

Phthalates in products that children are in direct contact with

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Preface

The project called "Phthalates in products that children are in direct contact with" was carried out from April 2010 till June 2010.

This report describes the project results, including a survey and chemical analyses of a number of selected products.

As a starting point, a survey was carried out on number of consumer products on the Danish market that might contain phthalates. Subsequently, quantitative analyses and migration analyses were carried out on a number of selected products.

The project was carried out by Danish Technological Institute with Kathe Tønning (MA) as project manager and Nils Nilsson (PhD), Eva Jacobsen (MSc) and Eva Pedersen (laboratory technician) as project co-workers.

The project was followed by a reference group consisting of the following persons:

- Shima Dobel, the Danish Environmental Protection Agency
- Maria Mostrup Scheel, the Danish Environmental Protection Agency
- Kathe Tønning, Danish Technological Institute
- Nils Nilsson, Danish Technological Institute
- Eva Pedersen, Danish Technological Institute.

The project was financed by the Danish Environmental Protection Agency.

Summary and conclusions

Since 2001, a wide range of projects have been carried out with the objective to estimate risks when using a number of different product groups. In 2008/2009, a project concerning the total exposure of 2-year-olds to chemical substances was carried out. The project demonstrated that the exposure of children to phthalates can form a risk when the entire exposure from foodstuffs, indoor climate and consumer products is considered.

It is on that basis, the project concerning phthalates in products that children are in direct contact with was initiated. The objective of the project is to illustrate the liberation of phthalates from products that children are in direct contact with.

The survey of products that children are in direct contact with and that might be expected to contain phthalates appears in chapter 2.

Only products that are not toys or baby articles were selected. Solely products that are not covered by regulations for toys or baby products were in question.

In the project, focus was on the four phthalates DEHP, BBP, DBP and DIBP that are classified as toxic for the reproduction.

The following product groups are comprised by the survey:

- bags
- swimming equipment (that are not toys)
- swimming pools (that are not toys)
- textiles (where children can have direct contact with the part that contains phthalates)
- oilcloth and dinner mats
- shower curtains that appeal to children
- balance balls.

This project focused on products for 2-year-olds and for 6/7-year-olds.

Besides identifying products within the above product categories, products for further analysis were selected and purchased. 72 products were selected and purchased for chemical analysis.

The products are distributed on 10 bags, 12 types of swimming equipment, 8 swimming pools, 10 textiles (T-shirts with print), 12 oilcloths and dinner mats, 10 shower curtains that appeal to children and 10 balance balls.

The 72 selected products from the survey were analysed quantitatively for four selected phthalates DIBP, DBP, BBP and DEHP. A sample amount of the products was extracted with dichloromethane and analysed by means of gas chromatography with mass spectrometric detection (GC-MS).

High concentrations of DEHP and DIBP were detected in a number of products. In the following table the products with a positive content larger than 1 % (m/m) are stated as well as the concentration interval.

Outline of products with a content of phthalates larger than 1%, (m/m)

Product group	Number	Number of products analysed	Types	DIBP %	DEHP %
Bags	4	10	Sponge bags and rucksacks		2-20
Swimming equipment	1	12	Water wings		33
Swimming pools	1	8	Swimming pools		26
Oilcloth and dinner mats	4	12	Oilcloth		13-25
Shower curtains	5	10	Shower curtain		23-30
Balance balls	4	10	Balance balls	11-35	44

BBP was not detected in the analysed products and DBP was only detected in concentrations less than 0.1%. 10 T-shirts were analysed and all detected phthalates were in concentrations less than 0.05%. A high content of DINP and isophthalate was detected in a wide range of products that were not quantified in this project.

In the light of the quantitative analysis results, 10 products were selected for 18 migration analyses with artificial sweat and saliva to simulate the exposure of skin and mouth contact of a child with the products.

The migration analyses detected the migration of DEHP in concentrations less than 0.0005% in the products, while the migration of DIBP was detected in a concentration of 0.02% in one product.

Less migration was observed to artificial saliva compared to artificial sweat.

Sammenfatning og konklusioner

Siden 2001 er der gennemført en lang række projekter med det formål at vurdere risici ved brug af en række forskellige produktgrupper. I 2008/2009 blev der gennemført et projekt om 2-åriges samlede udsættelse for kemiske stoffer. Dette projekt viste, at børns udsættelse for ftalater kan udgøre en risiko, når der ses på den samlede udsættelse for både fødevarer, indeklime og forbrugerprodukter.

På denne baggrund er projektet om ftalater i produkter, som børn har direkte kontakt med, igangsat. Projektets formål er at få belyst afgivelsen af ftalater fra produkter, som børn har direkte kontakt med.

Af kapitel 2 fremgår kortlægningen af produkter, som børn har direkte kontakt med, og som må forventes at indeholde ftalater.

Der er kun medtaget produkter, der ikke er legetøj, og som ikke er småbørnsartikler. Der er altså alene tale om produkter, der ikke er omfattet af regler der gælder for legetøjs- og småbørnsartikler.

Der er i projektet fokus på de fire ftalater DEHP, BBP, DBP og DIBP, der alle er klassificeret som reproduktionstoksiske.

Følgende produktgrupper er omfattet af kortlægningen:

- tasker
- svømmeudstyr (som ikke er legetøj)
- badebassiner (som ikke er legetøj)
- tekstiler (hvor børn kan have kontakt med den del, der indeholder ftalater)
- voksdug og dækkeservietter
- børneappellerende badeforhæng
- pilatesbolde.

Der er i projektet fokuseret på produkter til 2-årige børn og til børn i alderen 6-7 år.

Ud over at identificere produkter inden for ovenstående produktkategorier er produkter til videre analyse udvalgt og indkøbt. Der er udvalgt og indkøbt 72 produkter til kemisk analyse.

Produkterne fordeler sig på 10 tasker, 12 stk. svømmeudstyr, otte badebassiner, 10 stk. tekstiler (T-shirts med tryk), 12 voksdug og dækkeservietter, 10 børneappellerende badeforhæng og 10 pilatesbolde.

De udvalgte 72 produkter fra kortlægningen er analyseret kvantitativt for fire udvalgte ftalater DIBP, DBP, BBP og DEHP. En delprøve af produkterne er ekstraheret med dichlormethan og analyseret ved gaschromatografisk massespektrometri (GC-MS).

Der er påvist høje koncentrationer af DEHP og DIBP i en række produkter. I **Fejl! Henvisningskilde ikke fundet.** er antal produkter med positive indhold større end 1 %(m/m) angivet samt koncentrationsinterval.

Tabel 0.1 Oversigt over produkter med indhold af ftalater større end 1 %, (m/m)

Produktgruppe	Antal	Antal produkter analyseret	Typer	DIBP %	DEHP %
Tasker	4	10	Toilettasker og rygsæk		2-20
Svømmeudstyr	1	12	Svømmevinger		33
Badebassin	1	8	Badebassin		26
Voksdug og dækkeservietter	4	12	Voksdug		13-25
Badeforhæng	5	10	Badeforhæng		23-30
Pilatesbolde	4	10	Pilatesbolde	11-35	44

Der er ikke påvist BBP i de analyserede produkter, og DBP er kun påvist i koncentrationer mindre end 0,1 %. Der er analyseret 10 T-shirts, hvor alle de påviste ftalater var i koncentrationer mindre end 0,05 %. I en lang række produkter er der påvist høje indhold af DINP og isoftalat, som ikke er kvantificeret i dette projekt.

Ud fra de kvantitative analyseresultater er der udvalgt 10 produkter til 18 migrationsanalyser med kunstig sved og kunstigt spyt for at simulere eksponeringen af et barns hud- og mundkontakt med produkterne.

Der er ved migrationsanalyserne påvist migration af DEHP i koncentrationer mindre end 0,0005 % i produkterne, mens der er påvist migration af DIBP på 0,02 % i et produkt.

Der ses en mindre migration til kunstigt spyt sammenlignet med kunstigt sved.

1 Introduction

The project carried out by the Danish Environmental Protection Agency concerning the exposure of 2-year-olds to chemical substances demonstrated that the exposure of children to certain phthalates can form a risk when the entire exposure from foodstuffs, indoor climate and consumer products is considered.

That is why a number of consumer products available on the Danish market were investigated. Products that might contain phthalates and that children are in direct contact with were in question.

Only products that are not toys or baby articles were selected. Solely products that are not covered by regulations for toys or baby products were in question.

In the project, focus was on the four phthalates called DEHP, BBP, DBP and DIBP that are classified as toxic for the reproduction.

2 Survey

2.1 Objective of the survey

The objective of the survey was to identify a number of consumer products on the Danish market that children are expected to be in direct contact with.

The following product groups are in question:

- Bags
- Swimming equipment (that are not toys)
- Swimming pools (that are not toys)
- Textiles (where children can have direct contact with the part that contains phthalates)
- Oilcloth and dinner mats
- Shower curtains that appeal to children
- Balance balls.

Besides identifying products within the above product groups, the objective of the survey was to procure products for chemical analyses.

The survey only comprised products that are marketed in Denmark or sold on Danish internet pages.

In the following, the survey is described separately for each product group.

2.2 Delimitation

This project focused on products for 2-year-olds and for 6-7-year-olds.

The delimitation of each product group is described separately in the study of each product group.

2.3 Plastic bags

2.3.1 Delimitation

The product group called bags was limited to plastic bags for children. The product group comprised handbags, shoulder bags, sponge bags, rucksacks and trolleys. Plastic bags for consoles (such as Nintendo DS) were also included in the survey.

School bags and game bags did not form part of the survey. In addition, bags for laptops were not included in the survey as the age groups forming part of this project were not expected to be the target group of that type of bags. Likewise, bags for mobile phones were not included in the survey.

2.3.2 Procedure

The survey of plastic bags for children was carried out in April 2010 and the first part of May 2010.

Visits were paid to a number of retail shops in the Danish city of Aarhus and in the neighborhood. Mainly nation-wide shops were in question but local shops were also visited.

In addition, a wide range of internet shops dealing with plastic bags for children were visited.

