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International SAICM Implementation Project (ISIP)

In 2010, in an effort to demonstrate SAICM implementation via IPEN Participating Organizations, IPEN launched an International SAICM Implementation Project, also known as ISIP. ISIP aims to mobilize resources for initial enabling activities pertaining to national priorities, in keeping with the work areas set out in the strategic objectives of section IV of the SAICM Overarching Policy Strategy.

In particular, the ISIP supports the Governance objective of SAICM's Overarching Policy Strategy paragraph 26, which calls for enhanced "cooperation on the sound management of chemicals between Governments, the private sector and civil society at the national, regional and global levels."

In addition, ISIP builds on the 2008-2009 Global SAICM Outreach Campaign to raise awareness about SAICM and strengthen collaboration among the public interest, health and labor sectors.

ISIP Objectives

ISIP's four objectives include:
• Promoting the need for sound chemicals management
• Advancing National SAICM Implementation
• Promoting global SAICM implementation by global civil society
• Building capacity among NGOs developing countries and countries with economies in transition

Title of activity: Heavy metals assessment of some plastic toys in Bizerte (Tunisia)
NGO: Association pour la Protection de l'Environnement et Developpement Durable de Bizerte (APEDDUB)
Country: Tunisia
Date: October, 2012

Elements of SAICM Covered:

Participation in the collection, review, and assessment of existing information on information systems pertaining to chemicals in products including but not limited to regulations, standards and industry practices; Develop specific recommendations for actions to promote implementation of the Strategic Approach with regard to such information, incorporating identified priorities and access and delivery mechanisms; and follow up activities for the SAICM OEWG and ICMM3; Promote the use of safe and effective alternatives, including non-chemical alternatives to organic chemicals that are highly toxic, persistent and bioaccumulative; Promote the development and use of products and processes that pose lesser risks; Articles and products containing hazardous substances should all be accompanied by relevant information

for users, workplaces and at disposal sites; Promote provision of information for all chemicals in commerce, including appropriate information detailing their inherent hazards should be made available to the public at no charge and generated where needed with essential health, safety and environmental information made available (ICCM2 decision II/4, GPA items 54, 44, 108,111)

Description of the specific product(s) and chemical(s) related to the activity:
The toy samples were done in the north of Bizerte (Techga, Mateur, and Bizerte). Comparison of the study was between Techga, a rural area, and Mateur and Bizerte, considered as urban areas. This was a preliminary test for evaluation of heavy metals in toys in Bizerte (Tunisia). All toy samples are used in a children's school (1 Techga, 1 Mateur, 1Bizerte, 1 free market of Bizerte) and were tested for total content of heavy metals (lead : Pb and cadmium: Cd). A total of 24 samples were analyzed for lead and cadmium.

Description of the toxic effects of the chemicals contained in the product(s):
It is well known that metals such as Lead and Cadmium are toxic, especially to young children; however, toys as well as other consumer products still contain these metals. Toys are an integral part of children's developmental processes. Besides providing entertainment to children, toys also serve as educational materials for them. A toy may mean different things to children of different age groups and hence exposure pathways also differ accordingly. A child below 3 years of age may handle a toy in a completely different manner from a child 3 – 6 years of age. Chemical exposure to children, especially from toys, is an emerging concern. Metals in materials and paints are loosely bound to the surface and can leach easily. Lead poisoning from toys causes learning disabilities and kidney reactions, and proceeds rapidly to completely loose strength (causing damage to manufacturing equipment as well). Lead or Cadmium is hence added to Polyvinyl Chloride (PVC) as stabilizers, to prevent the free chlorine radicals from reacting with hydrogen radicals to form HCl. Lead compounds are the most common stabilizers in PVC. Some of them are: Basic lead carbonate, lead stearate, basic lead stearate, tribasic lead stearate, basic (dibasic) lead stearate, and basic lead phthalate. Other metals have also been used when lead came under regulatory scrutiny, including Cd, Zn, etc. Lead and Cadmium are also added into PVC or other plastic products as colouring agents in the form of organo-metallic compounds. What is noteworthy here is that, unlike popular perceptions, metal stabilizers are not bound to the polymer, but freely available to leach out over time or in response to light, chewing, etc. So toys made up of PVC when chewed or sucked by children put them at a risk of severe exposure to lead and cadmium. Although numerous investigations have been carried out on health impacts of lead and other heavy metals on humans, little has been done to ascertain their source in children's environments. Toys that are intimately linked to children's environments have not really been investigated as one of the sources of lead, cadmium failure, anemia and irreversible brain damage in children (WorldNet Daily, 2009). The chewing, licking and swallowing behavior of children is a common source of lead and cadmium exposure (Kelly et al., 1993). Children and pregnant women are particularly susceptible to lead poisoning. The digestive system of children absorbs up to 50% of the lead they ingest. In fact, physicians and scientists agree that no level of lead in blood is safe or normal (National Referral centre, 2009). Toys that are made of PVC are potential sources of risks to children. Polyvinyl Chloride, a leading chlorine-containing plastic, is a polymer or a large chain-like molecule, made up of repeating units of Vinyl Chloride (a monomer), and commonly referred to as Vinyl or PVC. It is one of the most commonly used materials in the consumer marketplace. It is used in packaging, construction and automotive material, all categories of products, including toys, and medical equipment. PVC has a special problem of auto- digestion, as free chlorine radicals in the structure react with free hydrogen radicals forming HCl (hydrochloric acid) leading to the digestion of PVC, which causes a chain and other heavy metals. The absence of any known study on heavy metals in toys in Bizerte (Tunisia), coupled with the fact that these materials dominate the children's environments, propelled the need for this study. This study was designed to ascertain the levels of lead and cadmium in soft plastic toys.

