

# Centre for Public Health Research



## **Report for a Survey of Low Cost Cosmetics (Lipstick) For the Ministry of Health**

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# Introduction

The Centre for Public Health Research (CPHR), established in 2000, is a multi-disciplinary team of researchers based on the Massey University Wellington campus.

The research programme of the Centre covers all aspects of public health research, but with a focus on:

- non-communicable diseases (respiratory disease, cancer, diabetes)
- occupational health
- environmental health
- socio-economic determinants of health
- surveillance and health information
- Māori health
- Pacific health research

The report, prepared by Mathu Shanthakumar and Barry Borman, provides the methodology and results of a study to investigate claims that certain brands of cosmetic products sold at discount stores were non-compliant with the Cosmetics Products Group Standard (as amended 1 November 2010) under the Hazardous Substances and New Organisms Act 1996 (HSNO Act).

## Background

The Ministry of Health is an enforcement agency under the HSNO Act, where it is necessary to protect public health. Cosmetic products in NZ are regulated under the HSNO Act via the Cosmetic Products Group Standard. A copy of this Group Standard (and associated Schedules) is available from the Environmental Protection Authority's website at <http://www.epa.govt.nz/Publications/gs--cosmetic.pdf>.

The Cosmetic Products Group Standard 2006 sets a number of requirements that cosmetic products must comply with labeling, packaging, etc. It also sets restrictions on the types of hazardous properties that are allowable in cosmetic products, and sets restrictions on certain components that may or may not be used, either banning them completely or placing restrictions on their use such as setting maximum concentration levels.

## Aim

The purpose of the survey was to check the level of compliance of lipsticks from low cost retailers with the Cosmetic Products Group Standard 2006 under the HSNO Act. The survey focused only on the presence of total and leachable selected heavy metals (i.e. antimony, arsenic, cadmium, chromium, lead and mercury) in randomly selected lipsticks.

# Sampling Methodology

## Target population

As retail outlets could not be selected based on available cosmetic brand names, those operating in New Zealand urban areas under names such as “The \$2 Shop”, “Dollar Store 1 2 3”, and “Price Busters”, which are reputed to sell low cost cosmetics (i.e. less than or equal to \$5), were the target population. Therefore, retail outlets such as Farmers, Smith and Caughey, The Warehouse, supermarkets and pharmacies that sell brand name cosmetics such as “L’oréal”, “Revlon” and “Maybelline” were excluded.

## Sampling frame

The sampling frame was constructed using the online resources, ‘*Yellow Pages*’ (New Zealand Business search) and ‘*finda*’ (New Zealand business directory, listings and reviews). Businesses with keywords such as discount, dollar or the symbol ‘\$’ were searched for and selected if it was found to be a discount store.

The search identified 175 discount type business stores in the country. The sampling frame is subject to some bias as only businesses listed in the *Yellow Pages* or *finda* directories were eligible for selection. Businesses selling low cost cosmetic brands that were not listed in either of the online resources or with names other than those specified would have been missed.

## Sampling design

A multi-stage stratified cluster sampling design was used to detect whether cosmetic products (in this instance, lipsticks) sold at ‘discount stores’ in New Zealand comply with the requirements for heavy metals as specified under the Cosmetic Products Group Standard as provided in the HSNO Act.

## Selection of the sample

A simple random sample of stores was to be selected assuming:

- a 95% level of confidence ( $z=1.96$ )
- a 3% precision rate or confidence interval of  $\pm 5$  ( $e=0.03$ )
- a 90% success rate for the indicator ( $p=0.9$ ;  $q=1-p=0.1$ )
- a population size of 175 stores ( $N=175$ )

$$n = \frac{z^2 \times p \times q \cdot N}{z^2 \times p \times q + (N-1)e^2}$$

$$n = 120.4458 \quad (\text{sample size})$$

Assuming a compliance rate of 70% (i.e. out of 100 stores, only 70 sell lipsticks), the sample size was increased to 175 stores.

