting that chemical accessories of plastics leaching into foodstuffs constitute the bulk (Shaw, 2009). Routes of EDC publicity from PTFCMs area growing situation. These include plastic cutlery, dishes, bottles and food containers, and others. Most commonly used plastic bottles comprise polyethylene terephthalate (PET), polycarbonate (PC), and Tritan™ —each one is a source of EDCs (Bach et al. 2012; Guart et al. 2013). Exceptionally, the consumption of canned

food and beverages also exposes contributors to bisphenol-A (BPA), a variety of EDC. That is because of epoxy resins used as a food contact lacquer coating inside cans (Sungur et al. 2014). EDCs inside PTFCMs can enter foods via contact via a system known as migration (Mezcua et al. 2012).Studies in Korea and Japan printed a heavy reliance on PTFCMs as plastic foods containers (71.6 and 64.6%), respectively (Japan Hygienic Olefin and Styrene Plastics organization, 2006; Korea foods and Drug Administration, 2007). Nevertheless, limited reviews are documented on PTFCMs in other regions, together with in Malaysia, for that reason the current study is important to be applied in evaluating their KAP of EDCs.

Materials and Methods

Samples

A whole of 300university student accommodation's food handlers from Al-Azhar University, Ain Shams University, Tanta University, and Future University;75 food handlers from each university accomodations7, all Four placed in Egypt. Amongst thesefood handlers, 150 had been studying science and 150 had been non science food handlers.

Survey Instrument

The study comprised a cross sectional survey for purposes of discovering KAP levels as good as frequency and patterns of PTFCMs utilization, moreover to modulators affecting PTFCMs utilization. Knowledge were accrued data utilizing an investigator-administered questionnaire completed with the researcher. The questionnaire comprised 5 sections that incorporated closed ended, open-ended, filtered, contingent and matrix questions.

Data evaluation

The Statistical Package for Social Science (SPSS, variation 17.0) at significant differences set at $p < 0.05$ was used within the information analysis.

Validity and Reliability

Inter-item correlation established reliability of results following the setting of Cronbach's alpha through a pilot test involving 35University food handlers. Capabilities scored $\alpha = 0.877$, indicating good consistency and as a result affordable reliability as α was once more than 0.7 (David de Vaus, 2002).

Results and Discussion

Demographic Profile of Respondents

Table 1 presents demographic profiles for all 300 respondents, including gender, age, and current educational status, household income and courses of study.

Table 1 : Demographic profiles for all 150 respondents

Variables	Number of studied sample	Percentage %
Gender		
Male	76	25.2
Female	224	74.8
Age in Years groups		
18-20	87	29.1
21-23	112	37.3
24-26	43	14.5
27-29	19	6.2
30-32	14	4.6
> 32	25	8.3
Current Educational Status		
PhD	22	7.2
MS	73	24.5
BS	132	44.1
Diploma	73	24.2
Household Income in LE		
< 1000	73	24.4

1000-2999	158	52.6
3000-4999	50	16.7
≥5000	19	6.3
Course of study		
Science	150	50.0
Non-Science	150	50.0

Knowledge

Advantage percentage scores had been low, with a mean of 37.1%. The vast majority of respondents (83.9%) had a knowledge level classified as poor. This outcome contradicted comparative studies by Kasemsup and Neesanan (2011) wherein most respondents (67.5%) scored medium expertise levels and 8.5% scored high levels. The distinction is definitely seeing that the prior studies involved only PTFCMs even as the present study included EDCs, which is a much less identified matter among the many common population. Handiest 32.7% respondents knew that bisphenol-A (BPA) is an EDC, even though it is the most common EDC determined in PTFCMs (Vandenberg et al. 2007). This discovering suggests that normal expertise of EDCs is particularly low.Science and non-science food handlers validated a significant difference ($p<0.0001$) in knowledge 'scores as assessed by the Mann-Whitney scan. Sciencefood handlers scored 42.9% for knowledge in comparison with 31.4% for non-sciencefood handlers. Seven questions addressed causes that increase favorable conditions for EDC migration. Science food handlers readily managed these detailed questions due to the fact stipulations for EDC and chemical migration has identical modulators that have an impact on chemical reaction rates. For instance, high temperatures increase reaction rates for usual chemical procedures and likewise account for increasedlevels of EDC migration (Arvanitoyannis and Bosnea, 2004).The present study knowledge of also located a significant association between knowledgelevel and course of study' ($p<0.0001$) as shown through Pearson chi-rectangular, which means that respondent knowledge is determined by educational history.

