

Toxic Chemicals in Kids Stationeries

Phthalates in Erasers



Toxic Chemicals in Kids Stationaries: Phthalates in Erasers

Published By

Environment and Social Development Organization-ESDO

Publication Year

March, 2022

Team Leader

Dr. Shahriar Hossain

Editorial Team

Siddika Sultana, Prof. Dr. Mohammad Abul Hashem

Study & Analysis

Hridita Ferdous & Wonjin Institute For Occupational and Environmental Health Team

Support Team

Khalilur Rahman, Mamun ul Hasan, Samina Khandoker, Subhatun Nur Prithy, Umme Fariha Tasnim

Copyright © Environment and Social Development Organization-ESDO, 2022; Wonjin Institute For Occupational and Environmental Health Team and Financial Industry Public Interest Foundation



Contact Address:

Environment & Social
Development Organization - ESDO

Level: 5, House: 8/1, Block: C,
Lalmatia, Dhaka-1207, Bangladesh

Phone: +880-2-55008178; E-mail:
info@esdo.org



Contact Address:

Financial Industry Public Interest
Foundation

14th floor, Bank Hall, 19,
Myeongdong 11-gil, Jung-gu, Seoul,
South Korea

Telephone: 02-3705-5743 Fax: 02-
3705-5744



Contact Address:

Wonjin Institute For Occupational
and Environmental Health Team

(2221) 53, Sagajeong-ro 49-gil,
Jungnang-gu, Seoul, South Korea

Telephone: 82-10-6425 -9852

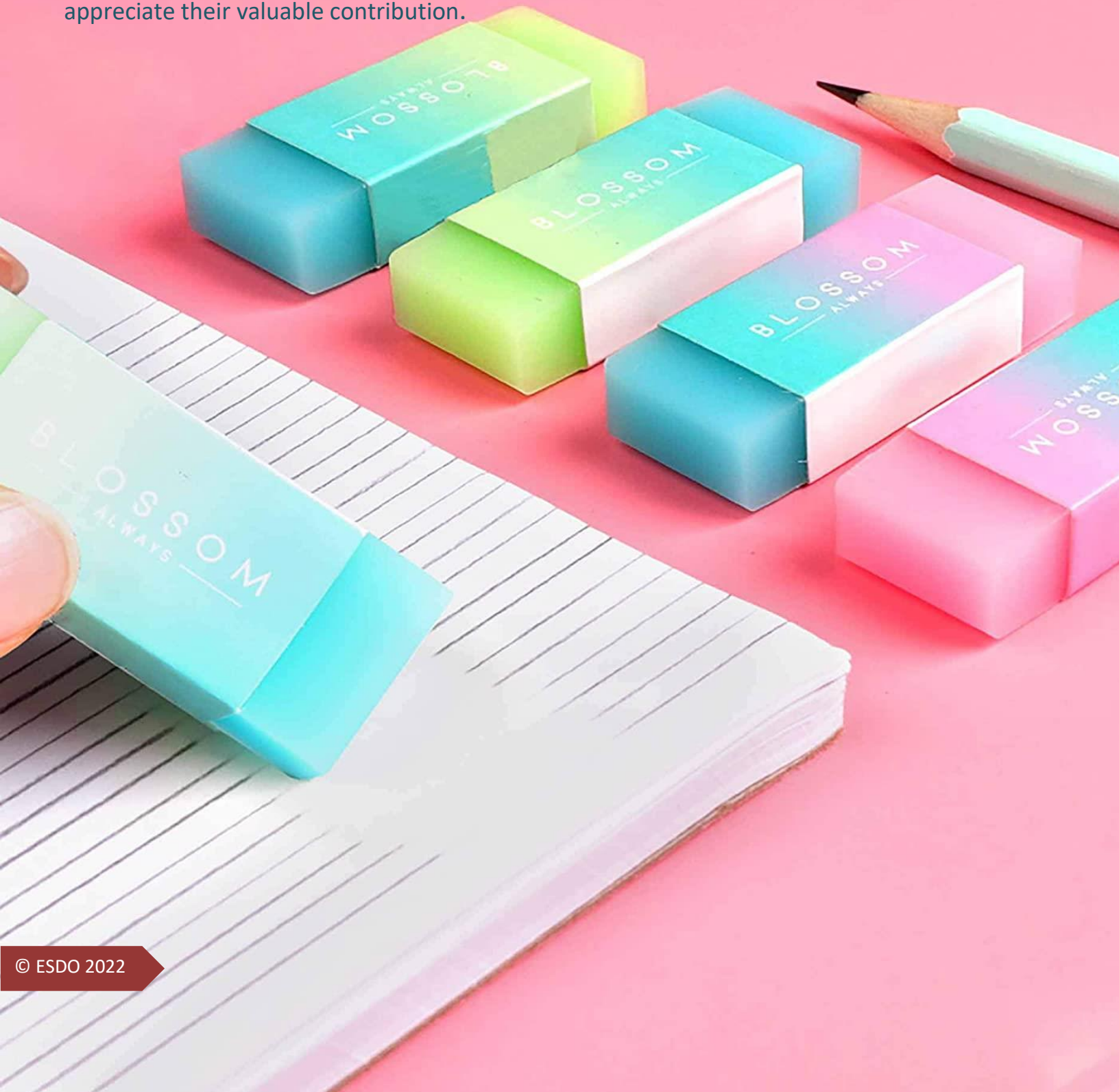
Disclaimer

This study publication does not imply the expression of any opinion whatsoever on the part of the Environment and Social Development Organization-ESDO concerning the legal status of any country, territory, city or area or of its authorities, or concerning delimitation of its frontiers or boundaries. Moreover, the views expressed do not necessarily represent the decision of national policy, or trade name of any commercial products.

Acknowledgement

First of all, praise to our Creator, the almighty for his kindness, who is merciful to all.

This study was funded by Financial Industry Public Interest Foundation in association with Wonjin Institute For Occupational and Environmental Health, Seoul, South Korea. ESDO truly appreciate their valuable contribution.



Contents

Acknowledgement.....	3
Executive Summary	5
Background.....	7
What Are Phthalates?.....	7
Phthalates in Every Day Products.....	9
Phthalates in Kids Products	10
How Phthalates Get Into Human Bodies	11
Ingestion	11
Absorption	11
Inhalation	12
Phthalates in Erasers	13
Children’s Exposure Extend to Phthalates Through Erasers.....	13
Methodology	14
Objective of the study	14
Phthalates in Erasers Available in Bangladesh	14
Sample Size	15
Sample Collection	15
Study Timeline	15
Data Analysis Method For Detecting Phthalates	20
Findings	21
Materials of the Erasers As per Their Label.....	21
Result of PVC Screening	22
Phthalates Presence in Samples	23
Phthalates in Erasers: South Asian Scenario	27
Health Effects of Phthalates in Children.....	30
Recommendation	34
Conclusion	35
References	37





Executive Summary

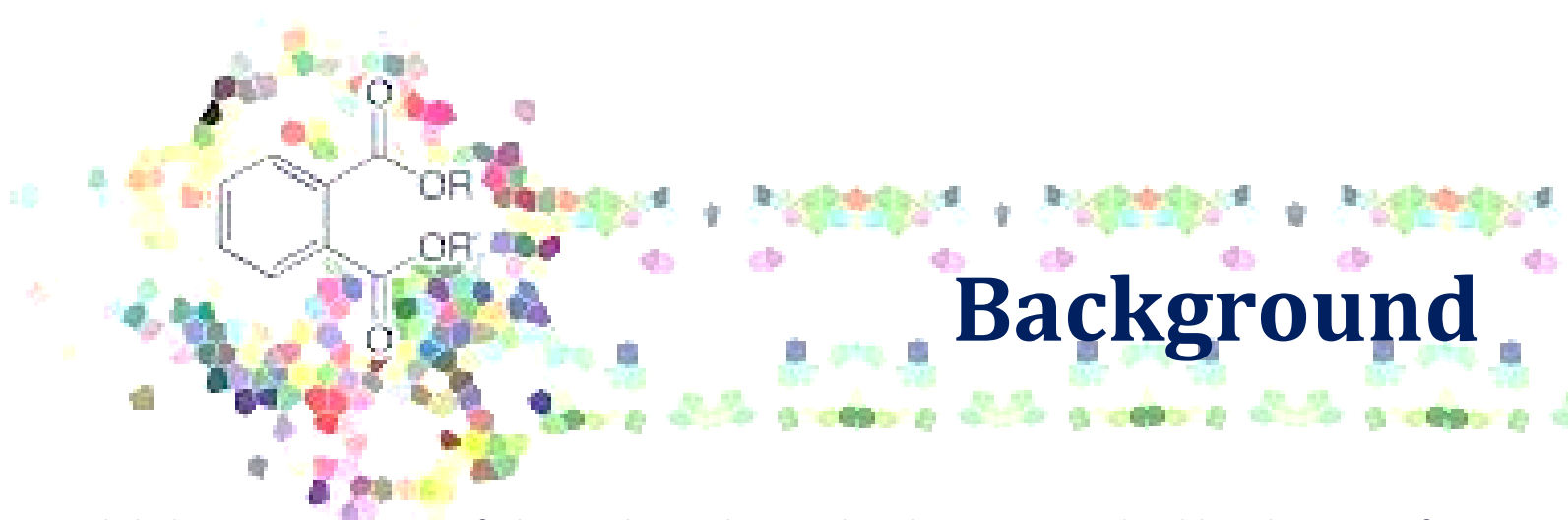
ERASER IS FUNDAMENTAL FOR KIDS' STUDY AND THEY ARE IN STEADY CONTACT WITH THESE STATIONARY ITEMS. A FEW ERASERS, DESIGNED WITH CUTE PATTERNS OR IN SPECIAL SHAPES, AND SCENTED WITH FLAVORS, ARE PROFOUNDLY PURSUED AMONG YOUNGER STUDENTS. NONETHELESS, THE ERASERS WERE TESTED AND IT WAS FOUND THAT THE GREATER PART OF THE TESTED ERASERS CONTAIN PHTHALATE WHICH IS ALSO KNOWN AS PLASTICIZERS. THEREFORE, IF CHILDREN HAVE THE HABIT OF LICKING, SUCKING AND CHEWING THEIR ERASERS, PARENTS SHOULD STOP THEM AT ONCE.