From each of the 175 discount stores, Health Protection Officers nationwide were instructed to purchase one lipstick (a random shade) from every brand that was available in stock. Data was collected on the location of the store, along with the cost, brand, batch number and colour of the product that was sampled. The samples were analysed by Environmental Laboratory Services through contract with the Institute for Environmental Science and Research Ltd (ESR).

## Cosmetic Products Group Standard

All heavy metals are prohibited for use in cosmetics although the presence of traces is allowed if their presence is technically unavoidable in good manufacturing practice, as per the Cosmetic Products Group Standard. Total compositions of selected heavy metals are included in this report for information only (Appendix 4). Total compositions of selected heavy metals were excluded from analysis because the Ministry of Health considers only the leachable components of these selected heavy metals to be of public health significance. Therefore, this report has focused its conclusions on leachable components of these selected heavy metals.

## Results

Data for 373 lipstick samples were collected from 133 stores (Appendix 1). The remaining 42 stores in the sampling frame were found to have either closed down or not sell discount lipstick products. Different shades of a brand were sampled from 12 stores. There were 52 different brands that were sampled, with “Jordana” being the most common brand (Appendix 2).

Fourteen samples were not analysed for leachable antimony, arsenic, cadmium, chromium, lead and mercury levels because the total levels for these heavy metals were below the limits of detection.

The remaining 359 colour samples that were tested had levels of leachable antimony, arsenic, and mercury below the limits of detection (Appendix 3A, 3B). Eleven colour samples (ie, one sample from 7 brands, two colour samples from two brands) had detectable levels of leachable cadmium above the detection limit of 0.1 mg/Kg (maximum recorded being 3.4 mg/Kg) (Appendix 3C). Three colour samples had detectable levels of leachable chromium above the detection limit of 0.2 mg/Kg (maximum recorded being 0.5 mg/Kg) (Appendix 3D). Nineteen colour samples had detectable levels of leachable lead above the detection limit of 0.1 mg/Kg (maximum recorded being 2.2 mg/Kg) (Appendix 3E). Of these 19 samples three also exceeded detectable levels of leachable cadmium and another three also exceed the detectable levels of leachable chromium.

No colour sample exceed detection levels of leachable lead, cadmium, and chromium.

Of the 11 colour samples which had detectable levels of leachable cadmium, eight were of the brand “Baolishi”, two were “Ya Shang” and one didn’t have a brand name. Of the three colour samples which had detectable levels of leachable chromium, there was one each from the brands “Baolishi”, “Laurel” and “Luoy’s”. Of the 19 colour samples which had detectable levels of leachable lead, eight were of the brand “Luoy’s”, five were “Baolishi”, and there was one each from the brands “Laurel”, “POFI”, “Jia Jin”, “4 ME”, “Heng Fang” and “Jordana”.

## Conclusion

All the lipstick colour samples (359) that were tested for the presence of leachable antimony, arsenic, and mercury complied with the Cosmetic Products Group Standard. However, 11 samples (3.06%), did not comply with the current Cosmetic Products Group Standard for leachable cadmium, 3 (0.84%) for leachable chromium, and 19 (5.29%) for leachable lead.

Trace levels of cadmium, chromium and lead are acceptable under the Cosmetic Products Group Standard. However, because trace levels are not quantified, we have used the maximum permissible leachable levels under the HSNO Graphic Materials Group Standard 2009 for comparison as these levels provide public health protection. All colour samples where cadmium, chromium and lead were detected were below the levels permitted in crayons, inks and water colours used by children.

In addition, the levels of leachable metals that exceeded the detection limits were assessed against the tolerable daily intake (TDI) for that metal. A TDI is the amount that can be eaten everyday over a person's lifetime, with no significant health risk. For a 10kg child, the amount of lipstick that would need to be eaten to exceed the TDI is shown. It is assumed that each lipstick weighs 4g.