Attitude

91.1% of respondents scored fair for attitude levels with a mean of 69.1 %. Our findings that attitude scored higher than attitude is of the same result with a study by using Kasemsup and Neesanan (2011). This result also suggests that university food handlers are aware of adverse effects from PTFCMs and EDCs but require extra knowledge about proper PTFCM usage. Similar to the just mentioned results, attitude scores for science food handlers were significantly better than for non-science food handlers ($p<0.0001$) (Mann-Whitney test).Pearson chi-square noted a significant association ($p<0.05$) between attitude and course of study. Even though attitude scores for both science and non-science food handlers dropped to fair, science food handlers scored significantly higher than non-science food handlers, (70.8 vs. 65.4%), respectively. This infers that science food handlers have slightly more complicated attitudes driven by higher levels of subject-related knowledge.

Practice

96.2 % of respondents stated their use of PTFCMs, which displays the normal trend reported by using Kasemsup and Neesanan (2011) where 80% of Thai participants used polystyrene, as also confirmed via Tukur et al. (2012) whose workforce mentioned that 80% of their British contributors use the PET bottle. This study's findings align with previous studies although the latters 'findings only taken with one PTFCM type. Thus, PTFCM utilization tendencies, as pronounced in previous reviews, would likely have approached our 96% level if they had additionally assessed common PTFCM utilization. Bottle utilization is an unavoidable aspect of a university food handler's tradition. The current study found that 49.6% of respondents admitted utilizing a polypropylene (PP) bottle or a polyethylene terephthalate (PET) bottle as the 2nd most usual choice (Table 2). PET utilization in Greece was reported at 80 % of all plastic bottles both used and manufactured for bottled water as a result of its desirable physical and chemical properties such as strength, transparency, light weight and ease of recycling (Diana and Dimitra, 2011). Nonetheless, our respondents favored the PP water bottle, due to its common reuse and convenience.

In the current study, an open-ended question to determine information related to other types of water bottle utilization was used. 10.7 % respondents used other type (code 7): 4.5% used Tritan TM; 4.1% used PC; and 6.7% used bottles without mentioning a

plastic form. However, PC should under no circumstances be used as a water bottle. USA even banned its use for the feeding of children and infants as of March 2007. However, this laws most effective concerned about the susceptibility of kids and infants to BPA, PC monomer component but BPA can be related to adverse wellbeing results in grownup with consider to increased cardiovascular sickness and diabetes (Lang et al. 2008).To the contrary, the TritanTM water bottle is the recommended alternative to PC considering it's BPA-free (Biron, 2012). The class for other bottle types provided no identifications, which suggests irresponsibility on the part of some bottle producers who provide insufficient information to bottle customers. This is certainly a serious matter for the reason that unlabeled bottles might not be risk-free should they contain substandard PC material.

Table 2. Daily Bottle Usage

Type of Bottle	Frequency	Percentage %
Polyethylene terephthalate (PET)	81	26.8
High density polyethylene (HDPE)	5	1.7
Polyvinyl chloride (PVC)	0	0.0
Low density polyethylene (LDPE)	6	1.8
Polypropylene (PP)	148	49.6
OTHER	32	10.6
Not related/ unsure	15	5.0
Non-plastic type	13	4.5
Total	300	100

Reponses for frequency of chosen PTFCM utilization (table 3) indicated using polypropylene (PP) foods containers at 50.99%; polystyrene (PS) food container at 49.81%; and carbonated canned beverages at32.08 %. Although frequency was tabulated as food utilization with the assumption that respondents utilized PTFCMs for foods consumption, calculated PTFCMs utilization are not able to directly replicate food consumption, indicating a limitation of the current work. The current study information analysis was adapted to report byChee et al.(1996)where <60% of frequency scores have been categorized as low consumption. All classifications of PTFCMs usage for foods and beverage consumption scored low levels. Nevertheless, the collective score is high if all nine PTFCMs had been assessed as the sum of total for usage. Considering that the PP container is reusable because of the fact that it is semi-rigid and may stand up to high temperatures, this could be account for PP being the most generally used plastic within the present study (Hui and Sherkat, 2005).