Description of how consumers are exposed to these toxic chemicals:

The chewing, licking and swallowing behavior of children is a common source of lead and cadmium exposure (Kelly et al., 1993). Children and pregnant women are particularly susceptible to lead poisoning. The digestive system of children absorbs up to 50% of the lead they ingest. In fact, physicians and scientists agree that no level of lead in blood is safe or normal (National Referral centre, 2009). Metals in materials and paints are loosely bound to the surface and can leach easily. So toys made up of PVC, when chewed or sucked by children, put them at a risk of severe exposure to lead and cadmium. Although numerous investigations have been carried out on health impacts of lead and other heavy metals on humans, little has been done to ascertain their source in children's environments.

Description of how the product waste that contains the hazardous chemical(s) is handled:

In Bizerte, no effective strategy was done to manage the waste generated by the toys and hazardous chemicals. APEDDUB will develop a local network to develop an innovative concept for handling hazardous chemical generated by toys.

Description of what information (or level of information) is available to consumers about the toxic chemicals in the product:

No information is available regarding toxic elements in toys. A lot of effort must be made to inform educators and the general population in Bizerte.

Description of what types of similar products are available on the market, including safer alternatives:

No real safer alternatives exist in Bizerte. Wooden toys without paint could participate in the reduction of toxic elements, but other chemical compounds continue to exist in these toys.

Project Outcomes:

Description of the activity conducted:

The present project is divided into two parts: Firstly i) to inform educators and the population about the chemical exposures to children, especially from toys, and secondly ii) to study heavy metals in some plastic toys in Bizerte (Tunisia).

i) A workshop related to the theme of the project was held in 02nd of July 2012 in Montazah El Rif (Bizerte). Three conferences explained the health risks of heavy metals presented by Mr K.Z Guellouz, Dr N. Bourawi, and Pr H. Abdelmelek. Following the conferences, a long discussion between the experts and the audience pointed to the preparation of a notice in order to summarize the mean recommendation of the seminar.

Additionally, an "Informative day" was held in a Kindergarten by Mr K.Z Guellouz:
Toy samples were gathered by Mr H. Abdelmelek. The visit aimed to inform educators and children about the chemical toxicity of heavy metals in some plastic toys.

ii) The study of heavy metals in some plastic toys in Bizerte was done between May- july 2012.
The toy samples were done in the north of Bizerte (Techga, Mateur, and Bizerte). Comparison of the study was between Techga, a rural area, and Mateur and Bizerte, considered as urban areas. This was a first, preliminary test evaluating toys for heavy metals content in Bizerte (Tunisia). All toy samples are used in children's school (Techga (n=6), Mateur (n=6), Bizerte (n=6), free market of Bizerte (n=6)) and were tested for total content of heavy metals. A total of 24 samples were analyzed for lead and cadmium. Atomic Absorption Spectroscopy (AAS) is very suitable for the detection of traces of heavy metal in plastics. The method is easy and the results show good precision and accuracy. With AAS only dissolved substances can be analyzed, therefore, the sample must first be ground and then digested.

After the mechanical preparation of the toys, the next step is microwave digestion, before the sample is finally analyzed in liquid form. The objective is the complete digestion of the sample with the digestion solution containing all elements and compounds which are of interest in an unaltered quantity. Inorganic substances should be transformed completely into soluble components. The ground parts of the toys (approx. 500 mg) are weighed in the digestion container and 20 ml nitric acid are added. The temperature development of all samples is continually measured and adapted to the specified digestion profile, depending on the reaction development. The samples are digested and can be filled to the nominal volume for the subsequent analysis in the Atomic Absorption Spectrometer.