Metal	TDI, ug/kg bw/day	Maximum leachable amount, mg/kg	Amount of lipstick consumed to reach the TDI	How many lipsticks?
Cadmium	0.8	3.4	2.4 g	>½
Chromium	1500	0.5	30 kg	7,500
Lead	1.9	2.2	8.6 g	>2

No leachable antimony, arsenic or mercury was detected in the lipsticks tested.

In conclusion, the samples tested for leachable metals did not appear to be of any significant public health risk.

## Appendix 1 – Number of colour samples collected from each store

Total number of colour samples collected at a particular store	Frequency of stores	Percent of all stores
1	45	33.8
2	25	18.8
3	24	18.1
4	14	10.5
5	10	7.5
6	11	8.3
7	2	1.5
10	2	1.5

*The above table shows the frequency of discount stores (along with the percentage of all stores) that collected a certain number of lipstick colour samples.*

*E.g.: A total of one lipstick colour sample was collected from 45 stores (accounting for 33.8% of all stores); a total of two lipstick samples were collected from 25 stores (accounting for 18.8% of all stores)*

## Appendix 2 – List of brands sampled

<b>Brand name</b>	<b>Colour samples</b>	<b>Percent</b>
Jordana	52	13.9
Midie	34	9.1
Baolishi	28	7.5
KK	28	7.5
4 ME	24	6.4
Luoyo	24	6.4
Li Dan Xiu	20	5.4
Santee Plus Beautiful Image	13	3.5
FOF	11	2.9
Aodie	10	2.7
Dehz	9	2.4
Heng Fang	9	2.4
Moisturising Silk	9	2.4
The 123 Selection NZ	9	2.4
USHAS	8	2.1
Fenza	6	1.6
Al 'Kiss	5	1.3
BMC	5	1.3
Laurel	5	1.3
Ya Shang	5	1.3
Aolimei	4	1.1
Cavier Modern Colors	4	1.1
Orient Fairy Cosmetics	4	1.1
Beautiful Coverstick	3	0.8
Davis	3	0.8
Aargh	2	0.5
Jia Jin	2	0.5
M	2	0.5
Paris Collection	2	0.5
SQ Fashion Cosmetics	2	0.5
Wet N Wild	2	0.5

## Appendix 2 continued

<b>Brand name</b>	<b>Frequency</b>	<b>Percent</b>
Artist	1	0.3
BYS – Be Yourself	1	0.3
Barbie	1	0.3
Classido USA Collection	1	0.3
Dream Woman	1	0.3
Enchant	1	0.3
Ever Bilena	1	0.3
Gialinna	1	0.3
Hermosa	1	0.3
High Class AO	1	0.3
Iris	1	0.3
Need Me	1	0.3
New Lip Care	1	0.3
POFI	1	0.3
Qibin	1	0.3
Runfeng	1	0.3
Tian Nuo	1	0.3
Wendy	1	0.3
Winmax Daiso	1	0.3
Zendori	1	0.3
No name	9	2.4

*The above table shows the frequency of brand names (along with the percentage of all samples) that were collected.*

*E.g.: 52 lipstick colour samples (accounting for 13.9% of all samples) collected were of the brand “Jordana”; 34 lipstick colour samples (accounting for 9.1% of all samples) collected were of the brand “Midie”*

## Appendix 3 – Leachable components of samples collected containing heavy metals

A

Leachable Antimony, mg/Kg	Frequency	Percent of colour samples
<1 <sup>#</sup>	359	100

<sup>#</sup> Values “<1” are below the limits of detection levels for antimony

B

Leachable Arsenic, mg/Kg	Frequency	Percent of colour samples
<0.5 <sup>#</sup>	359	100

<sup>#</sup> Values “<0.5” are below the limits of detection levels for arsenic

C

Leachable Cadmium, mg/Kg	Frequency	Percent of colour samples
<0.1 <sup>#</sup>	348	96.9
0.1-1.0	6	1.7
1.1-2.0	4	1.1
...	...	...
3.1-4.0	1	0.3

