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HEAVY METAL HAZARD

The Health Risks of Hidden Heavy Metals in Face Makeup

MAY 2011

Acknowledgments

ENVIRONMENTAL DEFENCE gratefully acknowledges the generous support of our donors and the "*Just Beautiful*" Campaign Cabinet for making this report possible. We would also like to thank Jane Houlihan, MScE from the **Environmental Working Group** for her review of the data analysis, Lisa Archer, Mia Davis, Stacy Malkan and Heather Sarantis from the **Campaign for Safe Cosmetics** for their insight and suggestions, as well as the six Canadian women who volunteered information about the makeup they use for the purpose of creating this report:

Erin Charter
Meggin Dueckman
Andria Kurychak
Brittany Martyn
Nnedimma Nnebe
Beth Raymer

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About ENVIRONMENTAL DEFENCE

ENVIRONMENTAL DEFENCE inspires change by connecting people with environmental issues that affect their daily lives in their homes, workplaces and neighbourhoods.

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ENVIRONMENTAL DEFENCE
116 Spadina Avenue, Suite 300
Toronto, Ontario M5V 2K6

Visit **www.environmentaldefence.ca** for more information.

Table of Contents

Executive Summary

Heavy metals are in our face makeup, and consumers have no way of knowing about it.

ENVIRONMENTAL DEFENCE asked six women of various ages from across Canada to each identify five pieces of face makeup that they use regularly for testing.

ENVIRONMENTAL DEFENCE also identified five products for testing. The final 49 face makeup items tested included five foundations, four concealers, four powders, five blushes or bronzers, seven mascaras, two eye liners, 14 eye shadows, and eight lipsticks or glosses. These items were purchased from various locations in Toronto and then sent to SGS Canada Inc., an accredited laboratory in Lakefield, Ontario, where they were tested for the presence of heavy metals.

As a group, heavy metals can build up in the body over time and are known to cause varied health problems, which can include: cancer, reproductive and developmental disorders, neurological problems; memory loss; mood swings; nerve, joint and muscle disorders; cardiovascular, skeletal, blood, immune system, kidney and renal problems; headaches; vomiting, nausea, and diarrhea; lung damage; contact dermatitis; and brittle hair and hair loss. Many are suspected hormone disruptors and respiratory toxins, and for some like lead, there is no known safe blood level. (See Appendix A: More on Metals)

In terms of cosmetics, those put on lips may be ingested and some may be absorbed through the skin, especially broken skin.

The four metals of most concern for this testing were arsenic, cadmium, lead, and mercury. This is because they are banned as intentional ingredients in cosmetics, have draft limits as potential impurities in cosmetics, and are designated “toxic” in Canada because of health concerns. The eight metals of concern include the four above as well as beryllium, nickel, selenium, and thallium. In all cases but nickel, these metals are banned as intentional ingredients in cosmetics.

WHAT OUR TESTING FOUND

- **Seven of the eight metals of concern were found in 49 different face makeup items. On average, products contained two of the four metals of most concern and four of the eight metals of concern.**
- **Only one product, Annabelle Mineral Pigment Dust (Solar), was found to not contain a single metal of most concern. All products contained at least two metals of concern.**
- **Benefit Benetint Pocket Pal (Red Tint) contained the most metals of concern with seven of the eight metals detected.**
- **The Benefit Benetint lip gloss also contained the highest level of lead at 110ppm, over 10 times higher than the 10ppm limit set out in the *Health Canada Draft Guidance on Heavy Metal Impurities in Cosmetics.***
- **Five products — one foundation, two mascaras, and two lipsticks/tints/glosses — contained the second-most metals of concern as six of the eight metals were found.**
- **None of the heavy metals were listed on the product label.**

RESULTS AT A GLANCE

HEAVY METAL	% OF ITEMS WITH DETECTABLE METAL
Arsenic	20%
Cadmium	51%
Lead	96%
Mercury	0%
Nickel	100%
Beryllium	90%
Thallium	61%
Selenium	14%

Source: ENVIRONMENTAL DEFENCE testing of 49 different face makeup items from a total of 35 different face makeup products

The metals were found at levels ranging from the testing detection limit to 110 parts per million (ppm). Being less than the detection limit does not mean the substance is not present – there could indeed be nothing or there could be something too small to be measured.

There are scientific debates as to what constitutes "safe" levels of heavy metal exposure. Overall, the health effects of heavy metals from cosmetics absorbed through skin requires further investigation. Notably though, the highest levels of arsenic (70 ppm), cadmium (3 ppm), and lead (110 ppm) were all found in lip glosses which could be ingested. Some metals, such as arsenic, cadmium, and lead, can accumulate in a person's body over time. There is limited understanding of the effects of cumulative exposure to these metals.

All but nickel are banned as intentional cosmetic ingredients in Canada. However, as product impurities, their presence in cosmetics is not required to be on the label. Health Canada has a draft set of guidelines for some metal impurities that it considers "technically avoidable" by cosmetics companies (*Draft Guidelines on Heavy Metal Impurities in Cosmetics*), but progress on the guidelines has stalled, as they have remained in draft form for over two years. Only one product tested in this report did not meet those draft guidelines, however, these guidelines need to be amended to better reflect what is "technically avoidable." A study of 20 lipsticks conducted by the United States Food and Drug Administration showed lead impurity levels averaged 1.07 ppm, where Canada's current draft guideline for lead impurities is 10 ppm, which is considerably high by comparison. Thus, the highest lead concentration we found in our testing (110 ppm) is more than ten times the limit set out in Health Canada's draft guidelines at 10 ppm, and even this latter limit is nearly ten times higher than what the US FDA has proven to be technically avoidable, at 1.07 ppm (US FDA, 2009).

Some may wonder why heavy metals in our makeup measured in the parts per million are really a cause for concern; for some of these metals, science has not established a "safe" level of exposure. Cumulative exposure over time is especially difficult to study, as different combinations of exposures can have different effects, and the possible combinations are seemingly endless, given the

number of cosmetics products out there. Additionally, cosmetics are not the only source of exposure to many of these metals. Arsenic, for example, can be found in some drinking water, lead can be found in old paint, etc., and low-dose exposures can add up.

Eliminating elements like lead, cadmium, and chromium from the body takes over 40 years, with accumulation leading to problems such as nervous system disruption and kidney damage (Gondal, Seddigi, Nasr, & Gondal, 2009).

RECOMMENDATIONS —

People have the right to know what is in their products and to make their own decisions regarding safety.

Building on ENVIRONMENTAL DEFENCE, Campaign for Safe Cosmetics and Environmental Working Group's prior report (*Not So Sexy*) on harmful substances in fragrances, ENVIRONMENTAL DEFENCE has concluded that stronger federal regulations are needed to give consumers better peace of mind regarding their cosmetics.