2.3.3 Shop visits

Visits were paid to a wide range of shops, including:

- Handbag shops
- Department stores
- Sports shops
- Clothes shops and shops for children's wear
- Toy shops
- Shops with electronic games
- Radio and TV shops
- Interior design shops with clothes, shoe and handbag department
- Supermarkets
- Discount shops.

In addition, catalogues, advertising brochures etc. were examined.

2.3.4 Internet visits

Searching took place on Google with different search words and word combinations such as e.g. "plastic bags, plastic handbags and children, bags for gym clothes and vinyl/PVC" in order to find a number of internet shops that sell plastic bags.

2.3.5 Result of survey

In general, plastic bags were first and foremost registered in handbag shops, department stores, supermarkets and sports shops while the supply was more moderate in shops for children's wear, interior design shops and discount shops.

Bags for game consoles were mainly registered in radio and TV shops, toy shops and shops with electronic games.

2.3.6 Result of shop visits

There was a very large and varied supply of bags with many different product names/brands/trademarks and in most cases there were many different models within each brand.

A very large part of the registered bags were coated polyester bags or coated cotton bags.

Many of the bags specifically appeal to girls (handbags, bags with princesses etc.). However, rucksacks, trolleys, bags for gym clothes and sponge bags with a motif that appeals to boys or to both sexes (e.g. Winnie the Pooh) were registered.

2.3.7 Result of survey via internet pages

A very large supply of plastic handbags for children was registered on the internet shops.

A number of the visited internet shops also sell many of the brands that were registered in the physical shops.

2.3.8 Selected products

Table 2.1 shows the products that in cooperation with the Danish Environmental Protection Agency were selected for analysis of content of the four classified phthalates DEHP, BBP, DBP and DIBP.

10 plastic bags were selected, including:

- 2 handbags
- 2 shoulder bags
- 2 rucksacks
- 3 sponge bags
- 1 console bag.

No distinction was made between bags that mainly appeal to 2-year-olds or 6/7-year-olds, respectively.

A total of 10 plastic bags were purchased; 5 plastic bags from physical shops and 5 plastic bags from internet shops.

The selection of plastic bags in the physical shops took place by visual assessment of the material the bags were made of (softened PVC or the like).

The selection of plastic bags from internet shops was based on the information each internet shop had about the product. Bags were selected where the material was characterized as e.g. "transparent oilcloth", "raincoat material" or "fake skin".

Another criterion for the selection of products was a wish for inexpensive as well as more expensive products.

When selecting plastic bags it was in general considered whether popular/trendy and/or branded goods were in question.

The following plastic bags were purchased.

Table 2.1 Purchased products – Plastic bags

No.	Type	Brief description	Shop type
1-61	Shoulder bag	Red bag with Mickey Mouse figure on the front	Supermarket
1-62	Handbag	Red bag ("pouch bag")	Discount shop
163	Handbag	Blue handbag with kitten on the front	Clothes shop
1-64	Console bag	White bag with red strap	Toy shop
1-65	Sponge bag	Yellow bag with motif	Internet shop
1-66	Rucksack	Pink bag with motif	Internet shop
1-67	Sponge bag	Black bag with motif	Handbag shop

No.	Type	Brief description	Shop type
1-68	Shoulder bag	Red bag with motif	Internet shop
1-69	Rucksack	Red bag with motif	Internet shop
1-70	Sponge bag	Multi-patterned bag with transparent oilcloth	Internet shop

2.3.9 Product prices

During the survey, plastic bags were registered in a price range from €2.67 to €79.87.

2.4 Swimming equipment

2.4.1 Delimitation

The product group comprised products that are not toys.

To limit the concept of toys during the survey of this product group "Guide to swimming equipment and phthalates"¹ was used. During the survey of the product group, swimming goggles, flippers and snorkels were included in addition to life jackets, water wings and swimming belts.

2.4.2 Procedure

The survey of swimming equipment was carried out in April 2010 and the first part of May 2010. The supply of this type of products was rather limited in the physical shops during the period as the swimming season had not yet started. Although the product group is used all year round (during the winter months in indoor public swimming baths and during holidays when travelling south) several shops stated that the supply was largest during summer.

Visits were paid to a number of retail shops in the Danish city of Aarhus and the neighborhood. Mainly nation-wide shops were in question but local shops were also visited.

In addition, a wide range of internet shops dealing with swimming equipment for children were visited.

2.4.3 Shop visits

Visits were paid to a wide range of shops, including:

- Sports shops
- Department stores
- Toy shops
- Supermarkets
- Discount shops.

In addition, catalogues, advertising brochures etc. were examined.

2.4.4 Internet visits

Searching took place on Google with different search words and word combinations such as e.g.: "life jackets, water wings and swimming belts, swimming goggles, diving masks, flippers and snorkels". The search words

¹ The Danish Environmental Protection Agency

were also combined with the search word "children". Searching was carried out to find a number of internet shops that sell goods from this product group.

2.4.5 Result of survey

Life jackets, water wings and swimming belts and swimming goggles, flippers, diving masks and snorkels were mainly registered in sports shops, department stores and toy shops while the product group was not registered in supermarkets or discount shops.

During the survey, the objective was to avoid CE marked products² and products that according to the homepage³ of the "Informationscenter for Miljø & Sundhed" (Danish Information Centre for Environment and Health) are quoted to not contain phthalates or PVC were not included in the survey.

Life jackets, water wings and swimming belts are expected to be used by 2-year-olds as well as 6/7-year-olds whereas flippers, snorkels, swimming goggles and diving masks are to a less extent expected to be used by 2-year-olds, but by the age group 6/7-year-olds.

2.4.6 Result of shop visits

Although the product group – as mentioned above – can be used all year round (in public swimming baths and swimming pools) the supply was rather limited in the physical shops. Two of the registered product names were very dominating on the market and were registered in many of the shops that were visited.

The two above-mentioned criteria (products that are not CE marked and products that according to the homepage of "Miljø og Sundhed" are quoted to not contain phthalates and PVC) limited the number of products considerably. For instance, it was not possible in the physical shops to find life jackets or water wings that were not CE marked.

The main part of the products that were registered in the physical shops turned out to be CE marked. In most cases, the CE marking appeared on the packaging material, but in some cases the CE marking only appeared on the product itself and therefore it was not possible to register the CE marking before the packaging material had been removed.

2.4.7 Result of survey via internet pages

A large part of the product group was registered in internet shops. It did not appear on the homepage of the internet shops to which degree the products were CE marked or not, but when the internet shops were contacted it turned out – as in the case of the physical shops – that the main part of the products were CE marked.

² A wide range of product groups is covered by the CE marking regulations, including toys

³ <http://www.miljoeogsundhed.dk/default.aspx?node=6393>

2.4.8 Selected products

Table 2.2 shows the products that in cooperation with the Danish Environmental Protection Agency were selected for analysis for content of the four classified phthalates DEHP, BBP, DBP and DIBP.

The 10 products that initially were selected were distributed as follows:

- 2 life jackets
- 4 pairs of water wings
- 1 swimming belt
- 2 pairs of flippers
- 1 pair of swimming goggles.

As previously mentioned, some of the selected products turned out to be CE marked when contact was taken to the internet shops before purchasing or the products turned out to be CE marked when the packaging material was removed and therefore the distribution of the products for further analysis became as follows:

- 1 pair of water wings
- 1 swimming belt
- 3 pairs of flippers
- 2 snorkels
- 2 diving masks
- 3 pairs of swimming goggles.

Two extra products were purchased giving a total of 12 products for further analysis.

A total of nine products were purchased in physical shops and three products were purchased from internet shops.

The criteria for the selection of life jackets, water wings and swimming belts and swimming goggles, flippers and snorkels were (as mentioned above) to omit products that were CE marked and products that according to the homepage of "Miljø & Sundhed" were quoted to not contain phthalates or PVC.

Another criterion for the selection of products was a wish for inexpensive as well as more expensive products.

The main part of the products that were registered in the physical shops turned out to be CE marked and therefore they were not selected for further analysis.

The selection of products from internet shops was based on information about the products on the homepages of the respective internet shops and on information procured through telephone conversations or written contact to the internet shops.

The below water wings, swimming belts, flippers, snorkels, diving masks and swimming goggles were purchased.

Table 2.2 Purchased products – Swimming equipment.

No.	Type	Brief description	Remarks	Shop type
1-48	Swimming	Blue goggles		Sports shop

No.	Type	Brief description	Remarks	Shop type
	goggles			
1-49	Snorkel	Blue snorkel		Sports shop
1-50	Flippers	Blue and black flippers		Sports shop
1-53	Swimming goggles	Goggles with animal motif		Toy shop
1-54	Swimming belt	Yellow swimming belt with black strap		Sports shop
1-55	Diving mask	Red mask		Toy shop
1-56	Swimming goggles	Pink goggles with "glitter"		Toy shop
1-57	Snorkel	Snorkel with motif – part of set with snorkel, flippers and diving mask		Toy shop
1-72	Diving mask	Diving mask with motif – part of set with snorkel, flippers and diving mask		Toy shop
1-58	Flippers	Yellow flippers		Internet shop
1-73	Water wings	Red water wings	Marked with "NB! The water wings contain "Phthalates" and must therefore not be used by children under the age of 3".	Internet shop
1-71	Flippers	Green flippers with black strap		Internet shop

2.4.9 Product prices

During the survey, life jackets, water wings and swimming belts and swimming goggles, flippers, diving masks and snorkels were registered in a price range from €3.33 to €63.87.

2.5 Swimming pools

2.5.1 Delimitation

The product group comprised products that are not toys. In order to limit the concept of toys for this product group the "Guide to swimming equipment and phthalates" was used.

2.5.2 Procedure

The survey of swimming pools was carried out in April 2010 and the first part of May 2010.

Visits were paid to a number of retail shops in the Danish city of Aarhus and in the neighborhood. Mainly nation-wide shops were in question but local shops were also visited.

In addition, a wide range of internet shops dealing with swimming pools were visited.