See results of toy testing in Annex 1.

Conclusion
The present study reveals that both PVC and non-PVC toys contain heavy metals in varying concentration. However, the levels of these metals in PVC toys are generally higher that non-PVC toys. This confirms that the use of PVC plastic in making toys contributes toxic metals to the toys. The toy samples show high concentration of lead and cadmium in Bizerte market and sometime in rural educative centers; this poses a threat to children exposed to such toys. Therefore, with all toys samples containing these heavy metals in varying concentration and some even showing high concentration, our results show that local and Chinese toys are potential source risk to children's health. Toys in Bizerte imported from EU and Gulf have few concentrations.

Impact on target groups:

The informative day was a great success. The participants in this conference were about 100 (educators, inspectors, directors, experts). Many of the participants explained for us that they were hearing for the first time about the health risk of heavy metals in toys. Results of the project will be communicated to the educational institutions of Techga, Mateur, and Bizerte.

Impact on target policies:

Following the seminar, all the directors, inspectors, and experts were motivated to share their knowledge related to the toxic effects of heavy metals in children and to communicate an abstract of the seminar to regional institutions implicated in children's education. In addition, the General Director in the Ministry of Children and Family present in the conference encouraged the members of the project and APEDDUB and agreed with the final recommendation of the workshop. However, no specific policies were targeted with this project.

Outreach to stakeholders:

Six institutions were directly implicated in the project:
1- Ministry of Environment
2-Ministry of Children and Family
3-Ministry of Health
4- Ministry of High Education and Research
5-Ministry of Industry – APII
6- NGO
All the participants were motivated to participate in the preparation of a final report related to toxic elements in toys and to discuss alternatives.

Deliverables, outputs and/or products:

1- Report related to the workshop 02nd July 2012
2- Report related to the study of heavy metals in toys
3- Abstract for all the regional institutions and ministries implicated in the project.

Communication efforts:

1- Oxygene FM

2- Please find enclosed to the present report some photo for the workshop and the experimental investigation.

SAICM National Focal Point:

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NGO Recommendations for next steps:

1- Annual conference with the actors in children's education
2- Promotion of alternatives in the field of toys manufacturing
3-Annual evaluation of heavy metal contamination (Toys, clothes...etc)
4-Publication of annual report

Annex 1: Results of Toy Testing

The results of heavy metal concentration in toy samples harvested in Governorate of Bizerte are presented in Table 1, 2, & 3. The origin of toys is divided in three groups; local, EU, Gulf. All the toy samples analyzed were found to contain cadmium and lead in varying concentrations. Cadmium was detected in all the toy samples. Both PVC and non-PVC toys contain heavy metals but the concentration of these metals in non-PVC toys is generally lower than that of PVC toys. This may be due to absence of salts of these metals in the polymer material as stabilizer but they are present as impurities. Lead and Cadmium are generally of higher concentration in "wood toys with local paint" and "baby" than other samples. These toy samples have an outer coating of paint which might have led to increase the concentration levels of these metals in them. This indicates a significant influence of the quality of paint and the origin of the paint products. It also suggests the possibility of the metals coming from the same source, especially PVC and/or paint. The correlation between Pb and Cd in the toy samples was obvious and it can then be argued that Pb and Cd were used as stabilizers in toys. For instance, concentration of lead in wood toys is significantly different from that of the other samples. In the present study, the maximum concentration of cadmium was determined in Bizerte Market 650.01 µgg-1 and the minimum at Bizerte Educative Center 2.96 µgg-1. Moreover, the maximum concentration of lead was determined in Bizerte Market 642.86 µgg-1 and the minimum at Bizerte Educative Center 2.08 µgg-1. There is no significant difference between levels of lead and cadmium in products coming from China. Abhay and Prashant (2007) determined the concentration of lead and cadmium in samples collected from three cities in India. The average results obtained are 27.8, 20.67 and 278.73 µgg-1 for lead and 26.53, 3.10 and 2.61 µgg-1 for cadmium in Delhi, Chennai and Mumbai respectively. The results are comparable to that obtained in this study. Joseph (1996) reported a Greenpeace study on lead and cadmium in children's vinyl products. The study expanded to include 10 major U.S. cities and all the vinyl products tested were found to have lead and cadmium in varying concentrations. Regulations exist which provides limits in materials for which surface contact with children can result in possible ingestion. Analysis of toys and other items of interest for heavy metal content is necessary to validate their manufacture, distribution and sale. The European standard for safety of toys, EN 71, part 3, which is adopted into ISO 8124-3, contains one section entitled "Migration of certain elements". In this section, it defines the limits of elements migration from toy materials. Only 2 (Ring a bell and Squeaky baby) out of 12 (17%) samples analyzed in this study exceeded the limit set for Lead (90 µgg-1). Only one sample (Squeaky baby) exceeded the limit for Cadmium (75 µgg- 1). It was observed that 2 samples (Ring a bell and Squeaky baby) are very toxic and this indicates that it is possible that other similar products are still in the toy market. Such high quantities of heavy metals in toys pose a threat to children's health. It must be noted that exposure from lead is in addition to that of other toxic metals. Hence, children playing with toys having these metals are exposed to health risk. Concentration of lead in toys and other products marketed to children under the age of 12 was limited to 300 µgg-1 (CPSC, 2009). The maximum limit for lead in vinyl formally recommended by the Consumer Product Safety Commission for vinyl mini-blinds is (200 ppm) (CPSC, 1996).