PHTHALATES ARE A GROUP OF CHEMICAL COMPOUNDS WIDELY USED AS ADDITIVES IN A RANGE OF PLASTICS AND OTHER MATERIALS THAT ARE FOUND IN MANY CONSUMER PRODUCTS. THEY MAKE PLASTICS, SUCH AS PVC, SOFT AND FLEXIBLE. THEY ARE NOT CHEMICALLY BOUND TO PLASTICS, SO THEY CAN BE RELEASED FROM CONSUMER PRODUCTS INTO THE ENVIRONMENT AND MAY RESULT IN HUMAN EXPOSURE. IN RECENT YEARS, THERE IS A GLOBAL CONCERN OVER THE PHTHALATES IN ERASERS. TAIWAN'S BUREAU OF STANDARDS, METROLOGY & INSPECTION BELIEVED PERTURBS THE BALANCE AND FUNCTIONS OF ENDOCRINE SYSTEM OF CHILDREN, INCREASE THE RISKS OF FEMINIZATION OF MALES AND BREAST CANCER FOR FEMALES. A RECENT STUDY REPORT SUGGESTED THAT EXPOSURE TO A SINGLE PHTHALATE FROM A SINGLE PRODUCT MAY NOT CONSTITUTE A MAJOR HEALTH RISK TO CHILDREN AS YOUNG AS 6 YEARS OLD. HOWEVER, EXPOSURE TO VARIOUS TYPES OF PHTHALATES FROM MULTIPLE SOURCES MAY LEAD TO GREAT HEALTH CONCERN.

ENVIRONMENT & SOCIAL DEVELOPMENT ASSOCIATION – ESDO IN ASSOCIATION WITH WONJIN INSTITUTE FOR OCCUPATIONAL AND ENVIRONMENTAL HEALTH STUDIED THE PRESENCE OF PHTHALATES IN ERASERS. 47 ERASERS WERE COLLECTED FROM RANDOM LOCAL SHOPS WHICH ARE EASILY AVAILABLE IN BANGLADESH. AMONG THE 47 TESTED SAMPLES, PHTHALATES WERE FOUND IN 30 SAMPLES. PVC SCREENING AND PHTHALATES TESTING WERE DONE IN ALL THE SAMPLES FOR ANALYZING THE PRESENCE OF SEVEN MAJOR PHTHALATES. IN 30 SAMPLES FOUR MAJOR PHTHALATES WERE FOUND WHICH WERE DIBP, DBP, DEHP_1, DEHP_2 AND DINP. THESE PHTHALATES ARE CONSIDERING AS ENDOCRINE DISRUPTORS AND MAY ALSO CAUSE ALLERGIES AND ASTHMA AND AFFECT NORMAL DEVELOPMENTS OF CHILDREN.

Imagine, a little kid, sitting in his Classroom, looking through the window at the nature. He gets his pencil and bites distractedly on the eraser at its top. Endocrine Disrupting Chemicals from the eraser break down in his saliva and enter his body.

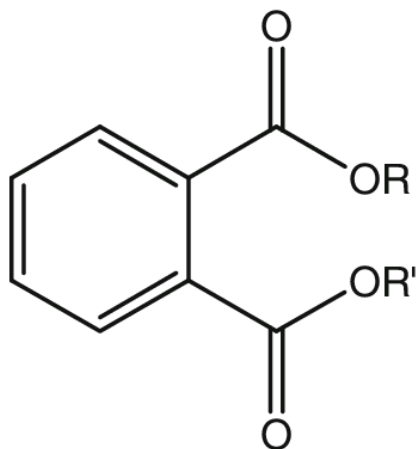




Phthalates are a group of chemicals used to make plastics more durable. They are often called plasticizers. Some phthalates are used to help dissolve other materials. The chemicals act as binding agents and also make plastics flexible. Phthalates are in hundreds of products, such as vinyl flooring, lubricating oils, and personal-care products (soaps, shampoos, hair sprays).

What Are Phthalates?

Phthalates are a family of man-made chemical compounds developed in the last century to be used in the manufacture of plastics, solvents, and personal care products. They are colorless, odorless, oily liquids that do not evaporate easily and do not chemically bind to the material they are added to. Phthalates are the esters of 1,2-dibenzene dicarboxylic acid (Peijnenburg, 2008). They are produced by the addition of an excess of branched or normal alcohols to phthalic anhydride in the presence of a catalyst. Phthalates constitute a diverse family of industrial compounds that are by far the most widely produced. Phthalates are a group of chemicals used to make plastics more durable. They are often called plasticizers. Some phthalates are used to help dissolve other materials. The chemicals act as binding agents and also make plastics flexible. Phthalates are in hundreds of products, such as vinyl flooring, lubricating oils, and personal-care products (soaps, shampoos, hair sprays).



Phthalates are a family of man-made chemical compounds developed in the last century to be used in the manufacture of plastics, solvents, and personal care products. They are colorless, odorless, oily liquids that do not evaporate easily and do not chemically bind to the material they are added to. Their low melting point and high boiling point make them also very useful as heat-transfer fluids and carriers. In some plastics, phthalates comprise up to 50% of the total weight. Both linear and branched phthalate esters are used in the manufacture of plastics; especially, linear esters provide superior flexibility at low temperatures and also have lower volatility. Phthalates with alkyl side chains lower than C6 are not often used as plasticizers because of volatility concerns. Phthalates can be found in ink, paint, adhesives, vinyl flooring, and even in some food products, cosmetics, and pharmaceuticals (Peijnenburg, 2008).

Of the dozens of phthalates synthesized over the years, the most prolifically used are DEHP, diisodecyl phthalate (DIDP), DINP, and di-n-butyl phthalate (DBP). Most of the data generated on phthalates are derived from research on these four particular phthalates. It should be noted that DOP (dioctyl phthalate) is used as a synonym for DEHP. Manufacturers use low-molecular weight phthalates (e.g. diethyl phthalate (DEP) and dibutyl phthalate (DBP)) as solvents in personal-care products (e.g. perfumes, lotions, cosmetics), and in lacquers, varnishes and coatings, including those used to provide timed releases in some pharmaceuticals (John D. Meeker, 2009).

PHTHALATES

What are Phthalates?

- Man-made chemicals used to increase the flexibility in plastics
- Commonly used as solvents or dissolving agents, and lubricants in cosmetics.

Where are they used in?

- toys
- vinyl flooring
- wall coverings
- detergents
- PVC
- piping
- packaging
- electrical wire
- lubricating oils
- food packaging
- pharmaceuticals
- blood bags
- personal care items
- nail polish
- hair sprays
- aftershave lotions
- soaps
- shampoos
- perfumes
- fragrances

Phthalate Characteristics

- colorless, odorless, oily liquids
- don't evaporate easily
- don't chemically bond to the material they are added to

Avoid These Plastics:

Not all plastics are the same. Products with a recycling symbol with the number 3 inside and V or PVC below, may contain Phthalates.