2.5.3 Shop visits

Visits were paid to a wide range of shops, including:

- DIY centres
- Toy shops
- Department stores
- Discount shops with furniture and textiles
- Supermarkets.

In addition, catalogues, advertising brochures etc. were examined.

2.5.4 Internet visits

Searching took place on Google with different search words such as e.g. "swimming pool, pools, garden pools, and the search words were combined with vinyl and PVC", in order to find a number of internet shops that sell goods from this product group.

2.5.5 Result of survey

Swimming pools were almost solely registered in toy shops but the product group was also registered in DIY centres and in discount shops with furniture and textiles.

2.5.6 Result of shop visits

The survey of swimming pools was – as mentioned above – carried out in April and the first part of May when the supply of this type of product was very limited in the physical shops. Several shops informed that swimming pools tend to appear in the retail shops when the season for swimming pools starts.

One registered product name is very dominating on the market.

2.5.7 Result of survey via internet pages

A somewhat larger supply of swimming pools was registered in internet shops than in physical shops.

2.5.8 Selected products

Table 2.3 shows the products that in cooperation with the Danish Environmental Protection Agency were selected for analysis of content of the four classified phthalates DEHP, BBP, DBP and DIBP.

A total of 8 swimming pools were selected.

A total of seven products were purchased in physical shops and one product was purchased from an internet shop.

Only swimming pools that were not CE marked and that had a water depth of more than 40 cm⁴ were selected. Swimming pools with a water depth of up to 40 cm is considered as a toy.

Likewise, swimming pools that according to the homepage of "Miljø & Sundhed" were quoted to not contain phthalates or PVC were not selected.

⁴ Guide on swimming equipment and phthalates. The Danish Environmental Protection Agency

The selection of swimming pools from internet shops was based on the experience obtained when visiting physical shops and on the information about the products on the homepages of the respective internet shops.

The following swimming pools were purchased.

Table 2.3 Purchased products – Swimming pools

No.	Type	Brief description	Remarks	Shop type
1-16	Swimming pool	Hexagonal swimming pool with sea motif	Inflatable pool 191 x 178 x 61 cm	Toy shop
1-17	Swimming pool	Rectangular swimming pool with chairs	Inflatable pool 229 x 229 x 66 cm	Toy shop
1-18	Swimming pool	Round swimming pool	Inflatable pool Ø 366 x 76 cm	Toy shop
1-19	Swimming pool	Rectangular swimming pool	Inflatable pool 305 x 183 x 56 cm	Toy shop
1-20	Swimming pool	Rectangular swimming pool with seats	Inflatable pool 305 x 183 x 76 cm	Toy shop
1-35	Swimming pool	Round swimming pool	Ø 244 x 46 cm	Internet shop
1-36	Swimming pool	Round swimming pool	Inflatable pool Ø 360 x 76 cm	DIY centre
1-37	Swimming pool	Rectangular swimming pool	Inflatable pool 262 x 175 x 56 cm	Internet shop

2.5.9 Product prices

During the survey, swimming pools were registered in the price range from € 19.99 to €119.87. It should be noted that focus was on this price range out of consideration for the project economy.

2.6 Textiles

2.6.1 Delimitation

Textiles were limited to T-shirts with print.

2.6.2 Procedure

The survey of T-shirts was carried out in April 2010 and the first part of May 2010.

Visits were paid to a number of retail shops in the Danish city of Aarhus and in the neighbourhood. Mainly nation-wide shops were in question but local shops were also visited.

T-shirts with print were only registered in physical shops. It has not been possible from a photo on a homepage with certainty to determine if the T-shirts have a print with "textile print" – understood as a print where the dyes do not resemble paint – or if "paint-like print" is in question or "rubbery print, embroidered motif, stick on motif" or the like and therefore internet shops were not included in the survey.

2.6.3 Shop visits

Visits were paid to a wide range of shops, including:

- Clothes shops and shops for children's wear
- Department stores
- Supermarkets

- Sports shops
- Brand shops
- Toy shops
- Discount shops.

In addition, catalogues, advertising brochures etc. were examined.

2.6.4 Result of survey

T-shirts with print were mainly registered in shops for children's wear, department stores, sports shops, brand shops and supermarkets. T-shirts with print were not registered in toy shops or discount shops.

2.6.5 Result of shop visits

A very large supply of T-shirts with print was registered for the 2-year-olds as well as the 6/7-year-olds. Many of the registered T-shirts cover both age groups.

Most T-shirts with print are registered in shops with several trademarks/brands but T-shirts with print were also registered in brand shops.

Many trademarks/brands were common in several shops.

2.6.6 Selected products

Table 2.4 shows the products that in cooperation with the Danish Environmental Protection Agency were selected for analysis of content of the four classified phthalates DEHP, BBP, DBP and DIBP.

A total of 10 T-shirts with print were selected. As mentioned previously, all 10 products were purchased in physical shops.

Only T-shirts were selected with a plastic-like/rubbery print. During the selection, the advice from "Miljø & Sundhed" were not followed. That means, that T-shirts marked with "the swan or the flower" were not selected. Likewise, T-shirts with an embroidered motif or a motif printed with dyes that do not resemble paint were not selected.

In general, the specific T-shirts tested in the investigation of "Miljø & Sundhed" from February 2010⁵ or in the investigation from environmental management in Gothenburg from 2009⁶ were not selected. When selecting T-shirts with print it was in general considered whether popular/ trendy and/or branded goods were in question.

Another criterion for the selection of products was a wish for inexpensive as well as more expensive products.

The below T-shirts with print were purchased.

⁵ <http://www.miljoeogsundhed.dk/default.aspx?node=6675>

⁶ [http://www5.goteborg.se/prod/Miljo/Miljohandboken/dalis2.nsf/vyFilArkiv/N800_R2009_8.pdf/\\$file/N800_R2009_8.pdf](http://www5.goteborg.se/prod/Miljo/Miljohandboken/dalis2.nsf/vyFilArkiv/N800_R2009_8.pdf/$file/N800_R2009_8.pdf)

Table 2.4 Purchased products – T-shirts with print

No.	Type	Brief description	Shop type
1-40	T-shirt with short sleeves	Black T-shirt with small one colour motif	Sports shop
1-41	T-shirt with short sleeves	Turquoise T-shirt with rather large multi-coloured motif	Sports shop
1-42	T-shirt with short sleeves	Green T-shirt with rather large multi-coloured motif	Shop for children's wear
1-43	T-shirt with short sleeves	Red T-shirt with rather large one colour motif	Department store
1-44	T-shirt with short sleeves	Light blue T-shirt with rather large 2-coloured motif	Department store
1-45	T-shirt with short sleeves	Red T-shirt with large multi-coloured motif	Supermarket
1-46	T-shirt with short sleeves	Navy blue T-shirt with rather large one colour motif	Department store
1-47	T-shirt with short sleeves	White T-shirt with rather large multi-coloured motif and patterned sleeves	Department store
1-51	T-shirt with short sleeves	Green T-shirt with large multi-coloured motif	Department store
1-52	T-shirt with short sleeves	Orange T-shirt with large multi-coloured motif	Clothes shop

2.6.7 Product prices

During the survey, T-shirts were registered in the price range from €5.33 to €33.20.

2.7 Tablecloths and dinner mats

2.7.1 Delimitation

Tablecloths were limited to oilcloth. Oilcloth is a very popular product in families with children – especially in families with small children.

During the survey of the product group, dinner mats were also included to a limited degree.

2.7.2 Procedure

The survey of oilcloth was carried out in April 2010 and the first part of May 2010.

Visits were paid to a number of retail shops in the Danish city of Aarhus and in the neighborhood. Mainly nation-wide shops were in question but local shops were also visited.

In addition, a wide range of internet shops dealing with oilcloth were visited.

2.7.3 Shop visits

Visits were paid to a wide range of shops, including:

- Textile shops
- Department stores
- Supermarkets
- DIY centres
- Interior design shops
- Furniture shops

- Discount shops with furniture and textiles
- Hardware stores
- Discount shops.

In addition, catalogues, advertising brochures etc. were examined.

2.7.4 Internet visits

Searching took place on Google with different search words such as e.g. "oilcloth, oilcloth and PVC/vinyl" in order to find a number of internet shops that sell goods from this product group.

2.7.5 Result of survey

Oilcloth was registered in all of the visited physical shops except for discount shops where only dinner mats were registered.

2.7.6 Result of shop visits

The supply of oilcloth in the physical shops was very large. A number of different trademarks/brands were registered and so were many different types/materials.

Tablecloths were registered with descriptions such as acryl, acryl-coated, vinyl/PVC, phthalate free PVC, PVC-coated cotton, PVC-coated flax, plastic, EVA, PE.

As mentioned previously, dinner mats were only to a limited degree included in the survey. Dinner mats were registered in a large part of the physical shops. However, a substantial part of the registered dinner mats were of the same trademarks in the various shops. Only a few of the dinner mats that were registered were made of vinyl/PVC.

2.7.7 Result of survey via internet pages

A very large supply of oilcloth was registered in the internet shops.

In general, dinner mats were not searched for in internet shops. Dinner mats with motifs that appeal to children were searched for, but the registered dinner mats had no information about the material they were made of.

2.7.8 Selected products

Table 2.5 shows the products that in cooperation with the Danish Environmental Protection Agency were selected for analysis of content of the four classified phthalates DEHP, BBP, DBP and DIBP.

A total of 9 oilcloths and 3 dinner mats were selected.

All 12 products were purchased in physical shops.

The selected oilcloth was mainly the oilcloth that according to the staff in the visited shops was purchased by families with children.

Another criterion for the selection of products was a wish for inexpensive as well as more expensive products.

The below oilcloth and dinner mats were purchased.