Table 3. Frequency Scores for Plastic Types of Food Contact Materials

Plastic type of food contact material	Science %	Non-Science %	Overall %
PET bottled mineral water	52.49	52.86	49.65
PET bottled mineral water	32.86	35.06	33.99
Plastic food cling wrap	28.74	32.96	36.44
PP plastic food container	49.03	47.08	50.99
PS plastic food container	50.40	49.19	49.81
PS cutlery	46.66	48.63	47.73
Canned-food	33.54	34.75	34.13
Non-carbonated canned beverage	31.83	37.93	35.00
Carbonated canned beverage	28.83	35.13	32.08

In 2008, the consumer Association of Penang (CAP) marketing consultant, Dr. T. Jayabalan, who can also be a memberof the national Poison Centre, encouraged consumers to avoid making use of plastic bags, polystyrene packing containers and plastic cling wrap to package foods as a result of the migration of detrimental chemical materials into the packaged foods (Sung, 2010).Even though CAP had highlighted the issue for years earlier than the current study, the score for food cling film usage used to be 36.44%.

Table 4 lists usage patterns for PTFCMs. Mutually, 44.2% of our respondents often left PET bottles within their cars. When left in a car during hot weather, EDC leaching from PET bottles raises andthe migration accelerates as temperatures rise along with exposure to UV radiation (Peiper, 2008 and Gin, 2009).This chemical reaction worsens in equatorial zones corresponding to Egypt, which is hot and humid throughout long time during the year where the temperature can be 40ºC. Furthermore, 51.7 %

of our respondents also used plastic cling film to wrap foodstuffs. EDCs from cling wrap films migrate into food rather more when in direct contact in comparison with no direct contact (Chen et al. 2008). Additionally, our respondents also reported keeping hot, acidic, oily food in plastics for lengthy periods of time; all of which are causes that increase EDC migration (Helmrothet al. 2002; Muncke, 2009; Muncke, 2011).

Table 4. Usage Pattern Frequencies: PET bottles, Cling film, PP & PS food containers

Practice	Frequency (Percentage %)			
	Never	**1-2 days per week**	**3-5 days per week**	**5-7 days per week**
PET bottle				
Leaving inside car	(55.9)	(30.3)	(11.1)	(2.8)
Reusing same bottle	(31.7)	(37.9)	(18.6)	(11.7)
Food cling film				
Wrap in contact with food	(48.4)	(34.7)	(10.6)	(6.5)
Wrap without food contact	(42.7)	(37.1)	(14.5)	(5.6)
Wrap fatty food	(64.5)	(20.2)	(12.1)	(3.2)
Microwave with food	(75.0)	(15.3)	(9.7)	(9)
PP Food container				
Holding hot food	(35.1)	(48.0)	(11.5)	(5.3)
Holding acidic food	(52.0)	(35.1)	(11.5)	(1.4)
Holding Oily food	((25.0)	(46.6)	(21.6)	(6.8)
Holding food for long period (> 5 hours)	(37.8)	41.2)	(12.2)	(8.8)
Holding food for short period ≤ 5 hours	(15.5)	(62.8)	(14.2)	(7.4)
PS food container				
Holding hot food	(34.0)	(43.1)	(14.6)	(8.3)
Holding acidic food	(62.5)	(25.7)	(8.3)	(3.5)
Holding oily food	(23.6)	(53.5)	(16.0)	(6.9)
Holding food for long period (> 5 hours)	(52.8)	(32.6)	(8.3)	(6.3)
Holding food for short period ≤ 5 hours	20.1)	(65.3)	(13.9)	(9.7)

Most Influential Factors Prompting the Use of PTFCMs

Modulating factors provide information that helps us comprehend motivations for PTFCM utilization. Our respondents reported the following factors: low price was the most influential factor (21.7%); followed by lightweight (20.4%); and ease of disposal without needing to clean (19.8 %). Customer purchasing behaviors can be complex and plenty of factors have an impact on purchasing-patterns with probably the most major being low cost (Raulerson et al. 2009). Despite the fact that price just isn't the only factor, in the case of PTFCMs it is highly significant, in particular as manufacturing and transportation expenditures for plastics are low, which make PTFCMs a long way cheaper than other materials (Andrady & Neal, 2009).