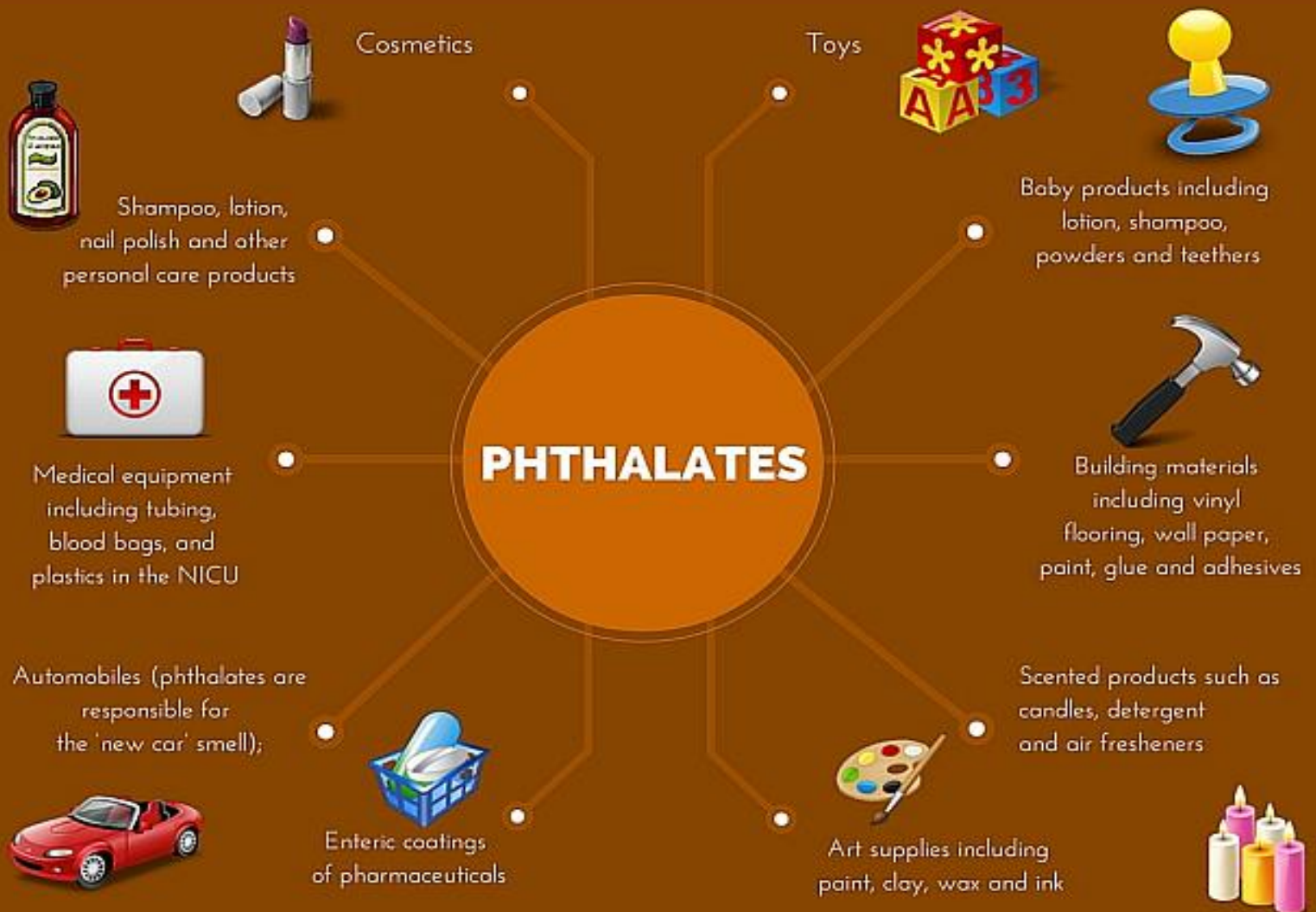
Phthalates in Every Day Products

Phthalates are considered "everywhere chemicals" as they can be found in a wide variety of products, including the water bottle we take to work, the floors in our bathroom, the shampoo in our shower, and the wrappers around our fast food.

Phthalates are also widely employed in many personal care products, cosmetics as well as plastics (softening of products made by these materials, especially vinyl plastics), paper coating, paints, and adhesives. Shampoo, body deodorant, body wash, hairspray, and hair gels are examples. Although the levels of phthalates in bottled waters have been detected as low, high consumption of such waters leads to a concern.

DEHP is generally applied in medical devices, including cardiac catheters, endotracheal tubes, and some implanted devices, whereas DINP is commonly found in wires, cables, hoses, and plastic toys. Unfortunately, plastic containers, such as food utilities, are the main source of DEHP, in which phthalates are physically dissolved in plastic not by chemical bonding.

Phthalates are a group of chemicals most commonly used to make plastic more flexible and harder to break. They also act as a binding agent or a solvent. Also known as plasticizers, they are found in a wide range of products and were first introduced in the 1920s as an additive in polyvinyl chloride (PVC) and some healthcare products, such as insect repellent (Zanolli, 2019). Phthalates can be found in plastic products like vinyl flooring, mini blinds and wallpaper, raincoats, plastic medical equipment and devices (including blood storage bags and IV tubes), plastic pipes, shower curtains, plastic film and food packaging, pharmaceuticals, lubricating oils and detergents, plastic school bags, erasers, toothbrushes etc.



Phthalates in Kids Products

Phthalates are useful to manufacturers as they make plastics and vinyl softer and more flexible. The problem is there is a growing body of evidence that ingesting and being otherwise exposed to these chemicals can be potentially harmful, particularly for growing children.

As phthalates are used to make plastic products flexible, it can be found in numbers of products including kids' product and its container unless and until it is labeled as "Phthalates Free" like children's toys, teething rings, baby shampoo bottle, lotion bottle, pencil box, lunch box, erasers, school bags etc.

However, not all soft plastic contains phthalates. But that cannot be a sign of relief because plastic wrap, for instance, typically contains DEHA (di(2-ethylhexyl) adipate), which -- while not technically a phthalate -- is chemically very close to DEHP and has been associated with liver tumors in rodent studies. Children are uniquely vulnerable to phthalate exposures given their hand-to mouth behaviors, floor play, and developing nervous and reproductive systems.

Urine samples from babies 2 months to 28 months old were tested for a research work whose mothers had used infant care products on them in the previous 24 hours. They found that every baby had at least one phthalate in his urine sample, and 81 percent of them had seven or more phthalates in their system. Babies 8 months or younger had the highest levels, along with babies whose moms used more infant personal care products (Miles).



How Phthalates Get Into Human Bodies

Ingestion

When a baby sucks or chews on an object that contains phthalates (like a teether, squeeze toy, or bath book), or a young child handles it and then sucks his fingers, the chemicals can end up in the child's body. Because babies suck on and put things in their mouth routinely, they're especially vulnerable to ingesting phthalates.

Older children also ingest plasticizers when they play with things that contain phthalates and then put their hands in their mouth. Polymer clays (a modeling compound designed to remain pliable until baked in a home oven) are one example. These clays are routinely sold for use by children and are made primarily with PVC plastics.

We also ingest phthalates/plasticizers by eating food that's been contaminated via certain food packaging or by drinking beverages from plastic bottles that leach the chemical into the food or liquid.

Absorption

Phthalates are found in many scented and cosmetic products, where they stabilize the fragrance, increase spread ability, and enhance absorption. So, it can be found in deodorants, nail polish (where they help prevent chipping), hair spray (where they prevent stiffness), perfumes, lotions, creams, and powders (including baby lotions, creams, and powders). The chemicals from these products can be absorbed through the skin and into the bloodstream (Lee).



Polymer Clays are quite popular among kids. This polymer clays are made with PVC Plastic that can contain phthalates for the flexibility.

PHTHALATES: WHAT YOU NEED TO KNOW

List of the most common phthalates, which may come in handy for checking labels (Lee):

- DBP (dibutyl phthalate)
- DNOP (di-n-octyl phthalate)
- DiNP (diisononyl phthalate)
- DEP (diethyl phthalate)
- BBzP (benzyl butyl phthalate)
- DEHP (di-2-ethylhexyl phthalate)
- DiDP (diisodecyl phthalate)
- DnHP (di-n-hexyl phthalate)
- DMP (dimethyl phthalate)
- DnOP (di-n-octylphthalate)

Exposure to phthalates is also a common part of any hospital stay. Many medical devices, such as catheters and IV equipment, are made with PVC (polyvinyl chloride or vinyl) – even the ones used in the NICU and other baby and child care areas. Because phthalates can leach out of the devices into stored liquids, like blood, plasma, and intravenous fluid, the FDA recommended in 2002 that healthcare providers avoid using intravenous bags, tubes, and other devices containing the phthalate DEHP when treating premature babies and women who are pregnant with male fetuses.

In 2002, a coalition of public health and environmental groups tested 72 name-brand, off-the-shelf cosmetics for phthalates. They found that nearly three-quarters of the products contained the plasticizers. And when the CDC tested phthalate levels in humans, it found the highest levels in women of childbearing age, presumably because of their use of cosmetics.