These improvements should include:

1) **GUIDANCE ON HEAVY METAL IMPURITIES IN COSMETICS.**

   Canada should take cumulative exposure into account and improve the draft guidelines on impurities in cosmetics to better reflect what is technically avoidable, then officially adopt them without delay. These guidelines have been in the draft stage since March 2009.

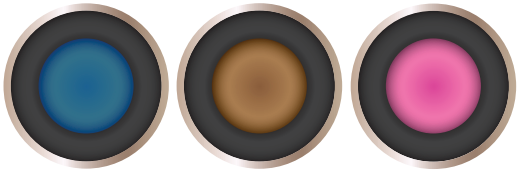
2) **A EUROPEAN-STYLE BAN ON HARMFUL AND RISKY SUBSTANCES.**

   Canada currently has a general ban on harmful substances in cosmetics and a cautious list ("the Hotlist") of substances it has singled out as concerning. Europe, on the other hand, has 5 annexes to their Cosmetics Regulation, classifying thousands of substances as permitted for certain uses (e.g. preservatives, UV filtration, colouring agents), restricted, or banned outright in cosmetics. Canada must follow Europe's lead and expand the Hotlist to include a ban on all substances banned in the European Union and substances known or suspected to be carcinogenic, mutagenic, reproductive toxicants, developmental toxicants, neurotoxicants, and hormone disruptors.

3) **COMPLETE AND PRIOR PUBLIC DISCLOSURE OF MATERIALS IN THE PRODUCTS.**

   Right now, the government doesn't even have to know what is in cosmetics and personal care products until after they are on store shelves. Even then, cosmetics companies are not obliged to report on the kinds of "impurities" found in this study. Manufacturers should be required to disclose all substances, intentional ingredients (including fragrance substances) and unintentional ingredients (including impurities), in their products without exception, and this information should be found on labels and be freely available online before products hit the market. The proposed US Safe Cosmetics Act of 2010 suggests that all ingredients, including those currently protected by trade secret laws (i.e. fragrance) unless protected as a trade secret by other laws, will have to be labeled on cosmetics. However, contaminants will not have to be labeled if present at levels below technically feasible detection limits (US Congress, 2010). It is recommended that Canada take a similar approach.

Introduction



Every day, our bodies are exposed to chemicals. Through the air we breathe, the water we drink, and the food we eat, we are exposed to harmful substances. We are also exposed to these via the personal care products we use. Canadians spend approximately $5.3 billion per year on cosmetics (Health Canada, 2006b). Environmental Working Group found that the average woman uses 12 products, containing a total of 168 unique ingredients, every day. Their study, *Exposures Add Up,* also showed that, through using these products on a daily basis, one in 13 women are exposed to ingredients that are known or probable human carcinogens, and one in 24 women are exposed to ingredients that are known or probable reproductive and developmental toxins, linked to impaired fertility or developmental harm for a baby in the womb or a child (Environmental Working Group, 2004).

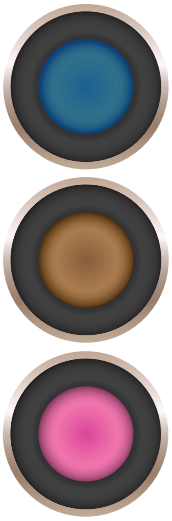
Numerous other studies have raised similar concerns. One study in Contact Dermatitis found 88 eye shadow colours from 49 different products revealed that 75 per cent of the colours contained more than five parts per million of at least one of lead, cobalt, nickel, chromium, and arsenic, and that 100 per cent of the products contained more than one part per million of at least one of those substances (Sainio, Jolanki, Hakala, & Kanerva, 2001). Testing conducted in the United States by the Campaign for Safe Cosmetics revealed that 61 per cent of the 33 brands of lipsticks contained lead, with levels of up to 0.65 parts per million. The higher-priced brands were not immune (The Campaign for Safe Cosmetics, 2007). Some of the brands with lead in them were identified on Canadian store shelves. The United States Food and Drug Administration also found lead in all the samples of lipstick that it tested, with levels ranging from 0.09 to 3.06 parts per million (US Food and Drug Administration, 2009). Health Canada found that 81 per cent of the samples of lipstick that it tested for lead had levels ranging from 0.079 to 0.84 parts per million, and that one lipstick contained 6.3 parts per million (Canwest News Service, 2008).

This is despite many metals being banned as intentional ingredients in cosmetics in Canada (Health Canada, 2010a). They are not banned as product impurities since their presence as such is considered unavoidable (Health Canada, 2009a). An impurity is a substance not intentionally added to a product, but rather is either a byproduct of the manufacturing process, formed by the breakdown of ingredients, or an environmental contaminant of raw ingredients (Environmental Working Group, 2006). The latter is the case for heavy metals, as their persistence in the environment and their natural presence in rocks, soil, and water cause them to be present in the manufacture of pigments and other raw materials used in various industries, including cosmetics (Health Canada, 2009a).

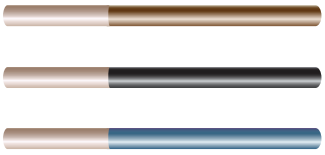
An Environmental Working Group analysis found that at least 146 cosmetic ingredients may contain harmful impurities linked to cancer and other serious health impacts and that 80 per cent of the 9,747 personal care products studied contain these potentially contaminated ingredients, including more than 80 per cent of all lip balms (EWG, 2006). According to this work, lead, arsenic, heavy metals, and mercury were estimated to be potential impurities in 3.6, 3.5, 2.6, and 1.9 per cent of products, respectively. An example of ingredients that may have lead and other heavy metal

impurities are D&C Red 6 and aluminum starch octenylsuccinate. An industry safety panel also has concerns over potential impurities for about one of every 10 ingredients assessed. A European government agency found carcinogenic impurities in 43 per cent of 128 products tested in 1998 (Environmental Working Group, 2006).

Following on the recent report that ENVIRONMENTAL DEFENCE, Campaign for Safe Cosmetics and Environmental Working Group released titled, *Not So Sexy: The Health Risks of Secret Chemicals in Fragrance* (2010), and earlier reports on pollution in Canadian adults, families, and politicians, ENVIRONMENTAL DEFENCE decided to test various types of face makeup used by six women across Canada for heavy metals. This report details what we found, and what can be done about it.



Summary



This project investigated and reported on the presence of heavy metals in various types of face makeup, including foundations, concealers, powders, blushes or bronzers, mascara, eyeliners, eye shadows, and lipsticks or glosses. For this project, six women from across Canada each identified five face makeup products that they use regularly and ENVIRONMENTAL DEFENCE identified another five products, so that a total of 35 face makeup products were purchased for testing. Given that some products had multiple parts (e.g., an eye shadow product may include three different and separate colours), a total of 49 different product items were tested for a total of eight different heavy metals. Twenty of the products were manufactured in the United States, ten were manufactured in Europe, four were manufactured in Canada, and one was manufactured in Korea. None of these metals were listed on the product label.