Table 2.5 Purchased products – Oil cloth and dinner mats

No.	Type	Brief description	Shop type
1-5	Oilcloth	Red oilcloth with white dots	Textile shop
1-6	Oilcloth	Transparent oilcloth with white dots	Textile shop
1-7	Oilcloth	Purple oilcloth with white flower	Textile shop
1-8	Oilcloth	Blue oilcloth with child's motif	DIY centre
1-9	Oilcloth	Lime green oilcloth with white line pattern	Supermarket
1-10	Oilcloth	Striped (sand-coloured and white) oilcloth	Textile shop
1-11	Dinner mat	Orange weave patterned dinner mat	Hardware store
1-32	Oilcloth	Blue striped oilcloth	Discount shop with furniture and textiles
1-33	Oilcloth	Black oilcloth with flower motif	Discount shop with furniture and textiles
1-34	Oilcloth	White "lace" oilcloth	Supermarket
1-59	Dinner mat	Red and white striped dinner mat with motif	Discount shop
1-60	Dinner mat	Green dinner mat formed as a fruit	Discount shop

2.7.9 Product prices

During the survey, oilcloth was registered in the price range from €2.66 per metre to €39.33 per metre and dinner mats in the range from €1.33 each to €9.33 each.

2.8 Shower curtains that appeal to children

2.8.1 Delimitation

The product group is limited to shower curtains with motifs/patterns/colours that are expected to appeal to children.

2.8.2 Procedure

The survey of shower curtains that appeal to children was carried out in April 2010 and in the first part of May 2010.

Visits were paid to a number of retail shops in the Danish city of Aarhus and in the neighborhood. Mainly nation-wide shops were in question but local shops were also visited.

In addition, a wide range of internet shops dealing with shower curtains that appeal to children were visited.

2.8.3 Shop visits

Visits were paid to a wide range of shops, including:

- Shops with bathroom accessories
- DIY centres
- Department stores
- Supermarkets
- Interior design shops
- Interior shops
- Furniture shops
- Discount shops with furniture and textiles
- Retail chains with textiles
- Textile shops

- Hardware stores
- Discount shops.

In addition, catalogues, advertising brochures etc. were examined.

2.8.4 Internet visits

Searching took place on Google with different search words such as e.g. "shower curtain, shower curtain and PVC/vinyl, shower curtain and children, shower curtain and animals/animal motifs" in order to find a number of internet shops that sell goods from this product group.

2.8.5 Result of survey

Shower curtains were registered in all visited physical shops except from discount shops. However, shower curtains that appeal to children were mainly registered in DIY centres.

The main part of the shower curtains that were observed in connection with the registration were made of polyester. In addition to PVC/vinyl, some were made of PEVA and a few were made of cotton and microfibers.

2.8.6 Result of shop visits

The selection of shower curtains that appeal to children was very limited in the physical shops.

2.8.7 Result of survey via internet pages

A larger supply of shower curtains that appeal to children was registered in the visited internet shops than in the physical shops.

2.8.8 Selected products

Table 2.6 shows the products that in cooperation with the Danish Environmental Protection Agency were selected for analysis of content of the four classified phthalates DEHP, BBP, DBP and DIBP.

A total of 10 shower curtains that appeal to children were selected.

A total of five products were purchased from physical shops and five products were purchased from internet shops.

Only shower curtains that appeal to children and that are made of PVC/vinyl were selected.

Another criterion for the selection of products was a wish for inexpensive as well as more expensive products.

The following shower curtains that appeal to children were purchased:

Table 2.6 Purchased products – Shower curtains that appeal to children

No.	Type	Brief description	Shop type
1-1	Shower curtain	Transparent shower curtain with yellow ducks	DIY centre
1-2	Shower curtain	Transparent shower curtain with coloured fish	DIY centre
1-3	Shower curtain	White shower curtain with grey dolphins	DIY centre
1-12	Shower curtain	Transparent shower curtain with goldfish and stones	Department store
1-28	Shower curtain	Transparent shower curtain with coloured fish	Internet shop
1-29	Shower curtain	Black shower curtain with white skulls	Internet shop
1-30	Shower curtain	Transparent shower curtain with pockets	Internet shop
1-31	Shower curtain	Transparent shower curtain with animal motif	DIY centre
1-38	Shower curtain	White shower curtain with pink pigs	Internet shop
1-39	Shower curtain	3D shower curtain with fish	Internet shop

2.8.9 Product prices

During the survey, shower curtains that appeal to children were registered in the price range from 10.13 to €66.67.

2.9 Balance balls

2.9.1 Delimitation

In addition to balance balls, the survey to a limited degree also comprised small exercise balls.

2.9.2 Procedure

The survey of balance balls was carried out in April 2010 and the first part of May 2010.

Visits were paid to a number of retail shops in the Danish city of Aarhus and in the neighborhood. Mainly nation-wide shops were in question but local shops were also visited.

In addition, a wide range of internet shops dealing with balance balls were visited.

2.9.3 Shop visits

Visits were paid to a wide range of shops, including:

- Sports shops
- Department stores
- Supermarkets
- DIY centres
- Discount shops with furniture and textiles
- Discount shops.

In addition, catalogues, advertising brochures etc. were examined.

2.9.4 Internet visits

Searching took place on Google with different search words such as e.g. "balance balls, balance balls and PVC/vinyl, training equipment, fitness, exercise balls" in order to find internet shops that sell goods from this product group.

2.9.5 Result of survey

Balance balls were mainly registered in sports shops and department stores with a sports department.

2.9.6 Result of shop visits

Some trademarks recurred several times in most of the shops where balance balls were registered.

As mentioned above, balance balls were mainly registered in sports shops and department stores with a sports department.

2.9.7 Result of survey via internet pages

A very large supply of balance balls and small exercise balls were registered in the internet shops.

2.9.8 Selected products

Table 2.7 shows the products that in cooperation with the Danish Environmental Protection Agency were selected for analysis of content of the four classified phthalates DEHP, BBP, DBP and DIBP.

A total of 10 balance balls were selected.

A total of three products were purchased from physical shops and seven products were purchased in internet shops.

If the label or the description on the homepage of the individual internet shop informed that the balance ball or the gym ball was made of PVC, then the product was selected. However, in most cases there was no information about the material used.

Another criterion for the selection of products was a wish for inexpensive as well as more expensive products.

The following balance balls and other exercise balls were purchased:

Table 2.7 Purchased products – Balance balls and other exercise balls.

No.	Type	Brief description	Shop type
1-13	Balance ball	Balance ball – 55 cm in diameter. Silver-Metallic	Sports shop
1-14	Balance ball	Balance ball – 65 cm in diameter. Black	Sports shop
1-15	Balance ball	Balance ball – 70 cm in diameter. Blue	Sports shop
1-21	Balance ball	Massage ball with "rubber nubs" – app. 55 cm in diameter	Internet shop
1-22	Redondo ball	Gym ball - app. 22 cm in diameter. Blue	Internet shop
1-23	Mini ball	9 cm in diameter. Green	Internet shop
1-24	Training ball	Soft ball in foamed material – max. 25 cm in diameter	Internet shop
1-25	Redondo ball	Gym ball - app. 22 cm in diameter. Orange	Internet shop
1-26	Balance ball	Balance ball – 65 cm in diameter. Silver	Internet shop
1-27	Balance ball	Balance ball – 65 cm. Purple	Internet shop

2.9.9 Product prices

During the survey, balance balls and other exercise balls were registered in the price range from €7.50 to €46.67.

3 Chemical analyses

3.1 Objective of analyses

The chemical analyses illustrate to which extent a number of consumer products for children contain one or more of the four selected phthalates: DIBP, DBP, BBP and DEHP. In addition, the analyses will illustrate to which extent there is a risk of exposure during close contact.

The following product groups are in question:

- Handbags
- Swimming equipment
- Swimming pools
- Textiles
- Oilcloth and dinner mats
- Shower curtains that appeal to children
- Balance balls.

Focus was given to products for the age group 2-year-olds and 6/7-year-olds.

All the products selected for the survey were analysed quantitatively for the four phthalates DIBP, DBP, BBP or DEHP. In order to investigate the exposure when in close contact with the products, migration analyses with artificial sweat or artificial saliva were subsequently carried out on selected products with a quantified content of one or several phthalates.

3.1.1 Choice of extraction agent and sampling

The selected analysis method for determination of the phthalates DIBP, DBP, BBP and DEHP in the products was extraction with dichloromethane which is believed to be the most suitable solvent for liberating phthalates completely from the relevant polymer materials. PVC is for instance soluble in that solvent.

In connection with the quantitative analyses a sample amount was removed from each product. Some products consist of several types of material and in those cases a sample amount was selected that is expected to be in contact with the skin or mouth. Sampling is described in detail in the following chapters under each product group.

3.1.2 Method description of quantitative analyses

A weighed sample amount (app. 1g) was extracted with 20 ml dichloromethane (DCM) added deuterium marked internal standards (DBP-d₄ and DEHP-d₄) by ultrasound extraction. In connection with lightweight materials the sample amount can be smaller and a correspondingly smaller amount of extraction agent is used. Analysis in duplicate was carried out.

The extracts were analysed by means of gas chromatography with mass spectrometric detection (GC-MS). The concentration of phthalates was calculated quantitatively against standards of the respective phthalates DIBP, DBP, BBP and DEHP. Blank specimens and control tests were included in the analysis. If the analysis showed larger concentrations of other phthalates, they are stated as comments to the quantitative analyses.

Table 3.1 states the complete name of the phthalates and the CAS no. besides the internal standards.

Table 3.1 Outline of the applied reference standards and internal standards

Phthalate abbreviation	Name	CAS no.	Application
DIBP	Diisobutyl phthalate	84-69-5	Reference standard
DBP	Dibutyl phthalate	84-74-2	Reference standard
BBP	Benzylbutyl phthalate	85-68-7	Reference standard
DEHP	Di(ethylhexyl) phthalate	117-81-7	Reference standard
DBP-d ₄	Deuterium labelled Dibutyl phthalate		Internal standard
DEHP-d ₄	Deuterium labelled Di(ethylhexyl) phthalate		Internal standard

Table 3.2 shows the chromatographic conditions.