In a study published in the February 2008 issue of the *Journal of Pediatrics*, researchers at the University of Washington's Seattle Children's Hospital and the University of Rochester found that babies whose mom had recently applied infant care products like baby lotion, shampoo, and powder were more likely to have phthalates in their urine than babies whose mom didn't use these products.

Inhalation

Phthalates can be breathed in from dust or fumes from any products that contain vinyl, such as vinyl flooring, vinyl seating (in cars, for example), and some diaper-changing mats. The production of fumes by these products is called off-gassing.

Phthalates are a concern for adults, too, of course. In addition, phthalates can cross the placenta, so they can be passed to a baby during pregnancy when the mother is exposed. And they can be transmitted through breast milk, so it's important to learn how to limit a mom's exposure in order to protect her baby.

Phthalates in Erasers

Basically, two different materials are used to make erasers: rubber and plastic. Generally, erasers those have PVC in them may contain harmful phthalate plasticizer. Phthalates have been reported to cause several undesirable effects when exposed to the human body. Some of the erasers that were made of PVC contained DEHP as a plasticizer, and children who have the habit of sucking or biting pieces off erasers may be exposed to harmful levels of DEHP. There could also be other sources of these chemicals in the child's environment that would contribute to the total exposure and these exposure to various types of phthalates from multiple sources may lead to great health concern in children.

Children's Exposure Extend to Phthalates Through Erasers

The exposure of a child to phthalates from erasers by licking and chewing depends on:

- How much phthalates from the eraser passes into the saliva;
- How long the child sucks or chews on the eraser and in what way;
- How much of the eraser is swallowed as small particles;
- To what extent the phthalates from these particles passes into gastric juice;
- To what extent phthalates are absorbed in the body from saliva and the gastrointestinal tract.

According to the Danish study a child is exposed to 120 μg of DEHP per square cm of eraser which is in contact with its saliva for an hour (120 $\mu\text{g}/\text{cm}^2/\text{h}$), but this is likely to be a six-fold overestimate. This rate of transfer from eraser to saliva is comparable to the highest DEHP values measured in a US study and ten times higher than the results for DiNP releases in two European studies. Therefore, in this risk assessment, the figure of 120 $\mu\text{g}/\text{cm}^2/\text{h}$ is considered a worst-case scenario. It is also assumed that 100% of the phthalate in the saliva or in swallowed particles passes into the body (Greenfacts, 2009).

Phthalates in Erasers Available in Bangladesh

Environment & Social Development Organization - ESDO in association with Wonjin Institute For Occupational and Environmental Health – WIOEH conducted this study to assess situation of phthalate presence in locally found erasers, where samples were collected and sent to test for presence of phthalates.

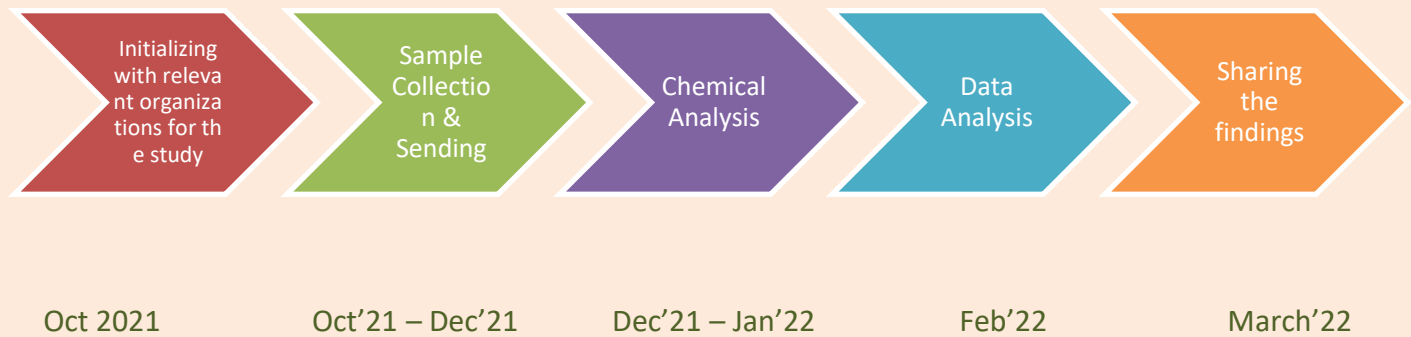
Objective of the study

- To find out the current status of presence of phthalates in erasers easily found in our markets.
- To promote further study requirement
- To design awareness campaign and policy advocacy

Methodology

To prepare this extensive report, the relevant study for data have been collected from both primary and secondary sources. The initial review was expanded relevant terms and included the following websites and sources –National Geographic, The Guardian, Goggle Scholar, United Nations Environment Programme and local media releases - using an advanced search by country, with key words and filters for the evaluations, most relevant to least relevant, special evaluations, and other ESDO supported study/documents. The primary data collection methodology has divided into two parts – Sample Collection & Sample analysis which have elaborated in this section. Then the data was compiled and analyses were made to make relevant assessments.

Study Timeline



Sample Collection

Amid the Covid-19 pandemic, ESDO team members had gone physically in different locations of Dhaka (New Market, Chawk Bazar, Mohammedpur Town Hall, Lalmatia, Gulisthan, Motijhile, Gulshan-1 & 2, Uttara and Mirpur 1,2 and 10) and randomly collected the erasers that is found in local markets.

Sample Size

Total 47 erasers of different brands, colors were collected for this analysis



Sample Details

No	Label No	Brand	Name of product	Legal basis	Certification Mark	Notes
1	BD-01	TiTi	Non-Dust Eraser	-	TR-5005	-
2	BD-02	Marko fisher	Marko fisher eraser	Office and drawing	C-209	No dust
3	BD-03	Nataraj	Non-dust eraser	For neat and clean erasing	EN- 71	Non-dust
4	BD-04	Color Gloves	Eraser	-	LT-301	-
5	BD-05	Maped	Eraser	-	-	-
6	BD-06	DOMS	Doms Dust free Eraser	Consumer care cell	Art no 3421	Dust free
7	BD-07	Great writing instruments	Kid mate	Soft, the eraser dust will strick together	6102	Dust free
8	BD-08	Good luck, RFL	Eraser super	Super clean	A product of RFL	Dust free
9	BD-09	DOMS	Doms X1 extra long	clean and clear erasing	Art no 7013	Dust free
10	BD-10	DOMS	Doms fragrance eraser	-	Art no 3406	-
11	BD-11	SBI	Soft eraser	Super clean	-	Dust free
12	BD-12	Petra	Soft eraser	-	-	No dust (Black)
13	BD-13	Petra	Soft eraser	-	-	No dust

No	Label No	Brand	Name of product	Legal basis	Certification Mark	Notes
14	BD-14	Matador	Neon Jelly eraser	Hi quality translucent eraser		Scented (green)
15	BD-15	DOMS	Extra Long Eraser	A quality product	Art No 3436	Dust free
16	BD-16	Matador	i-teen	Dust Free Eraser		Dust free (pink)
17	BD-17	Deli	POP!	Not For Children under 3 years	ref: 3045	Light Blue
18	BD-18	Staedtler Luna	School	High quality, phthalate free, latex free	526 L30 TH	
19	BD-19	Nishat	Soft eraser	Dust Free Eraser	NC40	
20	BD-20	Deli	Blooming Strawberry Freshness Eraser	Not For Children under 3 years	H014 00	Pink
21	BD-21	Deli	POP!	Not For Children under 3 years	ref: 3045	Pink
22	BD-22	Lyra	Eraser/Radierer/Gomme	Eraser for paper and film		
23	BD-23	IMax	I-color neon eraser	hi quality		
24	BD-24	Matador	Twinkle Eraser			

No	Label No	Brand	Name of product	Legal basis	Certification Mark	Notes
25	BD-25	Reflex	Super Cleaning Eraser	non toxic, dust free, easy remove	RX-703	
26	BD-26	Deli	Eraser Exam	Not For Children under 3 years	ref: 3043	Black
27	BD-27	Apsara	Matt Magic Eraser	neat and dust free erasing	102300202	Black
28	BD-28	Marko fisher	2B plastic Eraser	softy, clean, no dust	no 206	
29	BD-29	TiTi	Non-dust eraser		TR2000B	
30	BD-30	Matador	Neon Jelly eraser	Hi quality translucent eraser		Scented (yellow)
31	BD-31	DOMS	Neon Eraser	Neon Eraser		
32	BD-32	Faber Castle	Dust Free		7086-30 D	
33	BD-33	ColoKit	Eraser	Eraser for paper and film	C-E03	
34	BD-34	Faber Castle	Pencil Ink Eraser	Pencil Ink Eraser	18 82 30	
35	BD-35	Deli	Premium Plastic Eraser		GB21027 QB/T 2309	Black
36	BD-36	Apsara	Non-dust eraser	Foe neat and clean eraser	Art Nr ERA001	