In total, seven of the eight metals of concern tested were found in the 49 face makeup items tested, but results varied for each product. While all eight of the metals of concern are associated with various health effects, arsenic, cadmium, and lead are of the most concern because they are deemed "toxic" in Canada due to their health effects (Environment Canada, 2010b), are banned as intentional ingredients in cosmetics (Health Canada, 2010a), and have draft limits as impurities in cosmetics (Health Canada, 2009a). While mercury is also considered "toxic" in Canada because of health concerns, it was not found in any of the products. Antimony, which has a draft guideline limit but is not considered "toxic" in Canada, was not part of the testing suite.

Of the chemicals of most concern, arsenic was detected in 20 per cent of the products, cadmium was detected in 51 per cent, lead was detected in 96 per cent, and mercury was found in none of the items tested. Other chemicals of concern – nickel, beryllium, thallium, and selenium – were found in 100 per cent, 90 per cent, 61 per cent, and 14 per cent of all items, respectively.

PRODUCT TYPE		PRODUCT/PRODUCT ITEM	Mercury	Arsenic	Beryllium	Cadmium	Nickel	Lead	Selenium	Thallium
Foundation (5 items total)	MOST	*Clinique Stay True Makeup (Stay Ivory)*		●	●	●	●	●		●
	LEAST	*Marcelle Satin Mousse Makeup (Natural Beige)*			●	●	●			●
Concealer (4 items total)	MOST	*Laura Mercier Secret Camouflage (Light)*		●	●	●	●	●		
	LEAST	*Laura Mercier Secret Camouflage (Dark)*			●	●	●	●		●
Powders (4 items total)	MOST	*Sephora Sculpting Powder Trio (Brown and Pink)*			●		●	●		●
	LEAST	*Mary Kay Mineral Powder Foundation (Bronze 2), Sephora Sculpting Powder Trio (Beige)*			●		●	●		
Blush/Bronzer (5 items total)	MOST	*MAC Sheerton Shimmer Blush (Springsheen), Physician's Formula Summer Eclipse Bronzing & Shimmery Face Powder (Bronze and Gold)*			●		●	●		●
	LEAST	*Quo Faux Glow Bronzing Powder (Sun Drenched), Sephora Sun Disk (01 Copper)*			●		●	●		
Mascara (7 items total)	MOST	*L'Oreal Bare Naturale (Black/Brown)* *Avon Astonishing Lengths (Black A01)*		● ●	● ●	● ●	● ●	● ●	 ●	●
	LEAST	*Maybelline Colossal Volum' Express Drenched)*					●	●		
Eye liner (2 items total)	ALL	*Fashion Flare Eye Liner Pencil (Midnight Black); Cover Girl Perfect Point Plus (Black Onyx)*			●	●	●	●		
Eye shadow (14 items total)	MOST	*Too Faced Eye Shadow Duo (I know what boys want - Grey), Almay Intense i-color Trio (02-Trio for Blues - Dark Grey), Almay Intense i-color Trio (02-Trio for Blues - Brown), The Body Shop Shimmer Cubes (Palette 16 – Midnight Black)*			●	●	●	●		●
	LEAST	*Annabelle Mineral Pigment Dust (Solar)*			●		●			
Lip tints/ glosses/sticks (8 items total)	MOST	*Benefit Benetint Pocket Pal (Red Tint)*		●	●	●	●	●	●	●
	LEAST	*Urban Decay XXX Shine Cooling Lipgloss (Guys Love Betsey)*			●		●	●		

Source: ENVIRONMENTAL DEFENCE testing of 49 different face makeup items from a total of 35 different face makeup products

Finding multiple metals in products was common. As for the metals of most concern, products contained an average of two of the four. Of all 49 products, only Annabelle Mineral Pigment Dust (Solar) was found to not contain a single metal of most concern. Eight products — 2 foundations, 2 concealers, 2 mascaras, and 2 lipsticks or glosses — were found to contain the most metals of most concern as three of the four metals were found in each.

Meanwhile, products contained an average of four of the eight metals of concern. All products contained at least two. Benefit Benetint Pocket Pal (Red Tint) was the product containing the most metals of concern, as seven of the eight metals were found. Another five products, one foundation, two mascaras, and two lipsticks or glosses, contained the second-most metals of concern as six of the eight metals were found.

HEAVY METAL	% Of Items	Average (µg/g)	ITEMS WITH THE MOST	Amount (µg/g = ppm)	Above Canada's Draft Impurity Limits
ARSENIC	20%	1.8	*1. Benefit Benetint Pocket Pal (Clear Gloss)*	70	YES
			2. Benefit Benetint Pocket Pal (Red Tint)	12	YES
			3. L'Oreal Bare Naturale Mascara (Black/Brown), Clinique Stay True Makeup Foundation (Stay Ivory), Avon Astonishing Lengths Mascara (Black A01)	1.2	NO
CADMIUM	51%	0.3	*1. NYX Mega Shine Lip Gloss (110 Cosmo)*	3.0	NO
			2. Cover Girl Perfect Point Plus Eyeliner (Black Onyx)	2.9	NO
			3. Cover Girl Ultimate Finish Liquid Powder Makeup (450 Creamy Beige (Cool))	0.9	NO
LEAD	96%	4.6	*1. Benefit Benetint Pocket Pal (Clear Gloss)*	110	YES
			2. Benefit Benetint Pocket Pal (Red Tint)	28	YES
			3. Avon Ultra Color Rich- Mega Impact Lipstick, SPF 15 (Pink Pop C01)	9.9	NO
MERCURY	ND*	N/A	*N/A*	N/A	N/A

*ND means the chemical was not detected in the product

Source: ENVIRONMENTAL DEFENCE testing of 49 different face makeup items from a total of 35 different face makeup products

Erin Charter

CITY ..... Toronto, Ontario
AGE CATEGORY 28

ERIN'S PRODUCTS —

1. FOUNDATION: Marcelle Satin Matte Mouse Makeup (Natural Beige)
2. FOUNDATION: Cargo One Base (03)
3. CONCEALER: Laura Mercier Secret Camouflage (SC-2; Light and Dark)
4. MASCARA: L'Oreal Voluminous Original (Black/Brown)
5. LIP COLOUR: Benefit Benetint Pocket Pal (Red Tint and Clear Gloss)

Metals of Concern Found in Erin's Cosmetics

METAL	Minimum (µg/g)	Maximum (µg/g)	Median (µg/g)	Average (µg/g)	% of Products Containing
Mercury	0	0	0	0	0%
Arsenic	0	70	0.6	12	71%
Beryllium	0	1.4	0.1	0.3	86%
Cadmium	0	0.8	0.4	0.4	86%
Nickel	2.4	230	17	55	100%
Lead	0	110	2.5	21	86%
Selenium	0	40	0	9.7	43%
Thallium	0	0.4	0	0.1	43%

Source: ENVIRONMENTAL DEFENCE testing of 7 different face makeup items from a total of 5 different face makeup products

ERIN'S REACTION TO THESE RESULTS → "The product that I spend the most money on, because I believed it was better for me, ended up being the worst out of everything tested! I'd like to have some indication of these ingredients on the label, so I could make informed choices. Or, better still, I'd like there to be rules to protect me from these chemicals so I don't need to worry so much."