Table 3.2 Parameters for GC-MS

GC/MS-instrument	Agilent GC-MS
GC-parameters	Column: Phenomex, ZB-5MS 30 m x 0.5 mm id., 0.25 µm film thickness Carrier gas: Helium, constant flow at 1.8 ml/min. Oven program: 40 °C for 0.5 min., 30 °C/min. to 250 °C, 20 °C/min. at 320 °C, 320 °C for 8 min. Injection: 2 µl, 280 °C, splitless
MS-parameters	Scan mode: 40-450 m/z

The results are stated below and are organised according to the different product groups. They are stated as mg/kg and in % (m/m), respectively, which is the percentage by weight (mass/mass).

The results are stated as single analyses (a and b), the average of the analyses in duplicate (Average) and the calculated standard deviation of the analysis in duplicate (SD).

Results below the detection limit are stated as "< L.O.D", Limit of Detection. The detection limits are 10 mg/kg or 0.001 % (m/m), that is the weight percentage (mass/mass).

The relative uncertainty of the method is estimated to 10-15%.

3.2 Analyses of handbags

3.2.1 Quantitative analyses of handbags

The selected bags consist of several different materials. One analysis was carried out per product and during sampling importance was placed on removing the sample amount from material estimated to be plastic or that forms the largest part of the product.

The quantitative analysis results appear from Table 3.3 and Table 3.4.

The results are stated as single analyses (a and b), the average of the analyses in duplicate (Average) and the calculated standard deviation of the analysis in duplicate (RSD).

Results below the detection limit are stated as "< L.O.D".
The detection limits are 10 mg/kg or 0.001 % (m/m).

Table 3.3 Results of quantitative analyses in mg/kg, bags

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)
1-61	Shoulder bag	46.5	48.2	47.4	1.3	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		27.7	27.5	27.6	0.1
1-62	Handbag	16.2	13.4	14.8	2.0	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		23.4	16.8	20.1	4.7
1-63	Handbag	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-64	Console bag	10.7	11.1	10.9	0.3	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-65	Sponge bag	73.2	47.7	60.5	18.0	16.6	10.8	13.7	4.1	< L.O.D	< L.O.D	< L.O.D		220000	132000	176000	62200
1-66	Rucksack	623	395	509	161	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		11.8	12.2	12.0	0.3
1-67	Sponge bag	73.8	94.4	84.1	14.6	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		23400	18500	21000	3470
1-68	Shoulder bag	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		13.6	14.4	14.0	0.5
1-69	Rucksack	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		188000	216000	202000	19800
1-70	Sponge bag	9.7	10.3	10.0	0.4	20.7	20.2	20.4	0.3	< L.O.D	< L.O.D	< L.O.D		53500	54200	53900	495

Table 3.4 Results of quantitative analyses in %(m/m), bags

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-61	Shoulder bag	0.005	0.005	0.005	0.0001	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.003	0.003	0.003	0.00001
1-62	Handbag	0.002	0.001	0.001	0.0002	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.002	0.002	0.002	0.0005
1-63	Handbag	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-64	Console bag	0.001	0.001	0.001	0.00003	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-65	Sponge bag	0.007	0.005	0.006	0.002	0.002	0.001	0.001	0.0004	< L.O.D	< L.O.D	< L.O.D		22.0	13.2	17.6	6.2
1-66	Rucksack	0.062	0.039	0.051	0.016	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.001	0.001	0.001	0.00003
1-67	Sponge bag	0.007	0.009	0.008	0.001	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		2.34	1.85	2.09	0.34
1-68	Shoulder bag	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.001	0.001	0.001	0.0001
1-69	Rucksack	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		18.8	21.6	20.2	2.0
1-70	Sponge bag	0.001	0.001	0.001	0.00004	0.002	0.002	0.002	0.00003	< L.O.D	< L.O.D	< L.O.D		5.35	5.42	5.39	0.05

3.2.2 Comments to quantitative analyses of bags

A high content of DEHP was detected in two bags (no. 1-65, sponge bag and 1-69, rucksack) in concentrations of 18% and 20%, respectively.

In a number of bags DIBP, DBP and DEHP were detected in smaller concentrations, less than 0.06%. Two sponge bags (no. 1-67 and 1-70) had a content of DEHP in concentrations of 2% and 5%, respectively.

BBP was not detected in any of the products in excess of the stated detection limit of 0.001%.

Other phthalates were detected in several of the bags and they are stated in Table 3.5. It has not been investigated in this project whether the products contained other phthalates.

Table 3.5 Outline of other phthalates detected in bags

Phthalate abbreviation	Name	CAS-no.	Product no.
Isophthalate	Di-(2-ethylhexyl) isophthalate	137-89-3	1-61, 1-67
DINP	Di-isononyl phthalate	28553-12-0	1-70

3.3 Analyses of swimming equipment

3.3.1 Quantitative analyses of swimming equipment

The selected products for use when swimming consist of several different materials. One analysis per product was carried out and during sampling importance was placed on removing the sample amount in places where skin or mouth contact is expected. They appear from the following outline:

- Swimming goggles/masks – sample amount removed from soft plastic that ensures close contact between the goggle/mask and the skin.
- Flippers – sample amount removed from the inside of the shoe part and in connection with one sample another sample amount was removed from the strap behind the heel.
- Swimming belt – sample amount removed from the foamed part.
- Snorkel – sample amount removed from the mouthpiece
- Water wings – sample amount removed from the inner side.

Quantitative analysis results appear from Table 3.6 and Table 3.7.

The results are stated as single analyses (a and b), the average of the analyses in duplicate (Average) and the calculated standard deviation of the analysis in duplicate (SD).

Results below the detection limit are stated as "< L.O.D".

The detection limits are 10 mg/kg or 0.001 % (m/m).

Table 3.6 Results of quantitative analyses in mg/kg, swimming equipment

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)
1-48	Swimming goggles	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		2570	2290	2430	198
1-49	Snorkel	9.9	10.3	10.1	0.3	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-50	Flippers	1910	1860	1890	35	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-53	Swimming goggles	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-54	Swimming belt	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-55	Diving mask	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-56	Swimming goggles	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-57	Snorkel	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-72	Diving mask	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-58	Flippers	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*	
1-73	Water wings	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		331000	335000	333000	2830
1-71a	Flippers, strap	1110	1150	1130	28	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*	
1-71b	Flippers, foot	62.7	64.3	63.5	1.1	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	

*Detection limit, L.O.D., increased to < 50

Table 3.7 Results of quantitative analyses in %(m/m), swimming equipment

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-48	Swimming goggle	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.257	0.229	0.243	0.020
1-49	Snorkel	0.001	0.001	0.001	0.0000	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-50	Flippers	0.191	0.186	0.189	0.003	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-53	Swimming goggle	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-54	Swimming belt	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-55	Diving mask	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-56	Swimming goggle	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-57	Snorkel	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-72	Diving mask	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-58	Flippers	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*	
1-73	Water wings	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		33.1	33.5	33.3	0.3
1-71a	Flippers, strap	0.111	0.115	0.113	0.003	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*	
1-71b	Flippers, foot	0.006	0.006	0.006	0.0001	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	

*Detection limit, L.O.D., increased to < 0.005

3.3.2 Comments to quantitative analyses of swimming equipment

A high content of DEHP was detected in one product (no. 1-73, water wings) in a concentration of 33%.

In a number of products DIBP was detected in smaller concentrations, less than 0.2%.

BBP and DBP were not detected in any of the products in excess of the stated detection limit of 0.001%.

The detection limit was increased to 0.005% for a number of products due to interference of other compounds.

3.4 Analyses of swimming pools

3.4.1 Quantitative analyses of swimming pools

Several of the selected swimming pools consist of several types of materials. One analysis was carried out per product.

According to agreement with the Danish Environmental Protection Agency importance was during sampling placed on removing the sample amount from materials on the inside of the edge of the swimming pools and at a height that must be expected to be above the water surface. That is where greatest direct skin contact with the products is expected and is also where the child might suck on the material.

The quantitative analysis results appear from Table 3.8 and Table 3.9.

The results are stated as single analyses (a and b), the average of the analyses in duplicate (Average) and the calculated standard deviation of the analysis in duplicate (SD).

Results below the detection limit are stated as "< L.O.D".
The detection limits are 10 mg/kg or 0.001 % (m/m).

Table 3.8 Results of quantitative analyses in mg/kg, swimming pools

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)
1-16	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*	
1-17	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		113	107	110	4
1-18	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		248000	267000	258000	13400
1-19	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		324	348	336	17
1-20	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-35	Swimming pool	14.9	21.3	18.1	4.5	8.4	12.3	10.3	2.8	< L.O.D	< L.O.D	< L.O.D		24.2	108.5	66.4	59.6
1-36	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-37	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	

*Detection limit, L.O.D., increased to < 50

Table 3.9 Results of quantitative analyses in %(m/m), swimming pools

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-16	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*	
1-17	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.011	0.011	0.011	0.0004
1-18	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		24.8	26.7	25.7	1.3
1-19	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.032	0.035	0.034	0.002
1-20	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-35	Swimming pool	0.001	0.002	0.002	0.0004	0.001	0.001	0.001	0.0003	< L.O.D	< L.O.D	< L.O.D		0.002	0.011	0.007	0.006
1-36	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-37	Swimming pool	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	

*Detection limit, L.O.D., increased to < 0.005

3.4.2 Comments to quantitative analyses of swimming pools

A high content of DEHP was detected in one swimming pool (no. 1-18) in a concentration of 26%.

In a number of products DEHP was detected in smaller concentrations, less than 0.03% and one swimming pool (no. 1-35) there was a content of DIBP and DBP in a concentration less than 0.002%.

BBP was not detected in any of the products in excess of the stated detection limit of 0.001%.

Other phthalates were detected in 7 of the products and they are stated in Table 3.10. It has not been investigated in this project whether the products contained other phthalates.