Possible Types of EDC Exposure

In addition to components and plastic components that migrate into food, other impurities from plastic ingredients might leach from PTFCMs. These are referred to as NIAS (Non-Intentionally Added Substance). It's estimated that NIAS comprise>50% of such migrating compounds (Bradley et al. 2008). Unfortunately, these NIAS identities usually are not invariably identifiable (Grob, 2002). In an evaluation by Geuekeet al. (2014), as a minimum 119 recognized EDCs can leach from plastic food contact materials. The scenario will likely worsen as additional chemical materials from PTFCMs are recognized in future, some of which would even have endocrine disruptive properties (Neltneret al. 2013). Men and women who use the PET bottle subject to EDC chemical exposures. These toxins include BPA,formaldehyde, acetaldehyde, antimony, alkylphenols and a group of phthalates comprising dibutylphthalate(DBP), bis- (2-ethylhexyl) phthalate (DEHP) and benzylbutylphthalate (BBP) **(Diana &**

Dimitra, 2011; Guartetal. 2011; Bach et al. 2012; Elobied et al. 2012; Tukuret al. 2012). Plastic hold cling film exposes users to adipates, citrates and phthalates (Tsumura et al. 2002). A study by Goulas et al. (2007) determined bis-(2-ethylhexyl) adipate(DEHA) in foods wrapped in PVC cling film. Apart from styrene, a monomer that leaches from PS containers, components such sddimethyl phthalate (DMP), 4-tert-octylphenol (OP), nonylphenol (NP), di-(2-ethylhexyl) adipate (DEHA) and bis-(2-ethylhexyl) phthalate (DEHP) migrations have also been suggested (Ohno et al. 2001;Fasano et al. 2012). As for the PC bottle, BPA—a monomer used in the manufacture of PC—additionally migrates into foodstuffs (Cao and Corriveau, 2008).

Conclusion

The current study demonstrates that the knowledge level of respondents involving EDCs and PTFC Msis labeled as poor (overall mean = 37.1%). Furthermore, their majority (83.9%) confirmed a poor knowledge level and only 16.0% scored fair whilst none scored well. Nonetheless, their attitude scores averaged 69.1 %and their majority was once specified as fair while none scored poor, 91.1 % scored fair and 10.0% scored good. Almost all respondents (96.0%) used PTFCMs and most (49.6 %) normally used a PP water bottle. Usage Patterns‘ that increase EDC migration from PET bottles, food cling films, PS and PP foods containers were also common. For this reason, our findings point out that food handler KAP levels need improvement, exceptionally as countless deleterious health results are linked to EDCs. Government agencies and NGOs must combine their efforts to introduce educational programs as a way to scale down long term morbidity and mortality through teaching appropriate knowledge and measures that can help avoid or at the least reduce the general public‘s exposure to EDCs.

Future studies could investigate pregnant women and different normal working adults to extra validate the normal public‘s attitudes. In addition, PTFCMs no longer selected for the present study may also be distinct for future assessments to include parchment paper and paper boxes that commonly have plastic linings as well as plastic bags used for take-away foods, plastic gloves used within the preparation of foods, plastic food thermo-boxes and lots of others. Furthermore, biochemical elements will also be introduced such because the detection of EDCs in serum and urine samples. Such measures can inform a more complete appraisal of EDC publicity routes and in addition update our knowledge, attitude and practice information with relevant biochemical data.

References

Andrady, A.L. and Neal, M.A. (2009). Applications and societal benefits of plastics. *Philosophical Transactions of the Royal Society B*, ***364***: 1977–1984.

Arvanitoyannis, I. and Bosnea, L. (2004). Migration of materials from food packaging materials to foods. *Critical Revie ws in Food Science and Nutrition*, ***44***(2): 63–76.

Bach, C., Dauchy, X., Chagnon, M.C. and Etienne, S. (2012). Chemical compounds and toxicological assessments of drinking water stored in polyethylene terephthalate (PET) bottles: A source of controversy reviewed. *Water Research*, ***46***: 571–583.