Meggin Duekman

CITY ..... Vancouver, British Columbia
AGE CATEGORY 34

MEGGIN'S PRODUCTS —

1. POWDER: Sephora Sculpting Powder Trio (B01 and D20 and I20)
2. EYE SHADOW: Almay Intense i-colour Trio Eye shadow (02-Trio for Blues; Light Grey, Dark Grey, and Brown)
3. EYE SHADOW: Annabelle Mineral Pigment Dust (Solar)
4. MASCARA: L'Oreal Bare Naturale Mascara (Black/Brown)
5. LIP GLOSS: NYX Mega Shine Lip Gloss (110 Cosmo)

Metals of Concern Found in Meggin's Cosmetics

METAL	Minimum (µg/g)	Maximum (µg/g)	Median (µg/g)	Average (µg/g)	% of Products Containing
Mercury	0	0	0	0	0%
Arsenic	0	1.2	0	0.1	11%
Beryllium	0.02	8.0	0.4	1.3	100%
Cadmium	0	3.0	0	0.4	44%
Nickel	3.9	22	9.3	10	100%
Lead	0	8.5	0.4	1.6	89%
Selenium	0	0	0	0	0%
Thallium	0	2.2	0.1	0.3	78%

Source: ENVIRONMENTAL DEFENCE testing of 9 different face makeup items from a total of 5 different face makeup products

MEGGIN'S REACTION TO THESE RESULTS → "It makes me sick to realize that these chemicals and metals are in the products that I apply to my body. I feel that I am a careful consumer - and prefer to do research on personal care products before buying them. I normally read product labels as well. Despite this, the makeup that I have chosen to use (besides the eyeshadow) all contain ingredients that I would avoid. It makes me sad and angry to think that my son was also exposed to these chemicals and metals through my breast milk, and my unborn second child has also been exposed to them. This cycle will only continue unless something is done to better regulate personal care products."

Andria Kurychak

CITY ..... Toronto, Ontario
AGE CATEGORY 33

ANDRIA'S PRODUCTS:

1. CONCEALER: MAC Studio Finish Concealer (NC20)
2. BLUSH: MAC Sheerton Shimmer Blush (Springsheen)
3. BRONZER: Quo Faux Glow Bronzing Powder (Sun Drenched)
4. EYE SHADOW: Too Faces Eye Shadow Duo (I Know What Boys Want; Pink and Grey)
5. LIP GLOSS: Urban Decay XXX Shine (Guys Love Betsey)

Metals of Concern Found in Andria's Cosmetics

METAL	Minimum (µg/g)	Maximum (µg/g)	Median (µg/g)	Average (µg/g)	% of Products Containing
Mercury	0	0	0	0	0%
Arsenic	0	0.6	0	0.1	17%
Beryllium	0	1.2	0.2	0.4	83%
Cadmium	0	0.4	0	0.1	33%
Nickel	0.3	14	7.8	7.2	100%
Lead	0.2	2.2	1.0	1.1	100%
Selenium	0	0	0	0	0%
Thallium	0	0.2	0	0.1	50%

Source: ENVIRONMENTAL DEFENCE testing of 6 different face makeup items from a total of 5 different face makeup products

ANDRIA'S REACTION TO THESE RESULTS → "It's scary to realize that the stuff in these 'beauty' products is actually damaging and dangerous. It's even scarier to realize it's legal."

Brittany Martyn

CITY ..... Halifax, Nova Scotia
AGE CATEGORY 21

BRITTANY'S PRODUCTS:

1. POWDER: Maybelline Mineral Powder (Light Ivory Classic)
2. BRONZER: Sephora Sun Disk (01 Copper)
3. MASCARA: Almay One Coat Nourishing Mascara Lengthening (Black/brown)
4. EYE LINER: Cover Girl Perfect Point Plus (Black Onyx)
5. EYE SHADOW: Gosh Quattro Eye Shadow (Q24 Platinum (White, Silver, Light Grey, and Dark Grey)

Metals of Concern Found in Brittany's Cosmetics

METAL	Minimum (µg/g)	Maximum (µg/g)	Median (µg/g)	Average (µg/g)	% of Products Containing
Mercury	0	0	0	0	0%
Arsenic	0	0	0	0	0%
Beryllium	0.01	0.7	0.4	0.4	100%
Cadmium	0	2.9	0	0.4	38%
Nickel	6.9	160	12	34	100%
Lead	0.04	1.5	0.3	0.6	100%
Selenium	0	0	0	0	0%
Thallium	0	0.4	0.1	0.1	63%

Source: ENVIRONMENTAL DEFENCE testing of 8 different face makeup items from a total of 5 different face makeup products

Nnedimma Nnebe

CITY ..... Montreal, Quebec
AGE CATEGORY 20

NNEDIMMA'S PRODUCTS:

1. POWDER: Mary Kay Mineral Powder Foundation (Bronze 2)
2. CONCEALER: MAC Studio Finish Concealer (NW45 Bronze)
3. EYE LINER: Fashion Flair Eye Liner (Midnight Black)
4. MASCARA: Maybelline New York Great Lash Mascara (Very Black)
5. MASCARA: Maybelline New York Colossal Volum' Express (Classic Black/Very Black)

Metals of Concern Found in Nnedimma's Cosmetics

METAL	Minimum (µg/g)	Maximum (µg/g)	Median (µg/g)	Average (µg/g)	% of Products Containing
Mercury	0	0	0	0	0%
Arsenic	0	1.0	0	0.2	20%
Beryllium	0	0.2	0	0.1	40%
Cadmium	0	0.8	0	0.2	40%
Nickel	7.8	43	30	26	100%
Lead	0.1	1.2	0.9	0.7	100%
Selenium	0	1.2	0	0.2	20%
Thallium	0	0	0	0	0%

Source: ENVIRONMENTAL DEFENCE testing of 5 different face makeup items from a total of 5 different face makeup products

NNEDIMMA'S REACTION TO THESE RESULTS → "The amount of lead and cadmium in the cosmetics surprises me. As an undergraduate in environmental toxicology I study most of these metals pretty closely and I am somewhat shocked that they are present in my cosmetics."