Table 3.10 Outline of other phthalates in swimming pools

Phthalate abbreviation	Name	CAS-nr.	Product no.
Isophthalate	Di-(2-ethylhexyl) isophthalate	137-89-3	1-16, 1-35, 1-37
DINP	Di-isononyl phthalate	28553-12-0	1-17, 1-18, 1-19, 1-20, 1-36

3.5 Analyses of T-shirts

3.5.1 Quantitative analyses of T-shirts

Several of the selected T-shirts had a print consisting of several different colours and patterns. One analysis was carried out per product. During sampling, importance was placed on removing the sample amount across the print.

The quantitative analysis results appear from Table 3.11 and Table 3.12.

The results are stated as single analyses (a and b), the average of the analyses in duplicate (Average) and the calculated standard deviation of the analysis in duplicate (SD).

Results below the detection limit are stated as "< L.O.D".
The detection limits are 10 mg/kg or 0.001 % (m/m).

Table 3.11 Results of quantitative analyses in mg/kg, T-shirts

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)
1-40	T-shirt	12.1	12.6	12.4	0.4	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-41	T-shirt	< L.O.D	< L.O.D	< L.O.D		26.9	26.0	26.4	0.6	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-42	T-shirt	15.9	18.4	17.1	1.7	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-43	T-shirt	19.4	24.5	21.9	3.6	9.8	13.0	11.4	2.3	< L.O.D	< L.O.D	< L.O.D		8.1	7.8	8.0	0.2
1-44	T-shirt	22.4	24.4	23.4	1.4	< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*	
1-45	T-shirt	< L.O.D	< L.O.D	< L.O.D		36.3	40.3	38.3	2.8	< L.O.D	< L.O.D	< L.O.D		9.8	9.3	9.6	0.4
1-46	T-shirt	8.5	8.4	8.4	0.1	10.5	7.6	9.0	2.0	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-47	T-shirt	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		8.8	8.4	8.6	0.2
1-51	T-shirt	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*	
1-52	T-shirt	10.5	9.6	10.1	0.6	31.6	23.8	27.7	5.5	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	

*Detection limit, L.O.D., increased to < 50

Table 3.12 Results of quantitative analyses in %(m/m), T-shirts

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-40	T-shirt	0.001	0.001	0.001	0.00004	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-41	T-shirt	< L.O.D	< L.O.D	< L.O.D		0.003	0.003	0.003	0.0001	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-42	T-shirt	0.002	0.002	0.002	0.0002	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-43	T-shirt	0.002	0.002	0.002	0.0004	0.001	0.001	0.001	0.0002	< L.O.D	< L.O.D	< L.O.D		0.001	0.001	0.001	0.00002
1-44	T-shirt	0.002	0.002	0.002	0.0001	< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*	
1-45	T-shirt	< L.O.D	< L.O.D	< L.O.D		0.004	0.004	0.004	0.0003	< L.O.D	< L.O.D	< L.O.D		0.001	0.001	0.001	0.00004
1-46	T-shirt	0.001	0.001	0.001	0.00001	0.001	0.001	0.001	0.0002	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-47	T-shirt	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.001	0.001	0.001	0.00002
1-51	T-shirt	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*	
1-52	T-shirt	0.001	0.001	0.001	0.0001	0.003	0.002	0.003	0.0006	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	

*Detection limit, L.O.D., increased to < 0.005

3.5.2 Comments to quantitative analyses of t-shirts

A high content of DIBP, DBP and DEHP was not detected in T-shirts, and all concentrations were less than 0.002%.

BBP was not detected in any of the products in excess of the stated detection limit of 0.001%.

The detection limit was increased to 0.005% for two products due to interference of other compounds.

3.6 Analyses of oilcloth and dinner mats

3.6.1 Quantitative analyses of oilcloth and dinner mats

Several of the selected oilcloth and dinner mats consist of several different colours and patterns. One analysis was carried out per product. It was important during the sampling to extract the subsample across the different colours and patterns.

The quantitative analysis results appear from Table 3.13 and Table 3.14.

The results are stated as single analyses (a and b), the average of the analyses in duplicate (Average) and the calculated standard deviation of the analysis in duplicate (SD).

Results below the detection limit are stated as "< L.O.D".
The detection limits are 10 mg/kg or 0.001 % (m/m).

Table 3.13 Results of quantitative analyses in mg/kg, oilcloth and dinner mats

		DIBP				DBP				BBP				DEHP			
Product no.	Type	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)
1-5	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		195000	253000	224000	41000
1-6	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		256000	251000	254000	3540
1-7	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		200	191	196	6
1-8	Oilcloth	56.3	56.1	56.2	0.1	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		124000	136000	130000	8490
1-9	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		44.6	18.0	31.3	18.8
1-10	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		80.0	72.3	76.2	5.4
1-11	Dinner mat	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-32	Oilcloth	8.3	9.4	8.9	0.8	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-33	Oilcloth	9.6	9.3	9.5	0.2	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-34	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		226000	218000	222000	5660
1-59	Dinner mat	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		4.1	7.4	5.7	2.3
1-60	Dinner mat	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	

Table 3.14 Results of quantitative analyses in %(m/m), oilcloth and dinner mats

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-5	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		19.5	25.3	22.4	4.0
1-6	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		25.6	25.1	25.3	0.4
1-7	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.020	0.019	0.020	0.0006
1-8	Oilcloth	0.006	0.006	0.006	0.00001	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		12.4	13.6	13.0	0.8
1-9	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.004	0.002	0.003	0.002
1-10	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.008	0.007	0.008	0.0005
1-11	Dinner mat	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-32	Oilcloth	0.001	0.001	0.001	0.0001	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-33	Oilcloth	0.001	0.001	0.001	0.00002	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-34	Oilcloth	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		22.6	21.8	22.2	0.6
1-59	Dinner mat	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.0004	0.001	0.001	0.0002
1-60	Dinner mat	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	

3.6.2 Comments to quantitative analyses of oilcloth and dinner mats

A high content of DEHP was detected in 4 oilcloths (no. 1-5, 1-6, 1-8 and 1-34) in concentrations of 22%, 25%, 13% and 22%, respectively.

In five oilcloths and one dinner mat DIBP or DEHP was detected in smaller concentrations, less than 0.02%.

DBP and BBP were not detected in any of the products in excess of the stated detection limit of 0.001%.

DINP was detected in several oilcloths as stated in Table 3.15. It has not been investigated in this project whether the products contained other phthalates.

Table 3.15 Outline of other phthalates detected in oilcloth and dinner mats

Phthalate abbreviation	Name	CAS-no.	Product no.
DINP	Di-isononyl phthalate	28553-12-0	1-8, 1-9, 1-10, 1-34

3.7 Analyses of shower curtains that appeal to children

3.7.1 Quantitative analyses of shower curtains that appeal to children

Several of the selected shower curtains that appeal to children consist of various colours and patterns. One analysis was carried out per product. During sampling, importance was placed on removing the sample amount across colours and patterns.

The quantitative analysis results appear from Table 3.16 and Table 3.17.

The results are stated as single analyses (a and b), the average of the analyses in duplicate (Average) and the calculated standard deviation of the analysis in duplicate (SD).

Results below the detection limit are stated as "< L.O.D".

The detection limits are 10 mg/kg or 0.001 % (m/m).

Table 3.16 Results of quantitative analyses in mg/kg, shower curtains

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)
1-1	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		446	441	443	3
1-2	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		8.9	21.8	15.3	9.1
1-3**	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		261000	329000	295000	48100
1-12	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-28	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		24.7	31.8	28.2	5.0
1-29	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		226000	238000	241000	21200
1-30	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*	
1-31	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		246000	256000	251000	7070
1-38	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		235000	238000	237000	2120
1-39	Shower curtain	< L.O.D	< L.O.D	< L.O.D		13.0	13.8	13.4	0.6	< L.O.D	< L.O.D	< L.O.D		288000	304000	296000	11300

*Detection limit, L.O.D., increased to < 50

**The product is no longer on the marked

Table 3.17 Results of quantitative analyses in %(m/m), shower curtains

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-1	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.045	0.044	0.044	0.0003
1-2	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.001	0.002	0.002	0.0009
1-3**	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		26.1	32.9	29.5	4.9
1-12	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D	
1-28	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.002	0.003	0.003	0.001
1-29	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		22.6	23.8	23.2	0.9
1-30	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*	
1-31	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		24.6	25.6	25.1	0.7
1-38	Shower curtain	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		23.5	23.8	23.6	0.3
1-39	Shower curtain	< L.O.D	< L.O.D	< L.O.D		0.001	0.001	0.001	0.00006	< L.O.D	< L.O.D	< L.O.D		28.8	30.4	29.6	1.1

*Detection limit, L.O.D., increased to < 0.005

**The product is no longer on the marked

3.7.2 Comments to quantitative analyses of shower curtains

A high content of DEHP was detected in four shower curtains (no. 1-3, 1-29, 1-31, 1-38 and 1-39) in concentrations of 30%, 23%, 25%, 24% and 30%, respectively.

In a number of shower curtains DBP or DEHP was detected in smaller concentrations, less than 0.04%.

BBP and DIBP were not detected in any of the shower curtains in excess of the stated detection limit of 0.001%.

The detection limit was increased to 0.005% for one single product due to interference of other compounds.

DINP was detected in several of the shower curtains as stated in Table 3.18. It has not been investigated in this project whether the products contained other phthalates.

Table 3.18 Outline of other phthalates detected in shower curtains

Phthalate abbreviation	Name	CAS-no.	Product no.
DINP	Di-isononyl phthalate	28553-12-0	1-1,1-2, 1-3, 1-12, 1-28,1-30, 1-31

3.8 Analyses of balance balls

3.8.1 Quantitative analyses of balance balls

Balance balls mainly consist of one material besides a valve. One analysis was carried out per product. During sampling, importance was placed on removing the sample amount from the material that forms the main part of the product.

The quantitative analysis results appear from Table 3.19 and Table 3.20.

The results are stated as single analyses (a and b), the average of the analyses in duplicate (Average) and the calculated standard deviation of the analysis in duplicate (SD).

Results below the detection limit are stated as "< L.O.D".
The detection limits are 10 mg/kg or 0.001 % (m/m).