Table 1 – Toys gathered from educational centers between June and July from Bizerte governorate (Tunisia).

Samples	Techga	Mateur	Bizerte	Bizerte market	Observations
S1	Wood toy Tunisia	Car China	Baby EU	Bird China	S1 techga quality of paint

S2	Baby China	Toad China	Plane Emirates Gulf	Cup for baby China	-
S3	Bird ND	Bottle Tunisia	Horse EU	Car ND	-
S4	Car China	Dice China	Car UE	Baby bottle China	-
S5	Baby China	Wood toy Tunisia	Wood letters Tunisia	Wood cow Tunisia	S5 Mateur Quality of paint
S6	Horse EU	Plane China	Train EU	Plane China	-

ND: Not determined

Table 2 – Cadmium concentration in toys from educative centers of Bizerte Governorate (mg/g)

Samples	Techga	Mateur	Bizerte	Bizerte market
S1	255,84 ± 6,33	266,38 ±3,44	16,20 ±0,88	115,71 ± 18,08
S2	25,23 ±0,28	123,18 ±2,33	23,44 ±0,17	387,29 ±42,66
S3	36,00 ±0,21	55,32 ±1,47	5,61 ±0,87	420,03 ± 45,24
S4	65,80 ±0,15	25,95 ±1,22	2,96 ±0,07	266,87 ± 15,08
S5	65,00 ±0,47	35,90 ±0,26	12,56 ±0,12	650,01 ± 56,84
S6	5,71 ±0,47	15,44 ±0,80	12,76 ±0,38	180,32 ± 8,66

Table 3 – Lead concentration in toys from educative centers of Bizerte Governorate (mg/g)

Samples	Techga	Mateur	Bizerte	Bizerte market
S1	24,32 ± 4,11	184,09 ±17,05	5,06 ±0,08	234,08 ± 24,10
S2	6,12 ±0,86	246,10 ±28,43	6,40 ±0,22	642,86 ±34,17
S3	28,06 ±1,32	48,93 ± 6,34	2,08 ±0,05	189,08 ± 60,10
S4	230,78 ± 32,10	42,26 ±8,40	1,88 ±0,12	340,00 ± 45,14
S5	87,94 ± 19,86	28,04 ±4,06	2,60 ±0,02	464,89 ± 74,16
S6	5,71 ±0,47	15,44 ±0,80	12,76 ±0,38	180,32 ± 8,66

Annex 2: References

Budtz-Jørgensen E, Bellinger D, Lanphear B, Grandjean P An International Pooled Analysis for Obtaining a Benchmark Dose for Environmental**Lead** Exposure in **Children**. ; on behalf of the International Pooled **Lead** Study Investigators. Risk Anal. 2012 Aug 24.

Järup, L, M. Berglund, C.G. Elinder, G. Nordberg, M. Vahter, Health effects of cadmium exposure: a review of the literature and a risk estimate, Scand. J. Work Environ. Health 24 (1998) 1–51.

International Agency for Research on Cancer, Beryllium, cadmium, mercury, and exposures in the glass manufacturing industry, in: International Agency for Research on Cancer Monographs on the Evaluation of Carcinogenic Risks Humans, vol. 58, IARC Scientific Publications, Lyon, France, 1993, pp. 119–237.

Annex 3: Photos

Mr. Guellouz shares information about chemical toxicity with educators.

Mr. Guellouz explains chemical toxicity to children.

Conference on 2nd July related to heavy metal toxicity in toys held in Montazah Rif (Bizerte-Tunisia):

The General Director (right) and the regional Director (left Mr MN Mansouri) of the Ministry of Family at the first conference.


Dr. Najwa Bourawi, APEDDUB, at the second conference.

Third conference of Pr H. Abdelmelek at Carthage University.

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