Biron, M. (2012). *Thermoplastics and Thermoplastic Composites* (p. 886-887). Waltham: Elsevier Ltd.

Bradley, E., Driffield, M., Harmer, N., Oldring, P. and Castle, L. (2008). Identification of potential migrants in epoxy phenolic can coatings. *International Journal of Polymer Analysis and Characterization*, ***13*** (3): 200–223.

Cao, X.L. and Corriveau, J. (2008). Migration of bisphenolA from polycarbonate baby and water bottles into water under severe conditions. *Journal of Agricultural and Food Chemistry,* ***56***: 6378–6381.

Chee, S.S., Zawiah, H., Ismail, M.N. and Ng, K.K. (1996). Anthropometry, dietary patterns and nutrient intakes of Malaysian e state workers. *Malaysia Journal of Nutrition,* ***2***(2): 112–126.

Chen, M.L., Chen, J.S., Tang, C.L. and Mao, I.F. (2008). The internal exposure of Taiwanese to phthalate An evidenc e of intensive use of plastic materials. *Environment International,* ***34***: 79–85.

Damstra, T., Barlow, S., Bergman, A., Kavlock, R.J. and KraakGeds, V.D. (2002).World Health Organization (WHO) (Sep.):International assessment of the state-of-the-science of endocrine disruptors. Retrieved 02 Feb. 2015 from: http://www.who.int/ipcs/publications/endocrine_disruptors/endocrine_disruptors/en/

David de Vaus (2002). *Analysing Social Science Data: 50 key Problems in Data Analysis*, (p. 20). *Thousand Oaks: SAGE Publications Inc.*

Diana, A. and Dimitra, V. (2011). Alkylphenols and phthalates in bottled waters. *Journal of Hazardous Materials, **185***: 281–286.

Fasano, E., BonoBlay, F., Cirillo, T., Montouri, P. and Lacorte, S. (2012). Migration of phthalates, alkylphenols, bisphenol A anddi (2-ethylhexyl)adipate from food packaging. *Food Control, **27***: 132–138.

Food and Agriculture Organization (FAO). (2014). Guidelines for assessing nutritionrelated Knowledge, Attitudes and Practi ces.Retrieved 27 Feb. 2015 from: http://www.fao.org/docrep/019/i3545e/i3545e00

Geueke, B., Wgner, C.C. and Muncke, J. (2014). Food contact materials and chemicals of concern: a comparison of inventori es. *Food Additives & Contaminants, Part A, **31***(8): 1438-1450.

Gin, O.K. (2009). *Historical Dictionary of Malaysia* (p. 1). Plymouth: The Scarecrow Press Inc.

Goulas, A.E., Zygoura, P., Karatapanis, A., Georgantelis, D. and Kontominas, M.G. (2007). Migration of di(2-ethylhexyl) adipateand acetyltributyl citrate plasticizers from foodgrade PVC film into sweetened sesame paste (hala watehineh): kinetic and penetration study. *Food and Chemical Toxicology, **45***: 585–591.

Grob, K. (2002). Comprehensive analysis of migrates from foodpackaging materials: a challenge. *Food Additives & Contamina nts, **19***:185–191.

Guart, A., BonoBlay, F., Borrel, A. and Lacorte, S. (2011). Migration of plasticizers phthalates, bisphenolA and alkylphenols fr om plastic containers and evaluation of risk. *Food Additives and Contaminants, **28***(5): 676–685.

Guart, A. Wagner, M., Mezquida, A., Lacorte, S., Oehlamnn, J. and Borrell, A. (2013). Migration of plasticisers from Tritan™ and polycarbonate bottles and toxicological evaluation. *Food Chemistry **141***: 373–380.

Helmroth, E., Rijk, R., Dekker, M. and Jongen, W. (2002). Predictive modelling of migration from packaging materials into food products for regulatory purposes. *Trends in Food Science & Technology, **13***: 102–109.

Hui, Y. H. and Sherkat, F. (eds.) (2005). *Handbook of food science, technology, and engineering. Vol. 4* (p. 131–135). Boca Raton: CRC Press.