Table 3.19 Results of quantitative analyses in mg/kg, balance balls

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)
1-13	Balance ball	116	115	115	1	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*	
1-14	Balance ball	711	674	693	26	29.1	12.0	20.5	12.1	< L.O.D*	< L.O.D*	< L.O.D*		426000	458000	44200	22600
1-15	Balance ball	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*	
1-21	Balance ball	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		8690	9020	8860	233
1-22	Redondo ball	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*	
1-23	Mini ball	108000	110000	109000	1410	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		372	370	371	1
1-24	Training ball	365000	342000	355000	16300	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		4.4	13.9	9.2	6.7
1-25	Redondo ball	9.3	9.0	9.1	0.2	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		122	130	126	5
1-26	Balance ball	303	295	299	6	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		466000	412000	439000	38200
11-27	Balance ball	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		462	462	462	0.4

*Detection limit, L.O.D., increased to < 50

Table 3.20 Results of quantitative analyses in %(m/m), balance balls

Product no.	Type	DIBP				DBP				BBP				DEHP			
		a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-13	Balance ball	0.012	0.011	0.012	0.0001	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*	
1-14	Balance ball	0.071	0.067	0.069	0.003	0.003	0.001	0.002	0.001	< L.O.D*	< L.O.D*	< L.O.D*		42.6	45.8	44.2	2.3
1-15	Balance ball	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		<0.005	<0.005	<0.005	
1-21	Balance ball	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.869	0.902	0.885	0.023
1-22	Redondo ball	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		< L.O.D*	< L.O.D*	< L.O.D*	
1-23	Mini ball	10.8	11.0	10.9	0.2	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.037	0.037	0.037	0.0001
1-24	Training ball	36.5	34.2	35.4	1.7	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.0004	0.0014	0.0009	0.0007
1-25	Redondo ball	0.001	0.001	0.001	0.00002	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		0.012	0.013	0.013	0.0005
1-26	Balance ball	0.030	0.029	0.030	0.0006	< L.O.D	< L.O.D	< L.O.D		< L.O.D	< L.O.D	< L.O.D		46.6	41.2	43.9	3.9
11-27	Balance ball	< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		< L.O.D*	< L.O.D*	< L.O.D*		0.046	0.046	0.046	0.00004

*Detection limit, L.O.D., increased to < 0.005

3.8.2 Comments to quantitative analyses of balance balls

A high content of DEHP was detected in two balance balls (no. 1-14, 1-26) both in concentrations of 44% and a high content of DIBP was detected in two balance balls (no. 1-23 and 1-24) in concentrations of 11% and 35%, respectively.

In a number of balance balls DIBP, DBP and DEHP were detected in smaller concentrations, less than 1%.

BBP was not detected in any of the balance balls in excess of the stated detection limit of 0.001%.

The detection limit was increased to 0.005% for a number of products due to interference of other compounds.

DINP was detected in several balance balls as stated in Table 3.21. It has not been investigated in this project whether the products contained other phthalates.

Table 3.21 Outline of other phthalates detected in balance balls

Phthalate abbreviation	Name	CAS-no.	Product no.
DINP	Di-isononyl phthalate	28553-12-0	1-15, 1-21, 1-22, 1-23 og 1-27

3.9 Summary of quantitative analysis results

During analysis of the 72 products for the four selected phthalates high concentrations of DEHP and DIBP were detected in a number of products. Table 3.22 states contents larger than 1% (m/m):

Table 3.22 Outline of highest detected concentrations, % (m/m)

Product group	Product no.	Type	DIBP %	DEHP %
Bag	1-65	Sponge bag		18
Bag	1-67	Sponge bag		2
Bag	1-69	Rucksack		20
Bag	1-70	Sponge bag		5
Swimming equipment	1-73	Water wings		33
Swimming pool	1-18	Swimming pool		26
Oilcloth and dinner mats	1-5	Oilcloth		22
Oilcloth and dinner mats	1-6	Oilcloth		25
Oilcloth and dinner mats	1-10	Oilcloth		23
Oilcloth and dinner mats	1-8	Oilcloth		13
Oilcloth and dinner mats	1-34	Oilcloth		22
Shower curtain	1-3	Shower curtain		23
Shower curtain	1-29	Shower curtain		25
Shower curtain	1-31	Shower curtain		24
Shower curtain	1-38	Shower curtain		30
Balance ball	1-39	Balance ball		44
Balance ball	1-14	Mini ball	11	
Balance ball	1-23	Training ball	35	
Balance ball	1-24	Balance ball		44

BBP was not detected in the analysed products and DBP was only detected in concentrations less than 0.1%.

For all prints on T-shirts, the detected phthalates appear in concentrations less than 0.05%.

A high content of DINP and isophthalate were detected in a wide range of products that have not been quantified in this project.

4 Migration analyses

4.1 Migration analyses

The objective of the migration analyses was to investigate exposure when using the products whereas the quantitative analyses detected a content of the four selected phthalates.

During the migration analyses, the products were in contact with artificial sweat or artificial saliva, depending on the product and the expected use of the product. The artificial sweat or saliva was subsequently extracted and analysed for the phthalates DIBP, DBP, BBP and DEHP.

The results are used to estimate how large a part of a quantified content must be expected to be able to migrate at the stated conditions of the migration tests.

The exposure scenarios, including applied simulant and exposure time, were selected in cooperation with the Danish Environmental Protection Agency.

4.1.1 Choice of applied simulants and exposure temperature and time

The simulants for the sweat and saliva migrations were previously applied for comparable migration analyses for consumer products for children (exposure of 2-year-olds to chemical substances, survey no. 103, 2009).

The applied artificial sweat simulant is described in DS/EN ISO 105-E04 that is used in connection with ØKO-TEX certification (Öko-Tex Standard 100). The sweat simulant in DS/EN ISO 105-E04 consists of 1-histidine-monohydrochlorid-1-hydrate, sodium chloride, sodium dihydrogen phosphate and sodium hydroxide for adjustment of pH to pH 5.5.

The applied artificial saliva simulant is described in an EU project (Simoneau et al, 2001 EUR 19826 EN).

The artificial saliva consists of calcium chloride, magnesium chloride, potassium carbonate, potassium chloride, potassium phosphate, sodium chloride and hydrogen chloride for adjustment of pH to pH 6.8.

The migration tests were carried out at 37 °C as that is close to the body temperature and is used in DS/EN-71-3, DS/EN ISO 105-E04.

During the migration analyses, the simulant was pre-heated before addition to the sample amount of the product. The samples were placed in a temperature controlled oven (37 ± 3 °C) for 1 hour and in static contact with the simulant.

Of experimental reasons, the exposure time was set to 1 hour so measurable concentrations could be obtained.

4.1.2 Criteria for selection of products for migration analyses

In co-operation with the Danish Environmental Protection Agency, 10 products were selected for 18 migration analyses in the light of the results of the 72 quantitative analyses.

During selection importance was placed on the following criteria:

- High concentrations of phthalates
- Representative selection of the various product groups
- Representative selection of the detected phthalates DIBP and DEHP
- Products that appeal to children.

4.1.3 Exposure scenarios and selected products

When selecting relevant exposure scenarios, a starting point was taken in the possible use of the products by a 2-year-old and 6/7-year-old. In this project, focus was on contact with skin (sweat) and the mouth (saliva).

The exposure scenarios, including applied simulant and exposure time, were selected in cooperation with the Danish Environmental Protection Agency. Of experimental reasons, the exposure time was set to 1 hour so measurable concentrations could be obtained.

Table 4.1 describes the 18 exposure scenarios that were investigated in this project and the 10 products that were selected for the migration analyses.

Table 4.1 Exposure scenarios that were carried out

Product	Possible exposure	Simulant	Estimated expected exposure time (minuts/day)	Selected product no.	Detected phthalates
Bags	Child carries the bag in his hand and can suck on the material	Sweat	60	1-65, 1-69	DEHP
		Saliva	10	1-65	DEHP
Shower curtain	Child can play with and suck on the material	Sweat	10	1-31, 1-39	DEHP
		Saliva	10	1-31, 1-39	DEHP
Oilcloth and dinner mats	Child can place his arm on the material and suck on it. In addition, the child can touch the surface with moist fingers that are put into the mouth.	Sweat	60	1-6, 1-8	DEHP
		Saliva	10	1-6, 1-8	DEHP
Swimming equipment	Child carries the material on the skin	Sweat	60	1-73	DEHP
Swimming pools	Child sits against the material and can suck on it	Sweat	30	1-18	DEHP
		Saliva	10	1-18	DEHP
Balance balls	Child plays with the material and can suck on it	Sweat	15	1-14, 1-24	DIBP, DEHP
		Saliva	15	1-14, 1-24	DIBP, DEHP

Migration analyses were not carried out on T-shirts due to the very low content in the products, less than 0.004 % (m/m).

During the migration analyses, analyses were carried out for DIBP and DEHP that were detected in high concentrations in the selected products.

4.1.4 Method description for migration analyses

A weighed sample amount, see Table 4.2, was extracted and the surface was estimated. The sample is taken to represent of the surface of the product surface and to ensure good contact to the sweat simulant. An analysis in duplicate was carried out. The sample amount was lowered into the pre-heated sweat simulant (20 ml). The samples are placed in a temperature controlled incubator ($37 \pm 3^\circ \text{C}$) for 1 hour and with static contact to the simulant.

The sweat simulant was extracted by shaking it into a separatory funnel with dichloromethane (2 x10 ml) added deuterium marked internal standards (DBP-d₄ and DEHP-d₄). The extracts were analysed by means of gas chromatography with mass spectrometric detection (GC-MS).

The concentration of phthalates was quantified against the standards of the respective phthalates DIBP and DEHP. Blank specimens and control tests were included in the analysis.

The detection limits are 2-5 mg/kg or 0.0002-0.0005 % (m/m).
The relative uncertainty of the method is estimated to 10-15%.