No	Label No	Brand	Name of product	Legal basis	Certification Mark	Notes
37	BD-37	Atlas	Eraser	Non-Dust		
38	BD-38	Faber Castle	Dust Free	No Harmful Chemicals	187140	
39	BD-39	Faber Castle	Dust Free		187140	
40	BD-40	Orange	Premium Plastic Eraser	Recyclable, Keep Away from Children Taking		Black
41	BD-41	Matador	Wiper			
42	BD-42	Faber Castle	Dust Free		18 72 95	Black
43	BD-43	Great writing instruments	Kid mate	Soft, the eraser dust will stick together	6102	Dust free
44	BD-44	Faber Castle	Dust Free		187140	
45	BD-45	Petra	Soft eraser	-	-	No dust
46	BD-46	Lyra	Eraser/Radierer/Gomme	Eraser for paper and film	Art nr 3452	Black
47	BD-47	Staedtler Luna	School	High quality, phthalate free, latex free	526 L30 TH	

Data Analysis Method For Detecting Phthalates

This analysis was done in two phase: PVC Screening & Phthalates Testing.

PVC testing was done by portable XRF machine where chlorine was detected. PVC is typically about 55% chlorine. The used portable XRF technology offers simple and immediately accurate chlorine test results, non-destructively, at the point of use. Factory calibrations was also done for Cl to provide concentrations in ppm or percent values.

Determination of seven kinds of phthalates: di-ethyl phthalate (DEP), di-propyl phthalate (DPP), di-isobutyl phthalate (DIBP), di-butyl phthalate (DBP), benzyl butyl phthalate (BBP), di-(2-ethylhexyl) phthalate (DEHP), DNOP (di-n-octyl phthalate), DiNP (diisononyl phthalate), DiDP (diisodecyl phthalate) in erasers were done by gas chromatography in combination with mass spectrometry detector (GC-MS) in electronic ionisation mode (EI) with selected-ion monitoring (SIM) acquisition method (GC-MS (EI-SIM)) have been carried out. Methods have been developed for both qualitative and quantitative analysis of phthalates. Extraction, clean-up and analysis procedure have been optimized.



Portable XRF machine used for PVC Screening



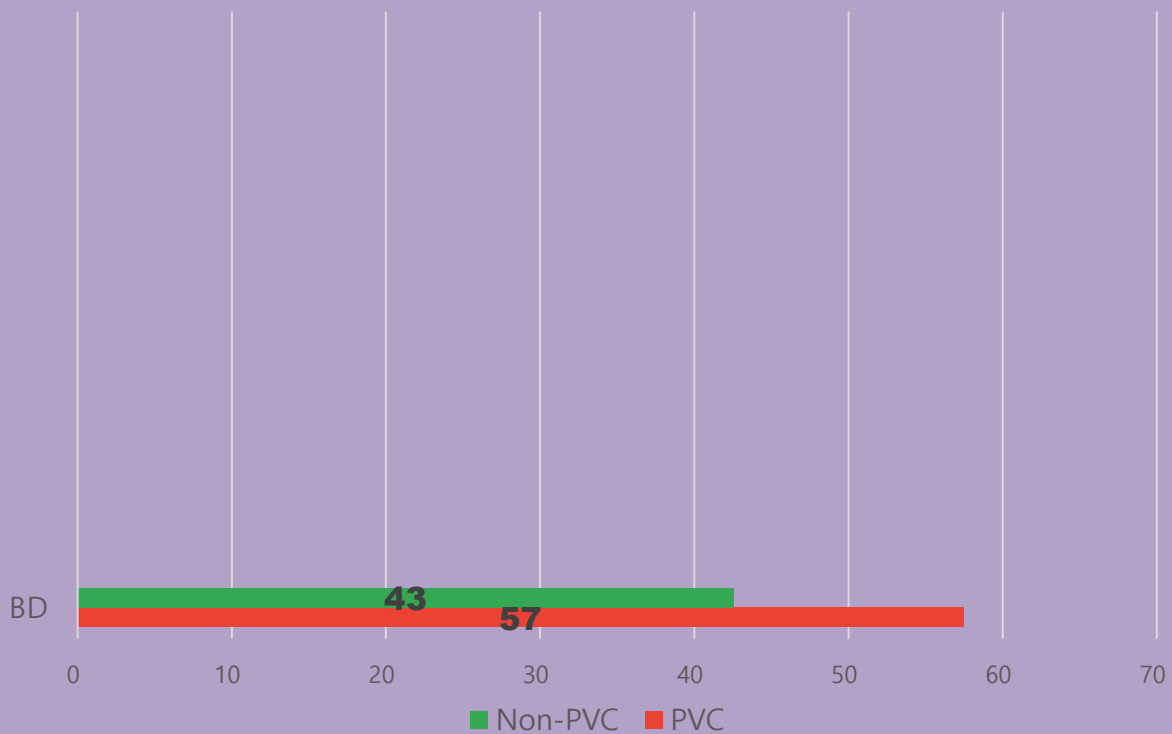
Findings

Materials of the Erasers As per Their Label

Material	Number
No Data	44
Polymer	2
High Polymer	1
Total	47

Result of PVC Screening

Among the 47 tested erasers 27 of them were PVC erasers & 20 of them were Non PVC Erasers.



Phthalates Presence in Samples

Sample No	Brand	Phthalates (mg/kg)								Sum (%)
		DiBP	DBP	BBP	DEHP_1	DEHP_2	DnOP	DINP	DiDP	
BD-01	TiTi	ND	52.0	ND	256895.2	25.7	ND	ND	ND	25.69
BD-02	Marko fisher	79100.1	2977.4	ND	203827.2	20.38	ND	ND	ND	28.59
BD-03	Nataraj	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-04	Color Gloves	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-05	Maped	14.8	ND	ND	ND	ND	ND	ND	ND	0.001
BD-06	DOMS	15.7	35.3	ND	ND	ND	ND	ND	ND	0.005
BD-07	Great writing instruments	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-08	Good luck, RFL	1457.2	67.2	ND	276.8	0.03	ND	ND	ND	0.180
BD-09	DOMS	18.6	49.5	ND	223394.5	22.34	ND	ND	ND	22.35
BD-10	DOMS	110.1	116.7	ND	225400.6	22.54	ND	ND	ND	22.56
BD-11	SBI	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-12	Petra	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-13	Petra	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-14	Matador	ND	45.8	ND	374870.8	37.49	ND	ND	ND	37.49
BD-15	DOMS	481.8	48.7	ND	208499.2	20.85	ND	1359.6	ND	21.04

Sample No	Brand	Phthalates (mg/kg)								Sum (%)
		DiBP	DBP	BBP	DEHP_1	DEHP_2	DnOP	DINP	DiDP	
BD-16	Matador	ND	ND	ND	252984.6	25.30	ND	ND	ND	25.30
BD-17	Deli	ND	37.0	ND	116.3	0.01	ND	ND	ND	0.02
BD-18	Staedtler Luna	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-19	Nishat	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-20	Deli	ND	ND	ND	81.5	0.01	ND	ND	ND	0.01
BD-21	Deli	ND	ND	ND	60.9	0.01	ND	ND	ND	0.01
BD-22	Lyra	ND	ND	ND	258541.1	25.85	ND	ND	ND	25.85
BD-23	IMax	ND	ND	ND	290323.5	29.03	ND	ND	ND	29.03
BD-24	Matador	ND	54.6	ND	252829.4	25.28	ND	ND	ND	25.29
BD-25	Reflex	480.6	38.9	ND	175.3	0.02	ND	ND	ND	0.069
BD-26	Deli	ND	36.7	ND	5644.1	0.56	ND	ND	ND	0.57
BD-27	Apsara	ND	ND	ND	498.3	0.05	ND	ND	ND	0.050
BD-28	Marko fisher	118970.6	128.2	ND	110759.7	11.08	ND	ND	ND	22.99
BD-29	TiTi	43.0	46.5	ND	143079.0	14.31	ND	ND	ND	14.32
BD-30	Matador	19.6	37.0	ND	373772.2	37.38	ND	ND	ND	37.38