Japan Hygienic Olefin and Styrene Plastics Association (JHOSPA). (2006). *Technical Report. Japan: survey report on mate rials used for food containers in Japan*.

Kasemsup, R. and Neesanan, N. (2011). Knowledge, attitudes and practices relating to plastic containers for food and d rinks. *Journal of the Medical Association of Thailand, **94***(3): 121–125.

Korea Food and Drug Administration (KFDA). (2007). *Public information brochure on packaging and tools for food*. Retrieve d 05Mar 2015 from: http://fse.foodnara.go.kr/pack/z05_buss/buss_public_view.jsp?pd_idx=33[25].

Lang, I.A., Galloway, T.S., Scarlett, A., Henley, W.E., Depledge, M., Wallace, R.B. and Melzer, D. (2008). Association of uri nary Bisphenol-A concentration with medical disorders and laboratory abnormalities in adults. *JAMA, **300***: 1303–1310.

Mezcua, M., MartinezUroz, M.A., GomezRamos, M.M., Gomez, M.J., Navas, J.M. and FernandezAlba, A.R. (2012). Analysis of synthetic endocrine-disrupting chemicals in food: A review. *Talanta, **100***: 90–106.

Muncke, J. (2009). Exposure to endocrine disrupting compounds via the food chain: Is packaging a relevant source? *Science o f the Total Environment, **407***(16): 4549–4559.

Muncke, J. (2011). Endocrine disrupting chemicals and other materials of concern in food contact materials: An updated review of exposure, effect and risk assessment. *Journal of Steroid Biochemistry & Molecular Biology, **127***: 118–127.

Neltner, T.G., Alger, H.M., Leonard, J.E. and Maffini, M.V. (2013). Data gaps in toxicity testing of chemicals allowed in foo d in the United States. *Reproductive Toxicology, **42***:85–94.

Ohno, K., Azum, Y., Nakano, S., Kobayashi, T., Hirano, S., Nobuhara, Y. and Yamada, T. (2001). Assessment of styreneoligomers eluted from polystyrenemade food containers for estrogenic effects in in vitro assays. *Food and Chemical Toxicology, **39***: 1233–1241.

Patisaul, H.B. and Adewale, H.B. (2009). Longterm effects of environmental endocrine disruptors on reproductive physiology andbehavior. *Frontiers in Behavioural Neuroscience, **3***:1

Peiper, H. (2008). *Create a Miracle with Hexagonal Water: The Simple Solution for Vital Health and Longevity* (p. 36). Sheff ield:ATN Publishing.

Raulerson, P., Malraison, J. and Leboyer, A. (2009). *Building Routes to Customers: Proven Strategies for Profitable Growth* (p .96). Bellevue: Springer Science & Business Media.

Shaw, I. (ed.) 2009. *Endocrine-Disrupting Chemicals in Food* (p. 103). Cambridge: Woodhead Publishing Limited.

Sungur, S., Koroglu, M. and Ozkan, A. (2014). Determinatıon of bisphenolA migrating from canned food and beverages in mar kets.*Food Chemistry, **142***: 87–91.

Sung, G. B. 2010. Ban on plastic bags usage: is it a right move? An empirical study on consumer perception and practic e. MS Thesis, Universiti Sains Malaysia, Penang. The Star Online. (March 2012). BPA now banned. Retrieved on13 Dec, 2012from: http://www.thestar.com.my/news/nation/2012/03/01/bpa-bottles-now-banned/

Tsumura, Y., Ishimitsu, S., Kaihara, A., Yoshii, K., Tonogai, Y. (2002). Phthalate adipates, citrate and some other plasti cizers detected in Japanese retail foods: a survey. *Journal of Health Science, **48***: 493–502.

Tukur, A. Sharp, L. Stern, B., Tizaoui, C. and Benkreira, H. (2012). PET bottle use patterns and antimony migration into bo ttled water and soft drinks: the case of British and Nigerian bottles. *Journal of Environmental Monitoring,**14***: 1237–1247.

Vandenberg, L.N., Hauser, R., Marcus, M., Olea, N. and Welshons, W.V. (2007). Human exposure to bisphenol-A (BPA). *Reproductive Toxicology, **24***: 139–177.