Table 4.2 Outline of sampling for migration analyses

Migration tests	Product type	Product no.	Average weight (g)	Average area of test sample cm ²
Sweat	Sponge bag	1-65	0.33	16.0
	Rucksack	1-69	0.33	15.8
	Shower curtain	1-31	0.17	19.8
	Shower curtain	1-39	0.26	16.8
	Oilcloth	1-6	0.17	19.8
	Oilcloth	1-8	0.31	16.8
	Water wings	1-73	0.33	17.2
	Swimming pool	1-18	0.39	14.0
	Balance ball	1-14	1.13	16.8
	Training ball	1-24	0.55	17.3
Saliva	Sponge bag	1-65	0.31	16.0
	Shower curtain	1-31	0.21	24.0
	Shower curtain	1-39	0.25	17.1
	Oilcloth	1-6	0.16	18.3
	Oilcloth	1-8	0.24	12.0
	Swimming pool	1-18	0.35	14.0
	Balance ball	1-21	1.11	15.6
	Training ball	1-24	0.59	17.6

4.2 Results of migration analyses

The results of the migration analyses are stated below and are stated with results calculated as mg/kg and in % (m/m), respectively, that are weight percentage (mass/mass). In addition, the results are calculated per average area, mg/cm².

The results are divided into migration analysis with saliva simulant, see Table 4.3, Table 4.4 and Table 4.5, and sweat simulant see Table 4.6, Table 4.7 and Table 4.8, respectively.

The results are stated as single analyses (a and b), the average of the analyses in duplicate (Average) and the calculated standard deviation of the analysis in duplicate (SD). The results are the amount of phthalates migrated from the product (mg/kg and % (m/m), respectively) at the stated conditions.

In cases where no average value could be calculated because phthalates were only detected in one of the two samples, the result of this sample is stated and no standard deviation is calculated.

Results below the detection limit are stated as "< L.O.D", Limit of Detection. The detection limits are 2-5 mg/kg or 0.0002-0.0005 % (m/m).

Table 4.3 Results of migration analyses in mg/kg, saliva

Product no.	Type	DIBP				DEHP			
		a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)
1-65	Sponge bag	< L.O.D	< L.O.D	< L.O.D		6.3	2.5	4.4	2.7
1-31	Shower curtain	< L.O.D	< L.O.D	< L.O.D		4.0	5.7	4.8	1.2
1-39	Shower curtain	< L.O.D	< L.O.D	< L.O.D		4.9	3.9	4.4	0.7
1-6	Oilcloth	< L.O.D	< L.O.D	< L.O.D		5.1	< L.O.D	5.1	
1-8	Oilcloth	< L.O.D	< L.O.D	< L.O.D		3.3	4.1	3.7	0.6
1-18	Swimming pool	< L.O.D	< L.O.D	< L.O.D		2.8	3.4	3.1	0.5
1-14	Balance ball	< L.O.D	< L.O.D	< L.O.D		3.5	3.1	3.3	0.3
1-24	Training ball	112	110	111	2	< L.O.D	< L.O.D	< L.O.D	

Table 4.4 Results of migration analyses in %(m/m), saliva

Product no.	Type	DIBP				DEHP			
		a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-65	Sponge bag	< L.O.D	< L.O.D	< L.O.D		0.0006	0.0002	0.0004	0.0003
1-31	Shower curtain	< L.O.D	< L.O.D	< L.O.D		0.0004	0.001	0.0007	0.0001
1-39	Shower curtain	< L.O.D	< L.O.D	< L.O.D		0.0005	0.0004	0.0004	0.0001
1-6	Oilcloth	< L.O.D	< L.O.D	< L.O.D		0.0005	< L.O.D	0.0005	
1-8	Oilcloth	< L.O.D	< L.O.D	< L.O.D		0.0003	0.0004	0.0004	0.0001
1-18	Swimming pool	< L.O.D	< L.O.D	< L.O.D		0.0003	0.0003	0.0003	0.00005

		DIBP				DEHP			
Product no.	Type	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-14	Balance ball	< L.O.D	< L.O.D	< L.O.D		0.0004	0.0003	0.0003	0.00003
1-24	Training ball	0.011	0.011	0.011	0.0002	< L.O.D	< L.O.D	< L.O.D	

Table 4.5 Results of migration analyses in mg/cm², saliva

		DIBP				DEHP			
Product no.	Type	a mg/cm ²	b mg/cm ²	Average mg/cm ²	SD mg/cm ²	a mg/cm ²	b mg/cm ²	Average mg/cm ²	SD mg/cm ²
1-65	Sponge bag	< L.O.D	< L.O.D	< L.O.D		0.00012	0.00005	0.00008	0.00005
1-31	Shower curtain	< L.O.D	< L.O.D	< L.O.D		0.00003	0.00005	0.00004	0.00001
1-39	Shower curtain	< L.O.D	< L.O.D	< L.O.D		0.00007	0.00006	0.00006	0.000010
1-6	Oilcloth	< L.O.D	< L.O.D	< L.O.D		0.00005	< L.O.D	0.00005	
1-8	Oilcloth	< L.O.D	< L.O.D	< L.O.D		0.00007	0.00008	0.00007	0.00001
1-18	Swimming pool	< L.O.D	< L.O.D	< L.O.D		0.00007	0.00009	0.00008	0.00001
1-14	Balance ball	< L.O.D	< L.O.D	< L.O.D		0.00025	0.00022	0.00024	0.00002
1-24	Training ball	0.0038	0.0037	0.0037	0.0001	< L.O.D	< L.O.D	< L.O.D	

Table 4.6 Results of migration analyses in mg/kg, sweat

		DIBP				DEHP			
Product no.	Type	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)	a (mg/kg)	b (mg/kg)	Average (mg/kg)	SD (mg/kg)
1-65	Sponge bag	< L.O.D	< L.O.D	< L.O.D		2.5	3.6	3.1	0.7
1-69	Rucksack	< L.O.D	< L.O.D	< L.O.D		9.8	10.5	9.9	0.8
1-31	Shower curtain	< L.O.D	< L.O.D	< L.O.D		8.5	5.6	7.0	2.1
1-39	Shower curtain	< L.O.D	< L.O.D	< L.O.D		6.0	4.6	5.3	1.0
1-6	Oilcloth	< L.O.D	< L.O.D	< L.O.D		4.7	6.9	5.8	1.6
1-8	Oilcloth	< L.O.D	< L.O.D	< L.O.D		4.7	5.1	4.9	0.3
1-73	Water wings	< L.O.D	< L.O.D	< L.O.D		4.3	4.2	4.2	0.1
1-18	Swimming pool	< L.O.D	< L.O.D	< L.O.D		4.3	3.2	3.8	0.8
1-14	Balance ball	< L.O.D	< L.O.D	< L.O.D		6.6	4.7	5.6	1.4
1-24	Training ball	179	184	182	4	< L.O.D	< L.O.D	< L.O.D	

Table 4.7 Results of migration analyses in %(m/m), sweat

		DIBP				DEHP			
Product no.	Type	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-65	Sponge bag	< L.O.D	< L.O.D	< L.O.D		0.0003	0.0004	0.0003	0.0001
1-69	Rucksack	< L.O.D	< L.O.D	< L.O.D		0.0009	0.0011	0.0010	0.0001
1-31	Shower curtain	< L.O.D	< L.O.D	< L.O.D		0.0009	0.0006	0.0007	0.0002

		DIBP				DEHP			
Product no.	Type	a %	b %	Average %	SD %	a %	b %	Average %	SD %
1-39	Shower curtain	< L.O.D	< L.O.D	< L.O.D		0.0006	0.0005	0.0005	0.0001
1-6	Oilcloth	< L.O.D	< L.O.D	< L.O.D		0.0005	0.0007	0.0006	0.0002
1-8	Oilcloth	< L.O.D	< L.O.D	< L.O.D		0.0005	0.0005	0.0005	0.00003
1-73	Water wings	< L.O.D	< L.O.D	< L.O.D		0.0004	0.0004	0.0004	0.00001
1-18	Swimming pool	< L.O.D	< L.O.D	< L.O.D		0.0004	0.0003	0.0004	0.0001
1-14	Balance ball	< L.O.D	< L.O.D	< L.O.D		0.0007	0.0005	0.0006	0.0001
1-24	Training ball	0.018	0.018	0.018	0.0004	< L.O.D	< L.O.D	< L.O.D	

Table 4.8 Results of migration analyses in mg/cm², sweat

		DIBP				DEHP			
Product no.	Type	a mg/cm ²	b mg/cm ²	Average mg/cm ²	SD mg/cm ²	a mg/cm ²	b mg/cm ²	Average mg/cm ²	SD mg/cm ²
1-65	Sponge bag	< L.O.D	< L.O.D	< L.O.D		0.00005	0.00007	0.00006	0.00001
1-69	Rucksack	< L.O.D	< L.O.D	< L.O.D		0.00020	0.00022	0.00021	0.00002
1-31	Shower curtain	< L.O.D	< L.O.D	< L.O.D		0.00007	0.00005	0.00006	0.00002
1-39	Shower curtain	< L.O.D	< L.O.D	< L.O.D		0.00009	0.00007	0.00008	0.00002
1-6	Oilcloth	< L.O.D	< L.O.D	< L.O.D		0.00004	0.00006	0.00005	0.00001
1-8	Oilcloth	< L.O.D	< L.O.D	< L.O.D		0.00009	0.00009	0.00009	0.00001
1-73	Water wings	< L.O.D	< L.O.D	< L.O.D		0.00008	0.00008	0.00008	0.000002
1-18	Swimming pool	< L.O.D	< L.O.D	< L.O.D		0.00012	0.00009	0.00011	0.00002
1-14	Balance balls	< L.O.D	< L.O.D	< L.O.D		0.00045	0.00031	0.00038	0.0001
1-24	Training ball	0.0057	0.0058	0.0058	0.0001	< L.O.D	< L.O.D	< L.O.D	

4.3 Summary of results of migration analyses

The migration analyses detected the migration of DEHP in concentrations less than 0.00038 mg/cm² in all products, while the migration of DIBP was detected in a concentration of 0.0058 mg/cm² in one product.

Less migration was observed to artificial saliva compared to artificial sweat.