Sample No	Brand	Phthalates (mg/kg)								Sum (%)
		DiBP	DBP	BBP	DEHP_1	DEHP_2	DnOP	DINP	DiDP	
BD-31	DOMS	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-32	Faber Castle	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-33	ColoKit	ND	ND	ND	56.6	0.01	ND	ND	ND	0.01
BD-34	Faber Castle	1057.8	51.3	ND	174.9	0.02	ND	ND	ND	0.13
BD-35	Deli	64.9	26.3	ND	242243.2	24.22	ND	ND	ND	24.23
BD-36	Apsara	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-37	Atlas	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-38	Faber Castle	19.1	39.3	ND	36303.3	3.63	ND	17926.9	ND	5.43
BD-39	Faber Castle	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-40	Orange	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-41	Matador	34.2	84.6	ND	222130.3	22.21	ND	ND	ND	22.22
BD-42	Faber Castle	ND	ND	ND	75.2	0.01	ND	ND	ND	0.01
BD-43	Great writing instruments	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-44	Faber Castle	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-45	Petra	ND	ND	ND	ND	ND	ND	ND	ND	ND
BD-46	Lyra	ND	ND	ND	252833.0	25.28	ND	694.2	ND	25.35
BD-47	Staedtler Luna	ND	ND	ND	70.3	0.01	ND	ND	ND	0.01

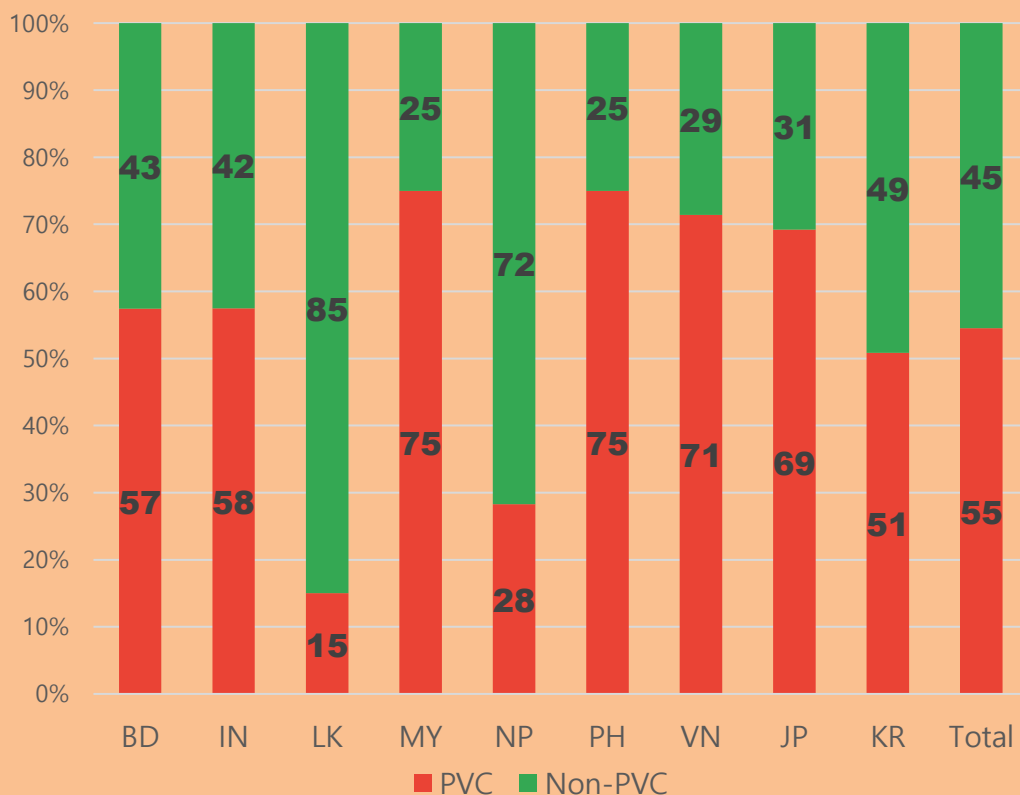
Phthalates were found in 30 samples out of 47 and among the 30 detected samples **only 9 samples contain phthalates around 0.01%** which can be considered safe according to Korea's regulation.

Sample No	Brand	PVC/ NonPVC	Phthalates (mg/kg)								Sum (%)
			DiBP	DBP	BBP	DEHP_1	DEHP_2	DnOP	DINP	DiDP	
BD-01	Titi	PVC	ND	52.0	ND	256895.2	25.7	ND	ND	ND	25.69
BD-29	Titi	PVC	43.0	46.5	ND	143079.0	14.31	ND	ND	ND	14.32
BD-02	Marko fisher	PVC	79100.1	2977.4	ND	203827.2	20.38	ND	ND	ND	28.59
BD-28	Marko fisher	PVC	118970.6	128.2	ND	110759.7	11.08	ND	ND	ND	22.99
BD-05	Maped	Non-PVC	14.8	ND	ND	ND	ND	ND	ND	ND	0.001
BD-08	Good luck, RFL	Non-PVC	1457.2	67.2	ND	276.8	0.03	ND	ND	ND	0.180
BD-06	DOMS	Non-PVC	15.7	35.3	ND	ND	ND	ND	ND	ND	0.005
BD-15	DOMS	PVC	481.8	48.7	ND	208499.2	20.85	ND	1359.6	ND	21.04
BD-09	DOMS	PVC	18.6	49.5	ND	223394.5	22.34	ND	ND	ND	22.35
BD-10	DOMS	PVC	110.1	116.7	ND	225400.6	22.54	ND	ND	ND	22.56
BD-14	Matador	PVC	ND	45.8	ND	374870.8	37.49	ND	ND	ND	37.49
BD-16	Matador	PVC	ND	ND	ND	252984.6	25.30	ND	ND	ND	25.30
BD-24	Matador	PVC	ND	54.6	ND	252829.4	25.28	ND	ND	ND	25.29
BD-30	Matador	PVC	19.6	37.0	ND	373772.2	37.38	ND	ND	ND	37.38
BD-41	Matador	PVC	34.2	84.6	ND	222130.3	22.21	ND	ND	ND	22.22
BD-17	Deli	PVC	ND	37.0	ND	116.3	0.01	ND	ND	ND	0.02
BD-20	Deli	PVC	ND	ND	ND	81.5	0.01	ND	ND	ND	0.01
BD-21	Deli	PVC	ND	ND	ND	60.9	0.01	ND	ND	ND	0.01
BD-26	Deli	PVC	ND	36.7	ND	5644.1	0.56	ND	ND	ND	0.57
BD-35	Deli	PVC	64.9	26.3	ND	242243.2	24.22	ND	ND	ND	24.23
BD-22	Lyra	PVC	ND	ND	ND	258541.1	25.85	ND	ND	ND	25.85
BD-46	Lyra	PVC	ND	ND	ND	252833.0	25.28	ND	694.2	ND	25.35
BD-23	IMax	PVC	ND	ND	ND	290323.5	29.03	ND	ND	ND	29.03
BD-25	Reflex	Non-PVC	480.6	38.9	ND	175.3	0.02	ND	ND	ND	0.069
BD-27	Apsara	Non-PVC	ND	ND	ND	498.3	0.05	ND	ND	ND	0.050
BD-33	ColoKit	PVC	ND	ND	ND	56.6	0.01	ND	ND	ND	0.01
BD-34	Faber Castle	PVC	1057.8	51.3	ND	174.9	0.02	ND	ND	ND	0.13
BD-38	Faber Castle	PVC	19.1	39.3	ND	36303.3	3.63	ND	17926.9	ND	5.43
BD-42	Faber Castle	PVC	ND	ND	ND	75.2	0.01	ND	ND	ND	0.01
BD-47	Staedtler Luna	PVC	ND	ND	ND	70.3	0.01	ND	ND	ND	0.01

Phthalates in Erasers: South Asian Scenario

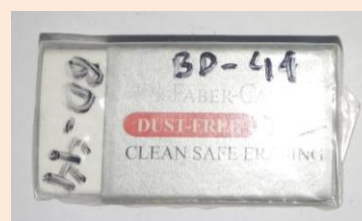
Samples from other south Asian countries were also collected by other organization from the following countries and sent to Wonjin Institute For Occupational and Environmental Health – WIOEH for analysis.

Country	Abbreviation	Number of Samples
Bangladesh	BD	47
Indonesia	IN	40
Sri Lanka	LK	40
Malaysia	MY	40
Nepal	NP	53
Philippines	PH	40
Vietnam	VN	42
Japan	JP	39
Korea	KR	59
Total		400



20 items were identified as the same products but 5 items showed different results.

