# PHTHALATES RELEASED FROM PLASTIC BOTTLES TO INNER DRINKING WATER WHICH THREATEN FOOD SAFETY

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# INTRODUCTION & SCIENTIFIC BACKGROUND

▸ Recently, since 2007 the EU and FSIS focused on the problem of phthalate-congeners which used as plasticizers' to enhance the properties of packaging materials (HARDNESS, TRANSPARENCEY, FLEXIBILITY & TIGHT).

▸ During 2008 – 2012 the EU & FSIS recommended some analytical methods to determine phthalate residues in certain kinds of food through distinct program of food safety. No recommended official method is available, so far.

# NATURE & EXPOSURE

- Phthalate congeners are phthalic acid esters which could easily released to the surrounding area of food because of the weak covalent bond between phthalates and organic substances mixed with food or containers and packaging materials.

- Phthalate(s) could reach up to 50% (w/w) of the packaging materials used in food industry. So far, more than 15.000 kind of packaging materials are available in food industry
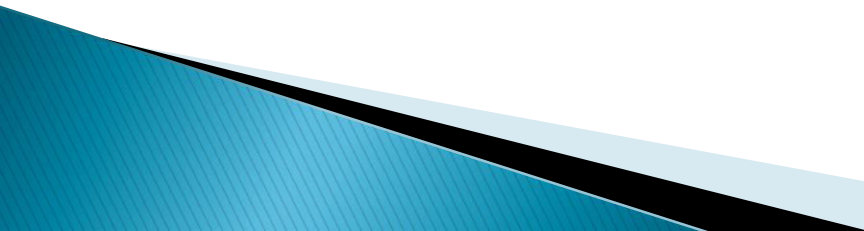
# NATURE & EXPOSURE

▸ Both temperature and storage period have a positive effect on the released concentrations of phthalate(s) to food.

▸ Exposure to phthalates could be occurred through; SKIN CONTACT & INHALATION, but it's confirmed that food still the main route and source to such hazard(s).

# OCCUREENCE ANDTYPE OF FOOD

▸ Many studies exhibited that bottled water contain high concentrations of phthalate congeners.

▸ Also, fatty foods or the high fat content foods are the most probable sources of phthalate(s) contamination (OILS AND ITS MIXTURES, DAIRY PRODUCTS esp. CHEESE AND BUTTER).

# EXPOSURE TO PHTHALTES

- Phthalates rank order: DINP > DIDP = DEHP

- Life stages: Toddlers > infants > children > women of
- reproductive age

- Sources: food most important

- routes not clear

- Example: PVC packaging for meat: DEHP

# PHTHALATES MANAGING RISKS

- Phthalates in PVC are not bound

- they will
- leach out
- Exposure difficult to manage

- Importance of phthalate

- free plastics (PP, PE)

# SUCEPTIBLE POPULATION
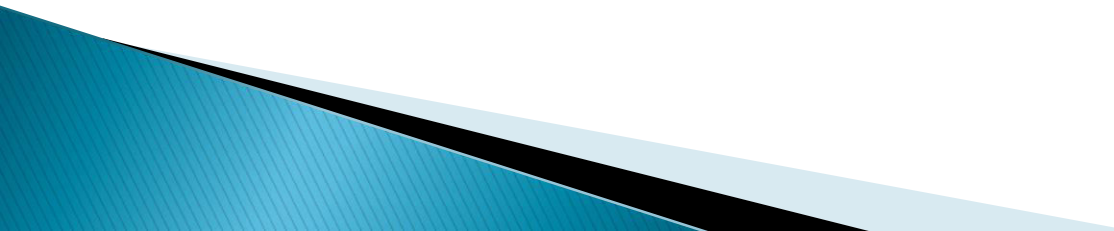
▸ Infants and children more susceptible
  ◦ Eat, drink water, and breathe more per unit of body weight than adults
  ◦ Put their fingers in their mouths
  ◦ Less well-developed immune systems and body detoxification processes

▸ Fetal exposure may increase risk of autism, asthma, learning disorders

# OBJECTIVES

▸ Focusing on chemical methodology using GC–MS to evaluate and recommend accurate, selective, sensitive and suitable method(s) to determine phthalate residues in different brands of BOTTLED WATER .

▸ Statistical analyses to determine (uncertainty of measurement, limit of detection (LOD), accuracy, repeatability, reproducibility.

# OBJECTIVES

- Determination of the RISK ASSESSMENT OF EXPOSURE TO PHTHALATE CONGENEERS.

- Estimating the National Daily Intake (ENDI) as recommended by the criteria of Codex Alim., 2011.