Beth Raymer

CITY ..... Toronto, Ontario
AGE CATEGORY 52

BETH'S PRODUCTS:

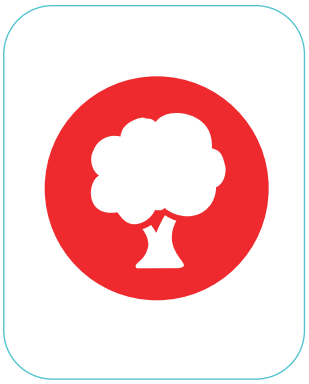
1. FOUNDATION: Clinique Stay True Makeup (Stay Ivory)
2. MASCARA: Avon Astonishing Lengths Mascara (Black A01)
3. LIPSTICK: Avon Ultra Color Rich-Mega Impact Lipstick SPF 15 (Pink Pop C01)
4. LIPSTICK: Revlon Super Lustrous Lipstick (245 Smoky Rose)
5. LIPSTICK: Estée Lauder Pure Color Long Lasting Lipstick (1A3 Maraschino)

Metals of Concern Found in Beth's Cosmetics

METAL	Minimum (µg/g)	Maximum (µg/g)	Median (µg/g)	Average (µg/g)	% of Products Containing
Mercury	0	0	0	0	0%
Arsenic	0	1.2	0	0.5	40%
Beryllium	0.03	4.0	1.5	1.7	100%
Cadmium	0.02	0.8	0.3	0.4	100%
Nickel	10	160	12	43	100%
Lead	1.5	9.9	3.4	5.1	100%
Selenium	0	1.4	0	0.5	40%
Thallium	0	0.9	0.5	0.4	80%

Source: ENVIRONMENTAL DEFENCE testing of 5 different face makeup items from a total of 5 different face makeup products

BETH'S REACTION TO THESE RESULTS → "I was surprised in particular that 100% of my cosmetics tested included lead, which would have included the foundation and mascara. And a 40% arsenic rate (evidently in two of the products) was similarly not encouraging. Coincidentally, I've been thinking of putting in another makeup order through a catalogue, but will instead be taking another look at my neighbourhood health-food shop for cosmetics recommendations."



ENVIRONMENTAL DEFENCE Choices

CITY ..... Toronto, Ontario
AGE CATEGORY ..... N/A

PRODUCTS —

1. FOUNDATION: Cover Girl Ultimate Finish Liquid Powder Makeup (240 Cream Beige (Cool))
2. BLUSH: Physician Formula Summer Eclipse Bronzing and Shimmery Face Powder (Moonlight and Light Bronzer)
3. MASCARA: Rimmel The Max Volume Flash (Black 001)
4. EYE SHADOW: The Body Shop Shimmer Cubes (Palette 16: Midnight Black, Dawn Pink, Dusk Pink, and Moonlight Silver)
5. LIPSTICK: Revlon ColorStay Ultimate Liquid Lipstick (001 Perfect Peony)

Metals of Concern Found in ENVIRONMENTAL DEFENCE'S Cosmetics

METAL	Minimum (µg/g)	Maximum (µg/g)	Median (µg/g)	Average (µg/g)	% of Products Containing
Mercury	0	0	0	0	0%
Arsenic	0	0	0	0	0%
Beryllium	0.03	2.2	1.5	1.3	100%
Cadmium	0	0.9	0	0.1	33%
Nickel	2.1	20	8.6	9.9	100%
Lead	0.4	3.7	2.9	2.5	100%
Selenium	0	1.2	0	0.1	11%
Thallium	0	0.6	0.3	0.3	89%

Source: ENVIRONMENTAL DEFENCE testing of 9 different face makeup items from a total of 5 different face makeup products

SECTION 2 — **WHAT DO THE RESULTS MEAN?**

So what? There are metals in our makeup measured in the parts per million – is that really a cause for concern? Well, for some of these metals, science has not established a "safe" level of exposure. Cumulative exposure over time is especially difficult to study, as different combinations of exposures can have different effects, and the possible combinations are seemingly endless, given the number of cosmetics products out there. In other words, even trace amounts may be of concern, because it all adds up.

As a group, heavy metals can build up in the body over time and are known to cause varied health problems, which can include: cancer, reproductive and developmental disorders, neurological problems; memory loss; mood swings; nerve, joint and muscle disorders; cardiovascular, skeletal, blood, immune system, kidney and renal problems; headaches; vomiting, nausea, and diarrhea; lung damage; contact dermatitis; and brittle hair and hair loss. Many are suspected hormone disruptors and respiratory toxins, and for some like lead, there is no known safe blood level. (See Appendix A: More on Metals)

Additionally, cosmetics are not the only source of exposure to many of these metals. Arsenic, for example, can be found in some drinking water, lead can be found in old paint, etc., and low-dose exposures can add up. Eliminating elements like lead, cadmium, and chromium from the body takes over 40 years, with accumulation leading to problems such as nervous system disruption and kidney damage (Gondal, Seddigi, Nasr, & Gondal, 2009). Down-the-drain disposal of personal care products containing heavy metals may also lead to ground water contamination (Ayenimo, Yusuf, & Adekunle, 2010).

Recent testing from the Canadian Health Measures Survey (CHMS) Cycle 1 (2007-2009) has revealed that the majority of Canadians carry a host of heavy metals as well as other chemicals in their bodies. The following chart outlines some of the CHMS findings and focuses on the levels of heavy metals in blood for over 5,300 people even if an element was also detected in urine, and the levels found in urine in those cases where levels in blood were not measured (Health Canada, 2010b).

Arsenic, cadmium, lead, mercury, beryllium, selenium (excluding selenium sulfide), and thallium are all banned from being intentionally added to cosmetics in Canada. But, there are no accepted standards for impurities in cosmetics. Health Canada has drafted guidelines for some heavy metals, but they have remained in the draft stage since March 2009. According to the chart below that outlines the Health Canada draft limits, heavy metal impurity concentrations above the levels listed are considered to be technically avoidable (Health Canada, 2009a). These limits are considered to be safe based on the World Health Organization's Provisional Tolerable Daily Intakes (WHO, 2006).

HEAVY METAL	% OF CANADIANS AGED 6-79 WITH A DETECTABLE LEVEL	ARITHMETIC MEAN	MEDIUM
Antimony	77.6	0.08	Urine
Arsenic	92.76	1.41	Blood
Cadmium	97.09	0.77	Blood
Copper	100	927.91	Blood
Lead	99.98	1.66	Blood
Manganese	100	9.68	Blood
Mercury (Total)	88.36	1.42	Blood
Molybdenum	99.91	0.76	Blood
Nickel	93.31	0.75	Blood
Selenium	100	204.01	Blood
Uranium	6.98	--	Blood
Vanadium	9.63	--	Urine
Zinc	100	6.44	Blood

Source: Data from and derived from using % less than the limit of detection the Canadian Health Measures Survey (CHMS) Cycle 1 (2007-2009)

Source: Total blood mercury comprises both inorganic and organic mercury (Health Canada, 2010b)

HEAVY METAL	CANADA DRAFT IMPURITY LIMITS FOR COSMETICS (ppm = μg/g)
Lead	10
Arsenic	3
Cadmium	3
Mercury	3
Antimony	5

Source: Health Canada Draft Guidance on Heavy Metal Impurities in Cosmetics

However, there is a difference between what is safe and what is technically avoidable. Take lead for instance. The United States Food and Drug Administration (FDA) conducted its own analyses of lead impurities in lipstick that show lead impurities much lower than 10 ppm are feasible. Of the 20 lipsticks tested, the highest amount of lead content was 3.06 ppm and the lowest was a mere 0.09 ppm, while the average was 1.07ppm (US FDA, 2009). Therefore, levels above these should be considered technically avoidable, and Canada's draft guidelines could and should be lowered to reflect this. According to the above draft Canadian guidelines, manufacturers are only considered able to technically avoid lead levels greater than 10 ppm in cosmetics. Health Canada considers this and the other limits to provide a high level of protection to susceptible subpopulations (e.g., children) (Health Canada, 2009a). But lead levels of 10 ppm or less are not necessarily safe. According to the United States Centers for Disease Control (CDC) (2010), there is no known safe blood lead level; even the current "low" levels of exposure in children are associated with neurodevelopmental deficits (Bellinger, 2008). The CDC has even gone so far as to recommend that parents avoid using cosmetics on their children that could be contaminated with lead (Centers for Disease Control and Prevention, 2009).