<sup>#</sup> Values “<0.1” are below the limits of detection levels for cadmium

D

Leachable Chromium, mg/Kg	Frequency	Percent of colour samples
<0.2 <sup>#</sup>	356	99.2
0.2	1	0.3
0.3	1	0.3
...	...	...
0.5	1	0.3

<sup>#</sup> Values “<0.2” are below the limits of detection levels for chromium

## Appendix 3 continued

E

Leachable Lead, mg/Kg	Frequency	Percent
<0.1 <sup>#</sup>	340	94.7
0.1-1.0	16	4.5
1.1-2.0	2	0.6
2.0-3.0	1	0.3

<sup>#</sup> Values “<0.1” are below the limits of detection levels for lead

*The above tables show the frequencies in levels of leachable components of antimony, arsenic, cadmium, chromium and lead (along with its percentages of all samples) detected in the lipstick colour samples collected.*

*E.g.: All 359 of the tested lipstick colour samples had levels of leachable antimony less than the detectable 1 mg/Kg; 6 of the tested lipstick samples (accounting for 1.7% of all samples) had levels of leachable cadmium between 0.1 mg/Kg and 1.0 mg/Kg*

## Appendix 4 – Total compositions of colour samples collected containing heavy metals

Total Antimony, mg/Kg	Frequency	Percent
0-1	354	94.9
2-10	17	4.6
...	...	...
34	1	0.3
94	1	0.3

Total Arsenic, mg/Kg	Frequency	Percent
0.0-1.0	195	69.4
1.1-2.0	48	17.1
2.1-3.0	13	4.6
3.1-4.0	5	1.8
4.1-5.0	2	0.7
5.1-6.0	11	3.9
6.1-7.0	3	1.1
7.1-8.0	2	0.7
8.1-9.0	2	0.7

Total Cadmium, mg/Kg	Frequency	Percent
0.0-0.1	279	74.8
0.1-1.0	50	13.4
1.1-10.0	28	7.5
10.1-20.0	4	1.1
...	...	...
32.4	1	0.3
90.1-110.0	3	0.8
400-500	3	0.8
1930	1	0.3
2220	1	0.3
2670	1	0.3
3240	1	0.3
3390	1	0.3

## Appendix 4 continued

<b>Total Chromium, mg/Kg</b>	<b>Frequency</b>	<b>Percent</b>
0.0-1.0	92	26.9
1.1-2.0	51	14.9
2.1-3.0	27	7.9
3.1-4.0	19	5.6
4.1-5.0	12	3.5
5.1-10.0	52	15.2
10.1-20.0	28	8.2
20.1-100.0	53	15.5
100-230	8	2.3

<b>Total Lead, mg/Kg</b>	<b>Frequency</b>	<b>Percent</b>
0.0-1.0	102	32.5
1.1-2.0	96	30.6
2.1-3.0	26	8.3
3.1-4.0	22	7.0
4.1-5.0	10	3.2
5.1-10.0	23	7.3
10.1-20.0	7	2.2
20.1-100.0	9	2.9
101-200	8	2.6
201-890	11	3.5

<b>Total Mercury, mg/Kg</b>	<b>Frequency</b>	<b>Percent</b>
0.0-0.1	364	97.6
0.1-0.5	9	2.4

*The above tables show the frequencies in total compositions of antimony, arsenic, cadmium, chromium, lead and mercury (along with its percentages of all samples) detected in the lipstick samples collected.*

*E.g.: All 354 of the tested lipstick colour samples (accounting for 94.9% of all samples) had total compositions of antimony between 0 mg/Kg and 1 mg/Kg; 17 of the tested lipstick colour samples (accounting for 4.6% of all samples) had levels of leachable cadmium between 2 mg/Kg and 10 mg/Kg*