# RESULTS AND DISCUSSION

# Retention Time, Regression curve, accuracy and less detectable concentrations of 6 phthalate esters

| Phthalate esters | Retention time(Rt) | Regression Curve | Accuracy (R) | Less Detect. concent. |
|---|---|---|---|---|
| DMP | 29.10 | Y = 1.9 x + 0.3 | 0.993 | 25 ng/ ml. |
| DEP | 33.22 | Y = 3.1 x + 0.4 | 0.991 | 25 ng./ ml |
| DBP | 40.56 | Y = 8.2 x + 1.4 | 0.989 | 25 ng./ ml |
| BBP | 45.69 | Y = 6.3 x + 1.2 | 0.998 | 25 ng./ ml |
| DEHP | 55.35 | Y = 3.6 x + 0.7 | 0.990 | 25 ng./ml |
| DOP | 58,92 | Y = 2.7 x + 0.6 | 0.988 | 25 ng./ ml |
| Mean | | | 0.991± 0.016 | |

The retention time (Rt) versus the relative abundance of 6 Phthalates using GC-MS. Injected volume 1 ul containing 25 ng each of DMP, DEP, DBP, BBP, DEHP & DOP
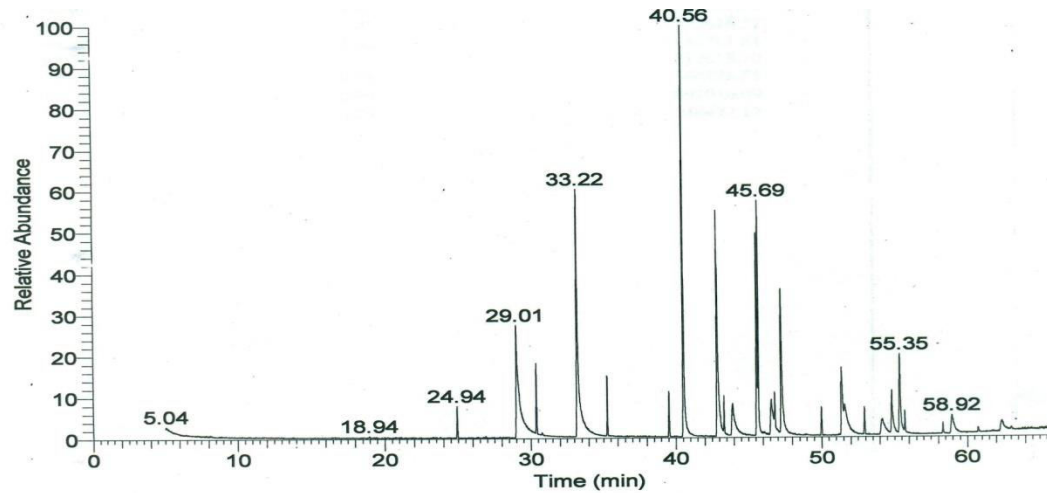
## The percentages of average of accuracy and average Of precision

| Phthalates | Concentrations (ng./ ul) | | | Av. Ac.% | Av.Pr. % |
|---|---|---|---|---|---|
| | 25 | 50 | 100 | | |
| DMP | 0.222 | 0.470 | 0.910 | 1.18 % | 3.12 % |
| DEP | 0.314 | 0.612 | 1.150 | 2.71 % | 3.22 % |
| DBP | 0,266 | 0.488 | 0,870 | 3.10 % | 3.74 % |
| BBP | 0.315 | 0.590 | 1.100 | 3.07 % | 3.56 % |
| DEHP | 0.360 | 0.710 | 1.310 | 2.96 % | 3.02 % |
| DOP | 0.284 | 0.530 | 1.101 | 3.11 % | 3.11% |
| Overall mean ± SD | | | | 2.69 ± 0.96 | 3.29 ± 0.36 |

. percentages of recovery of spiked blank water samples. show the

| Phthalates | Concentrations (ng./ ul) | | | Average Recovery % | Coeffic. Of Var. % |
|---|---|---|---|---|---|
| | 25 | 50 | 100 | | |
| DMP | 84.6 | 86.5 | 88.1 | 86.4 % | 4.8 % |
| DEP | 83.7 | 81.4 | 84.6 | 83.2 % | 5.3 % |
| DBP | 95.7 | 96.7 | 97.1 | 96.5 % | 4.3 % |
| BBP | 96.8 | 97.4 | 96.8 | 97.0 % | 3.9 % |
| DEHP | 91.4 | 95.3 | 98.4 | 95.0 % | 4.2 % |
| DOP | 83.6 | 87.1 | 86.3 | 85.7 % | 4.7 % |
| Overall mean ± SD | | | | 90.6 ± 6.9 | 4.5 ± 0.7 |

# Phthalate residues in 3 bottled water brand with 3 sizes At 3 different intervals.

| Phthalate esters | | Brands | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | A | | | B | | | C | | |
| | | 1 | 3 | 6 | 1 | 3 | 6 | 1 | 3 | 6 |
| | S | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DMP | M | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | L | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | S | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DEP | M | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | L | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | S | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DBP | M | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | L | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | S | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BBP | M | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | L | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | S | --- | --- | --- | --- | --- | -++ | --- | --- | --+ |
| DEHP | M | --- | --- | --- | --- | --- | --+ | --- | --- | --+ |
| | L | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | S | --- | --- | --- | --- | --- | --+ | --- | --- | --+ |
| DOP | M | --- | --- | --- | --- | --- | --+ | --- | --- | --- |
| | L | --- | --- | --- | --- | --- | --- | --- | --- | --- |

# CONCLUSION

▸ Although, the presented data showed negligible levels of phthalates−contamination with no significant occurrence in bottled drinking water, there is an urgent need to; firstly, develop more reliable and validated methods of analysis suites the different matrices of foods

# CONCLUSION

▸  Secondly, to determine and establish the relation between the concentration of the released phthalates, temperature and storage time of packaged foods during their shelf life..

# CONCLUSION

- Thirdly, to initiate extensive studies of risk assessment dealing with phthalate(s) hazards and considering the unavoidable multi-sources of exposure to such hazards

# Thank you

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