The CDC has even gone so far as to recommend that parents avoid using cosmetics on their children that could be contaminated with lead (Centers for Disease Control and Prevention, 2009).

There is also reason to be concerned about arsenic and cadmium. Arsenic and its inorganic compounds, and cadmium and its compounds are considered human carcinogens (International Agency for Research on Cancer, 2010). Inorganic arsenic compounds and inorganic cadmium compounds are also considered carcinogenic and substances "for which there is believed to be some chance of adverse health effects at any level of exposure" in Canada (Environment Canada & Health Canada, 1993; Environment Canada & Health Canada, 1994a).

Information suggests that heavy metals, including arsenic, cadmium and lead, can be absorbed through skin (Health Canada, 2009a), but inhalation and ingestion tend to be the major contributors to heavy metals in humans. See Appendix A for further details about each metal.

It's also important to note, that different routes of exposure to a single metal may lead to different health effects. In the case of nickel, high levels of exposure can lead to health effects depending on route and the kind of nickel exposed to (Health Canada, 2010b). And in the case of arsenic, long-term exposure through inhalation includes some skin effects, circulatory and peripheral nervous disorders, an increased risk of lung cancer (Agency of Toxic Substances and Disease Registry, 2007a), and a possible increase in the risk of gastrointestinal tract and the urinary system cancers (Gibb & Chen, 1989), but long-term skin contact is not likely to lead to any serious internal effects (Agency of Toxic Substances and Disease Registry, 2007a). Overall, the health effects of heavy metals from cosmetics absorbed through skin, especially over time, requires further investigation.

The health effects for exposure via ingestion are better known. Notably, the highest levels of arsenic (70 ppm), cadmium (3 ppm), and lead (110 ppm) were all found in lip glosses, which could be ingested.

The health effects for exposure via ingestion are better known. Notably, the highest levels of arsenic (70 ppm), cadmium (3 ppm), and lead (110 ppm) were all found in lip glosses, which could be ingested. These levels are all above their respective maximum acceptable concentrations for drinking water in Canada (whereby 1 ppm = 1 mg/L). Arsenic is above the acceptable impurity ingestion limit of 0.1 ppm for foods (Health Canada, 2009a). The highest lead concentration is more than ten times the limit set out in Health Canada's draft guidelines at 10 ppm, and even this latter limit is nearly ten times higher than what the US FDA has proven to be technically avoidable, at 1.07 ppm (US FDA, 2009).

Unfortunately, it is unknown whether or not more can be done during manufacturing to reduce impurities. There is only the possibility of this being the case. To expand, the 2009 draft lead, arsenic, cadmium, and antimony impurity limits for Canada are more stringent than those of Germany's limits, which were made in 1985 (Health Canada, 2009a). This suggests that, with time, the ability of manufacturers to technically reduce impurities can and has changed. Interestingly, the German technically avoidable limit for mercury is 1 ppm while the Canadian draft limit is 3 ppm. While mercury was not found in any of the products tested, this Canada-Germany limit comparison suggests that reducing mercury impurity levels to those less than 3 ppm is possible. Given that impurities may be unavoidable, Europe and Canada have both acknowledged the importance of manufacturing practices to ensure impurity levels in cosmetics are safe (Health Canada, 2009a; European Commission Joint Research Centre Institute for Health and Consumer Protection).

Some companies are also moving towards plant-based colorants and away from petroleum- or coal tar-based colorants to avoid some raw material contaminants. Others are asking their suppliers to screen for contaminants and source the least contaminated ingredients possible. In the United States, manufacturers may purchase ingredients certified by an independent organization called United States Pharmacopeia that may contain lower levels of harmful impurities (Environmental Working Group, 2006) and there is some evidence that industry actions have reduced the levels of some impurities over the past 25 years (Matyska, Pesek, & Yang, 2000). Regardless, it is clear that impurities still exist.

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SECTION 3 — **WHAT SHOULD BE DONE?**

Heavy metals are in our face makeup. While not intentionally added, they remain unlabelled on products and we therefore unknowingly put them on our eyes, face, and lips. The good news is that none of the products tested contained mercury and some products contained lower levels of heavy metals of concern than others. But, consumers have no way of knowing short of sending face makeup to a lab for testing if their products contain metal impurities, and at what levels. The amounts applied to the skin or lips each day might be small, but exposures via cosmetics and elsewhere can add up over time, something regulatory and standard-setting agencies often do not consider.

In Canada, cosmetics fall under control of the Food and Drugs Act. Section 16 of this Act states that the sale of any cosmetic that "has in or on it any substance that may cause injury to the health of the user when the cosmetic is used" is to be prohibited (Department of Justice, 2008). The federal government has a list (called the *Hotlist*) of restricted and prohibited intentional ingredients in Canadian cosmetics to help manufacturers make sure that they are not selling such products (Health Canada, 2010a). However, the *Hotlist* does not apply to impurities (or byproducts).

Cosmetics are also regulated under the Act's Cosmetic Regulations. Currently under these, cosmetics and personal care products are allowed on the market prior to manufacturers telling the federal government what is in them. In fact, manufacturers and importers are only required to submit a list of ingredients and their concentrations to Health Canada up to 10 days after the product is on the market (Department of Justice Canada, 2007). When disclosure finally does take place, companies are not required to report on impurities. This means that product purity is up to the industry with manufacturers being left to decide whether to use ingredients with more or less impurities (Environmental Working Group, 2006). Under the regulations, companies are also required to list all intentional ingredients, with some exceptions (e.g., those ingredients making up "fragrance") on cosmetics and personal care products. This includes those used in salons.

In fact, manufacturers and importers are only required to submit a list of ingredients and their concentrations to Health Canada up to ten days after the product is on the market (Department of Justice Canada, 2007).