No.	Product name	Sample ID	DiBP	DBP	DEHP	DINP	PVC Y/N	Country of Brand	Origin of Manufacture	Manufacture Date
1	apsara non dust eraser	NP-11					N	India	India	
		NP-12					N	India	India	
		NP-28					N	India	India	2017.08
		NP-31	50.5	32.2	236902.3		Y	India	India	2015.06
		BD-36					N	India	India	
2	deli3043 EXAM great for exam	IN-17		41.0	169.4		Y	China	China	2021.01.06
		BD-26		36.7	2413.4		Y	China	China	
3	FABER-CASTELL DUST-FREE	IN-8			177.0		Y	Germany	Malaysia	
		NP-09		43.7			N	Germany	Malaysia	2019.11
		BD-38	19.1	39.3	43158.3	17926.9	Y	Germany	India	2017.03
		BD-39					N	Germany	India	2019.11
		BD-44					N	Germany	India	2019.11
4	Maries No:C6242	MY-19		50.2	27000.1		N	China	China	
		NP-25		66.4	8197.5		N	China	China	
5	PLUS JAPAN	VN-17					N	Japan	Taiwan	
		LK-38		11.5	373681.1		Y		Taiwan	



FABER-CASTELL DUST-FREE



DEHP

apsara non dust eraser



DEHP

deli3043 EXAM great for exam

It can be summarized that the total amount of phthalates exceeded the Korea limit ($=0.1\%$) in 30.5% ($N=104$) of the samples analyzed. DEHP was the phthalate most frequently found in eraser samples, followed by DBP and DiBP. DEHP and DBP are known as Endocrine Disrupting Chemicals, and their use in children's products has already been restricted in EU and the USA. According to the country of Brand information, the proportion of imported products was high. It seems necessary to regulate and manage imported products as well as domestic products. In Korea, the use of phthalate plasticizers among children's products has been restricted since June 2015 and has been continuously strengthened. In this survey, only one product in Korea exceeded the safety standard.

Health Effects of Phthalates in Children

Phthalates are called “endocrine disruptors” because they affect the body’s hormones by mimicking them or blocking them. They interfere with the body’s natural levels of estrogen, testosterone, and other hormones, which is why they are called “disruptors.” Endocrine disruptors are hard to study for several reasons:

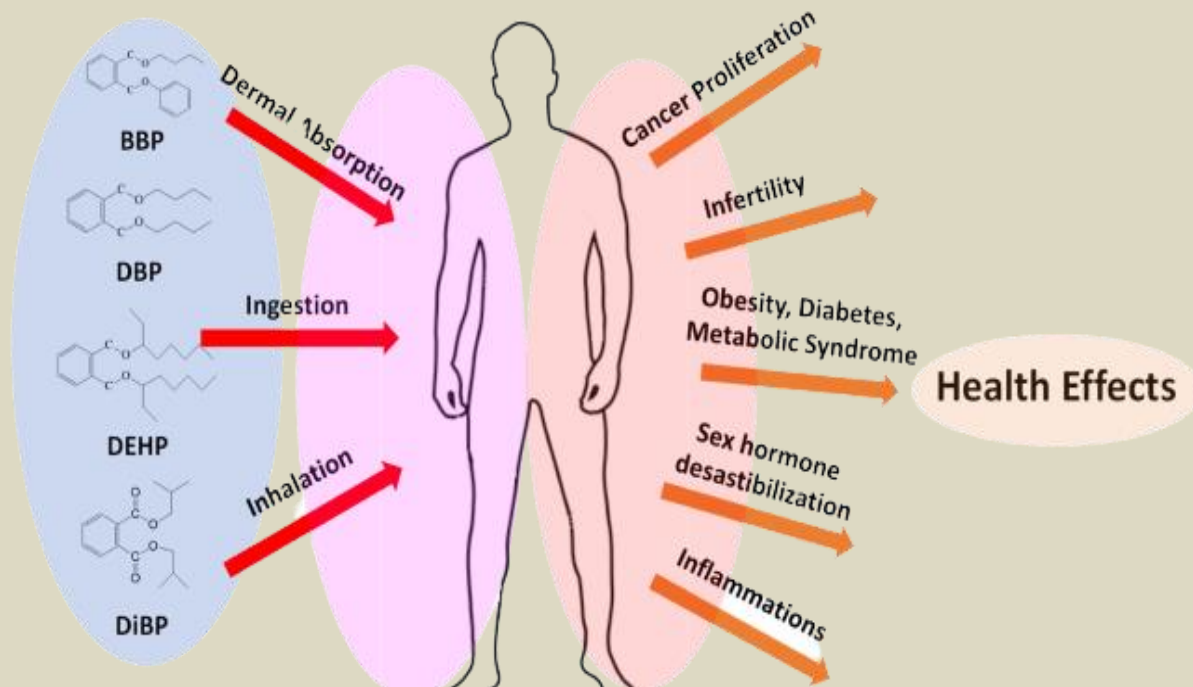
- We are exposed to very small quantities from many different sources every day,
- Researchers have proved that, unlike other chemicals, these appear to have more serious effects at lower levels than at higher levels.

Usually, we assume that the higher the dose or exposure, the greater the harm, but endocrine disruptors play by different rules. Hormones can increase the risk of some cancers, whether those hormones are natural or synthetic. Too much or too little of a hormone can be harmful.

Characterization of the nine most common phthalates & their health effects

[Source: (Marketa Møller, 2020)]

<u>Name of Phthalates</u>	<u>Health Effects</u>
di(2-ethylhexyl) phthalate (synonym: bis(2-ethylhexyl) phthalate (DEHP)	Toxic to reproduction, causes allergies and asthma
dibutyl phthalate (DBP)	Toxic to reproduction, causes allergies and asthma
diisodecyl phthalate (DIDP)	Damage to liver
benzyl butyl phthalate (BBP)	Damage to liver
diisononyl phthalate (DINP)	Damage to liver, causes allergies and asthma, toxic to reproduction
diisobutyl phthalate (DIBP)	Toxic to reproduction, toxic to development
di-n-octyl phthalate (DNOP)	Damage to live
dipentyl phthalate (DPP)	Toxic to reproduction, toxic to development
bis(2-ethylhexyl) isophthalate (DOIP)	Toxic to reproduction
bis(2-methoxyethyl) phthalate (DMEP)	Toxic to reproduction



Phthalates are believed to also affect girls' hormones, but the health impact is not yet known (Aakkola JJ, 2008).

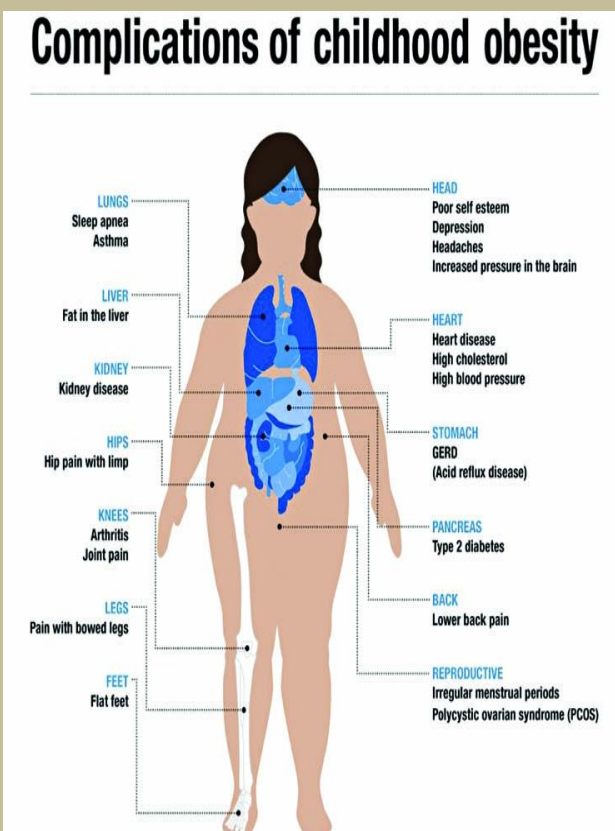
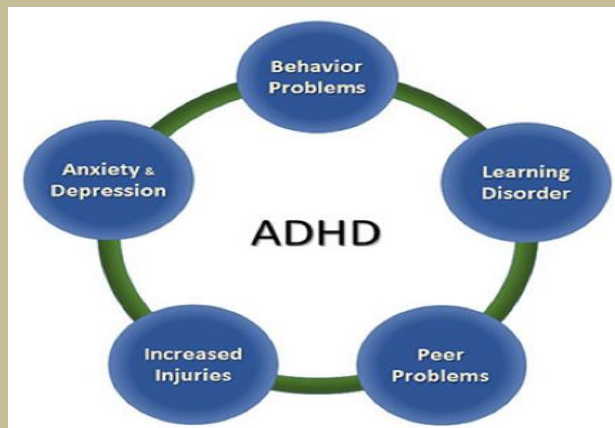
Researchers at Mount Sinai also found a link between obesity and phthalates (Teitelbaum SL, 2012). They found that among overweight girls ages 6 to 8, the higher the concentration of certain phthalates (including low molecular weight phthalates) in their urine, the higher their body mass index (BMI). BMI takes height and weight into account when determining if someone is overweight. A study among Danish children ages 4 to 9 found that the higher the concentration of phthalates (all of them), the shorter the child. This was true for girls and boys (Boas M, 2010). More research is needed to determine the impact of phthalates on height and BMI.

Even short-term exposure has now been linked to developmental deficits. Researchers found that children in intensive care units were exposed to the phthalate DEHP through plastic tubing and catheters. The children had 18 times as much DEHP in their blood compared to children who had not spent time in the ICU. Four years later, the children who had been exposed to DEHP had more problems with attention and motor coordination. The researchers found that the DEHP caused these problems regardless of medical complications or treatments (Verstraete S, 2016).

Scientific studies proved relations between certain phthalates and reproductive toxicity, asthma in children and also developmental disorders, such as the ADHD syndrome, characterized by attention deficit and hyperactivity.

A longitudinal study carried out in the USA proved impacts of phthalates on neurobehavioral development of children. The study of the Mount Sinai School of Medicine in New York, lasting nine years, showed higher incidence of aggression, emotional instability, attention deficits, and depressions. The researchers measured amounts of phthalates, and their metabolites, in urine of mothers in the third trimester (Marketa Møller, 2020). If higher amounts of phthalates were detected in their urine, their children showed behavioral disorders more often than in the case of mothers with low phthalate concentrations (Engel, 2009).

A further study, carried out by Swedish doctors, found that children exposed to higher phthalate concentrations, measured in dusts from their households, were more susceptible to allergies, eczema, and asthma (Válek, 2016). Phthalate impacts on liver, kidneys, and lungs, and on blood coagulation, cannot be neglected, too. Impacts of phthalates on human health have to be assessed individually, because they differ in the individual phthalates.





Research indicates that boys exposed to phthalates while in the womb may be more likely to develop smaller genitals and incomplete descent of the testicles (Main KM, 2010). Boys who are born with undescended testicles are 2-8 times more likely to develop testicular cancer later on than men born with both testicles descended. However, their risk is lessened if they get corrective surgery before age 13 (al., 2007). Studies by Harvard researchers have shown phthalates may alter human sperm DNA and semen quality (Duty, 2003).

Columbia University researchers discovered that three-year olds with high prenatal exposure to two types of phthalates were more likely to have motor delays. They also reported that three phthalates were linked to certain behavior problems in three-year olds, such as social withdrawal. One phthalate in the study was linked to lower mental development in girls (Whyatt RM, 2012).

Recommendation

- Taking initiatives to create public awareness about phthalates and its presence in everyday products.
- Product label should specify about its details on phthalates content
- Prevent the exposure of phthalates, particularly in children
- Specific regulation should be imposed on restricting phthalates content in products, particularly in children's stationaries like erasers which they use daily
- Market monitoring should be done for effectively limiting or eliminating phthalates
- More research should be executed for better understanding the effects of phthalates
- Impose immediate restriction to import phthalates contain eraser & local production



Conclusion

Phthalates are chemical plasticizers that have been widely used since the 1950s to soften plastics that would otherwise be brittle and crack when bent. Because phthalates are not chemically bound to the plastics they're added to, they're continuously released into the air or food or liquid. Phthalates are found in an amazing array of products. In personal care items, they're used to help lubricate other substances, help lotions penetrate and soften the skin, and help fragrances last longer. They're also used in toys, electronics (such as personal computers), car-care products, insecticides, and many household products, including adhesives, plastic wrap, plastic containers, flooring, furniture, wallpaper, shower curtains, and other things made of vinyl or PVC.

Phthalates are endocrine disruptors and their exposure should be limited until proper regulation is imposed to limit their use. Parents need to limit the amount of baby care products you use on baby, especially if he's 8 months or younger.

Products that are phthalate-free labeled needs to be chosen to avoid the exposure. Unfortunately, it's not always easy to tell from the list of ingredients. Manufacturers aren't required to list phthalates separately, so they may be included under the term "fragrance". As phthalates are added to containers to make them more flexible and durable, and because the chemical can leach from the container into the product, it is also required to determine whether the product's container is phthalate-free.

People should use glass and stainless steel instead of plastic (for water bottles, storage containers, and baby bottles, for example) to avoid phthalates. It is also to be noted that we shouldn't microwave food in plastic, and should not put plastic containers in the dishwasher. High temperatures cause the chemicals to leach out of the plastics.

As per several research, phthalates were linked to delayed motor skill in children, impacting girls' hormones, obesity in kids, developmental deficits, reproductive toxicity, asthma, developmental disorders like ADHD syndromes, impacting neurobehavioral development of children, allergies, eczema etc, its use should be restricted in erasers and other children stationaries. Government of Bangladesh should come forward and impose restriction on phthalates.

European governments have restricted the use of phthalates in some baby products, cosmetics, and plastics designed to come into contact with food. The U.S. Consumer Product Safety Commission (CPSC) has reviewed the same evidence viewed by the EU but felt it was incomplete and left the decision up to manufacturers, many of whom voluntarily removed phthalates from items typically mouthed by babies such as teething rings, pacifiers, nipples, and some toys. Bangladesh should also impose a proper legislation for restricting the use of consumer and baby products and stationeries in particular for creating a better environment for their development.



References

Jaakkola JJ Knight TL The Role of exposure to phthalates from polyvinyl chloride products in the development of asthma and allergies: a systematic review and meta-analysis. [Journal]. - [s.l.] : Environ Health Perspect, 2008.

al. Pettersson A et Age at surgery for undescended testis and risk of testicular cancer. [Report]. - [s.l.] : New England Journal of Medicine , 2007.

Boas M Frederiksen H, Feldt-Rasmussen U, Skakkebaek NE, Hegedus L, Hilsted L, et al. Childhood exposure to phthalates: associations with thyroid function, insulin-like growth factor I, and growth. [Journal]. - [s.l.] : Environmental Health Perspectives, 2010.

Duty S. M., M. J. Silva, et al., Phthalate exposure and human semen parameters. [Report]. - [s.l.] : Epidemiology , 2003.

Engel S., A. Miodovnik, R. Canfield, C. Zhu, A. Calafat, M. J. Silva and M. Wolff Prenatal Exposure to Low Molecular Weight Phthalates and Childhood Behavior and Executive Functioning. [Conference] // Epidemiology 20. - Dublin, Ireland : ISEE , 2009.

Greenfacts Phthalates in school [Report]. - [s.l.] : DG Health and Consumers of the European Commission, 2009.

John D. Meeker Sheela Sathyanarayana and Shanna H. Swan Phthalates and other additives in plastics: human exposure and associated health outcomes [Journal]. - [s.l.] : Philos Trans R Soc Lond B Biol Sci. , 2009.

Lee Gretchen Phthalates: What you need to know [Report]. - [s.l.] : BabyCenter.

Main KM Skakkebaek NE, Virtanen HE, Toppari J Genital anomalies in boys and the environment [Report]. - [s.l.] : Best Pract Res Clin Endocrinol Metab., 2010.

Marketa Møller Miroslava Jopková, Karolina Brabcova, Mgr Jiří Kristian Phthalates in Children's Environment - Case Studies 2007 - 2016 [Report]. - [s.l.] : Arnika - Toxics and Waste Programme, 2020.

Miles Karen Phthalates in baby shampoos, baby lotions, and baby powder [Report]. - [s.l.] : Babycenter.

Peijnenburg W.J.G.M. Phthalates [Journal]. - [s.l.] : Encyclopedia of Ecology, 2008.

Teitelbaum SL Mervish N, L Moshier E, Vangeepuram N, Galvez MP, Calafat AM, Silva MJ, L Brenner B, Wolff MS. Associations between phthalate metabolite urinary concentrations and body size measures

in New York City children. [Journal]. - [s.l.] : Environmental Research, 2012.

Válek P. Těžké kovy a ftaláty ve výrobcích pro děti – mezery v legislativě [Report]. - [s.l.] : Arnika - Toxics and Waste Programme, 2016.

Verstraete S Vanhorebeek I, Covaci A, Güiza F, Malarvannan G, Jorens PG, Van den Berghe G. Circulating phthalates during critical illness in children are associated with long-term attention deficit: a study of a development and a validation cohort. [Journal]. - [s.l.] : Intensive Care Med , 2016. - Vol. 42.

Whyatt RM Liu X, Rauh, VA, Calafat AM, Just AC, Hoepner L, Diaz D, et al. Maternal prenatal urinary phthalate metabolite concentrations and child mental, psychomotor and behavioral development at age three years [Report]. - [s.l.] : Environmental Health Perspectives, 2012.

Zanolli Lauren Phthalates: why you need to know about the chemicals in cosmetics [Report]. - [s.l.] : The Guardian, 2019.



Environment & Social Development Organization – ESDO

House # 8/1, Level # 5, Block # C, Lalmatia,

Dhaka-1207, Bangladesh

Website: <http://esdo.org/>