Canada also has *Draft Guidance on Heavy Metal Impurities.* While still in draft form, it represents Health Canada's most current guidance to industry on this issue, and serves as the point of reference for compliance and enforcement purposes. A framework document and recommendations for lead and mercury as trace contaminants is also being worked on internationally by the International Cooperation on Cosmetic Regulation, "an international group of cosmetic regulatory authorities from Canada, the European Union, Japan, and the United States" (US Food and Drug Administration, 2010).

Though it is clear Health Canada is taking strides to deal with this issue, strengthened federal cosmetics regulations are needed to give consumers peace of mind regarding their cosmetics.

These improvements should include:

1) **GUIDANCE ON HEAVY METAL IMPURITIES IN COSMETICS.**

   Canada should take cumulative exposure into account and improve the draft guidelines on impurities in cosmetics to better reflect what is technically avoidable, then pass them without delay. These guidelines have been in the draft stage since March 2009.

2) **A EUROPEAN-STYLE BAN ON HARMFUL AND RISKY SUBSTANCES. CANADA NEEDS TO FOLLOW EUROPE BY HAVING A MORE COMPREHENSIVE LIST OF PROHIBITED OR RESTRICTED SUBSTANCES THAT HAS CLEAR LEGAL AUTHORITY.**

   Canada currently has a general ban on harmful substances in cosmetics and a cautious list ("the Hotlist") of substances it has singled out as concerning. Europe, on the other hand, has 5 annexes to their Cosmetics Regulation, classifying thousands of substances as permitted for certain uses (e.g.: preservatives, UV filtration, colouring agents), restricted, or banned outright in cosmetics. These include many carcinogens, mutagens, and reproductive toxicants (European Commission, 1976; European Commission, 2009) not on Canada's Hotlist. Canada must follow Europe's lead and expand the Hotlist to include a ban on all substances banned in the European Union, and substances known or suspected to be carcinogenic, mutagenic, reproductive toxicants, developmental toxicants, neurotoxicants, and hormone disruptors.

3) **COMPLETE AND PRIOR PUBLIC DISCLOSURE OF MATERIALS IN THE PRODUCTS.**

   Right now, the government doesn't even have to know what is in cosmetics and personal care products until after they are on store shelves. Even then, cosmetics companies are not obliged to report on the kinds of "impurities" found in this study. Manufacturers should be required to disclose all substances, intentional ingredients (including fragrance substances) and unintentional ingredients (including impurities), in their products without exception, and this information should be found on labels and be freely available online before products hit the market. The proposed US Safe Cosmetics Act of 2010 proposes that all ingredients, including those currently protected by trade secret laws (i.e. fragrance) unless protected as a trade secret by other laws, will have to be labeled on cosmetics. However, contaminants will not have to be labeled if present at levels below technically feasible detection limits (US Congress, 2010). It is recommended that Canada take a similar approach.

Be "JUST BEAUTIFUL"

In addition to joining ENVIRONMENTAL DEFENCE in calling for better regulations, what can consumers do in the meantime? One-time use of face makeup highlighted in this report may not cause harm. But cosmetics and personal care products are used repeatedly and in combination with other consumer products that can also contain hazardous chemicals. Research by government agencies, academia and independent organizations finds widespread human exposure to multiple chemicals (CDC 2009); we are all regularly exposed to various toxic chemicals from our air, water, food and household products. People can also be exposed to the same chemical from multiple sources. Here's what you can do to protect yourself, your loved ones and future generations from unnecessary exposure to toxic chemicals in personal care products:

1) **CHOOSE SAFER PRODUCTS.**
   It's unfortunately impossible to tell if the face makeup you are using contains heavy metals by reading the label unless you know exactly which ingredients may contain a heavy metal impurity (e.g., D&C Red 6 and aluminum starch octenylsuccinate). You can, however, visit our website, **www.environmentaldefence.ca** and use our pocket shopping guide or use EWG's Skin Deep database, **www.safecosmetics.org** to help you identify safe products.

2) **LESS IS BETTER.**
   If you are very attached to your product, consider eliminating other products from your routine or use makeup less often.

3) **HELP PASS SMARTER, HEALTH-PROTECTIVE LAWS.**
   Buying safer products is a great start, but we can't just shop our way out of this problem. In order for safer products to be widely available and affordable for everyone, we must pass laws that shift the entire industry to non-toxic ingredients and safer production. Ask that Health Canada be given the authority and resources it needs to ensure the safety of cosmetics by visiting **www.justbeautiful.ca**.

4) **DEMAND THAT COSMETICS COMPANIES FULLY DISCLOSE INGREDIENTS AND SUPPORT THOSE THAT DO.**
   Tell cosmetics companies that you want them to fully disclose the ingredients in the products they make – including impurities. You can find companies' toll-free customer hotlines on product packages and online, and calling them only takes a moment. We've provided some helpful talking points on our heavy metal report fact sheet, which you can find online at **www.justbeautiful.ca**. Companies need to hear from you, the potential customer – you have the power to vote with your dollars! In the meantime, support companies that fully disclose product impurities.

APPENDIX A — **MORE ON METALS**

ARSENIC

Arsenic is a metal that naturally occurs in the earth's crust and may enter water sources naturally (Agency of Toxic Substances and Disease Registry, 2007a). However, it is used in various products including textiles, preservatives, and pigments (Health Canada, 2010b) and released to the environment through metal production, use of pesticides, burning fossil fuels, particularly coal, and waste disposal (Environment Canada & Health Canada, 1993). Humans are mostly exposed via food, but other sources include drinking water, soil, ambient air (Environment Canada & Health Canada, 1993), house dust (Rasmussen, Subramanian, & Jessiman, 2001), and cigarette smoking (Schneider & Krivna, 1993). It was found at a maximum of 2.3 ppm in a study on its presence in 88 different colours of eye shadow (Sainio et al., 2001).

Ingested arsenic compounds are readily absorbed in the gastrointestinal tract and distributed throughout the body, including to developing fetuses (Environment Canada & Health Canada, 1993), and can mostly be found in the liver, kidneys, lungs, spleen, and skin within 24 hours (Health Canada, 2010b). Humans are suggested to rid 50 per cent of arsenic from the body between two and 40 days later, although it will tend to accumulate in skin and hair over time (Environment Canada & Health Canada, 1993). Arsenic may also be inhaled (Environment Canada & Health Canada, 1993) or absorbed via the skin, although an US FDA study has predicted that dermal exposure to arsenic may contribute less than 1 per cent of the exposure from ingestion (Health Canada, 2009a).

Arsenic and its inorganic compounds are considered to be "carcinogenic to humans" by the International Agency for Research on Cancer (IARC) (International Agency for Research on Cancer, 2010) and are considered "toxic" in Canada because of their carcinogenicity (Environment Canada & Health Canada, 1993). In humans, the lethal dose is estimated to be between 50 to 300 mg (or 0.8 to 5 mg/kg-bw) of arsenic trioxide (Environment Canada & Health Canada, 1993).

The ingestion of drinking water with very high arsenic levels have been suggested to increase the risk of cancer in internal organs like the bladder, liver, and lungs (Health Canada, 2006a) (Agency of Toxic Substances and Disease Registry, 2007a). Long-term exposure via ingestion has also been associated with skin cancer, skin thickening or discolouration (Environment Canada & Health Canada 1993), decreased blood cell production, blood vessel damage, feet and hand numbness, nausea and diarrhea (Health Canada, 2006a). According to a single study with a small number of participants, it may also impair the immune system (Environment Canada & Health Canada, 1993). Long-term exposure through inhalation includes some of the skin effects, circulatory and peripheral nervous disorders, an increased risk of lung cancer (Agency of Toxic Substances and Disease Registry, 2007a), and a possible increase in the risk of gastrointestinal tract and the urinary system cancers (Gibb & Chen, 1989). Long-term skin contact is not likely to lead to any serious internal effects (Agency of Toxic Substances and Disease Registry, 2007a).

Canada and other countries have imposed certain limits on arsenic levels for drinking water and food. In Canada, the maximum acceptable concentration (MAC) is 0.010 mg/L for drinking water, while the acceptable oral ingestion limit for arsenic impurities is 0.1 ppm for foods (Health Canada, 2009a). It is also limited it to 1000 mg/kg in paints or other coatings used on toys and other children's products (Health Canada, 2009c). The United States Pharmacopoeia (USP) has limited it as an impurity to 3 ppm in nutritional supplements and the US FDA has limited to <3 ppm in certain colourants (Health Canada, 2009a).

CADMIUM

Cadmium also occurs naturally in the environment. Some of its presence in the environment is the result of natural processes such as forest fires, volcanic emissions, and weathering of soil and bedrock, but it is mostly the result of human activities, particularly metal production, fuel burning, transportation, solid waste disposal, and sewage sludge application (Environment Canada & Health Canada, 1994a). Canadians are mostly exposed via food, but also drinking water, air, consumer product releases, occupational exposures, and smoking (Environment Canada & Health Canada, 1994a; Health Canada, 2010b). Cadmium from body and hair creams can also be absorbed into the human body through dermal contact (Ayenimo et al., 2010). It is mostly used to make nickel-cadmium batteries, but is also used in pigments, including those for ceramic glazes, polyvinyl chloride (PVC) plastics, and industrial coatings (Environment Canada & Health Canada, 1994a).

Cadmium is absorbed into the body, accumulating in the kidney and the liver, although it can be found in almost all adult tissues (Elinder, 1985). The total amount absorbed by humans has been estimated to be between 0.2 and 0.5 µg/day (Health Canada, 2010b), with absorption via skin estimated to be 0.5 per cent (Health Canada, 2009a). Little absorbed cadmium is eliminated (Health Canada, 2010b) with humans getting rid of 50 per cent of cadmium from the body 10-12 years after exposure (Lauwerys, Bernard, Roels, & Buchet, 1994; Amzal et al., 2009).

Cadmium and cadmium compounds are considered to be "carcinogenic to humans" by the IARC (International Agency for Research on Cancer, 2010) and are considered "toxic" in Canada because their carcinogenicity and environmental effects (Environment Canada & Health Canada, 1994a). It and its compounds are also classified as known human carcinogens by the United States Department of Health and Human Services (Agency of Toxic Substances and Disease Registry, 2008).

The chemicals of concern in this report have different statuses in terms of being "toxic" in Canada (i.e., being listed on the List of Toxic Substances) and/or banned as intentional ingredients cosmetics.

Metal	Toxic Substances List Status	Cosmetic Ingredient Hotlist Status
Arsenic	Toxic	Banned
Cadmium	Toxic	Banned
Lead	Toxic	Banned
Mercury	Toxic	Banned
Beryllium	No	Banned
Nickel	Toxic*	No
Selenium	No	Banned**
Thallium	No	Banned

* not because of health concerns

** excluding selenium sulfide

Source: (Environment Canada, 2010b; Health Canada, 2010a)

Oral exposure to high levels of cadmium has led to severe stomach irritation, leading to (Agency of Toxic Substances and Disease Registry, 2008) vomiting and diarrhea, while exposure to lower levels over time has been found to cause kidney damage, bone deformity, and the ability of bones to break easily (Environment Canada & Health Canada, 1994a; Agency of Toxic Substances and Disease Registry, 2008). Meanwhile, breathing cadmium has been associated with lung cancer in humans exposed occupationally and in rats (Agency of Toxic Substances and Disease Registry, 2008a). There is evidence of increased mortality due to lung and prostate cancer after the inhalation of cadmium over a long period of time in various occupational settings (Environment Canada & Health Canada, 1994a). Lower levels over time in the workplace or general environment have also been shown to result in kidney dysfunction (Environment Canada & Health Canada, 1994a). Acute ingestion and inhalation can lead to skin and eye irritation (Environment Canada & Health Canada, 1994a). Cadmium has also been shown to "exert significant effects on ovarian and reproductive tract morphology" even with extremely low doses. Exposure during pregnancy is being associated with decreased birth weights and premature birth (Henson & Chedrese, 2004).

The established MAC for cadmium in drinking water is 0.005 mg/L (Federal-Provincial-Territorial Committee on Drinking Water, 2008). It is also limited to 1000 mg/kg in paints or other coatings used on toys and other children's products (Health Canada, 2009c). The USP has determined an acceptable oral limit for nutritional supplements to be 0.09 μg/kg bw/day to 3 ppm (Health Canada, 2009a).

LEAD

Lead, like other metals, occurs naturally in the earth's crust (Health Canada, 2009b). While a little may enter the environment from natural processes (e.g., erosion), human industrial activities such as metal smelters or refineries are responsible for the majority of its presence in the environment (Health Canada, 2010b). Lead has been and continues to be used extensively, particularly in the making of lead-acid batteries (Environment Canada, 2010a), however it is also used to make lead shot and fishing weights, sheet lead, solder, some brass and bronze products, pipes, professional paints (other than paints for use by children), some ceramic glazes, dyes in paints and pigments, medical equipment (e.g., radiation shields), scientific equipment, and military equipment (Agency of Toxic Substances and Disease Registry, 2007b). Lipstick can become contaminated with lead via the use of contaminated raw materials or via the use of pigments that contain lead (Campaign for Safe Cosmetics, 2007). The level of lead was less than 20 ppm in all products in a study on its presence in 88 different colours of eye shadow (Sainio et al., 2001), and it was also found in 61 per cent of the 33 brands of lipsticks tested by the CSC (The Campaign for Safe Cosmetics, 2007), 100 percent of lipsticks tested by the US FDA (US Food and Drug Administration, 2009), and 81 per cent of the samples of lipstick tested by Health Canada (Canwest News Service, 2008).

While lead exposure in Canada has decreased since the 1970's, everyone is exposed to trace amounts through air, soil, household dust, food, drinking water and various consumer products (Environment Canada, 2010a). If lead is ingested, adults will absorb about 10 per cent into blood while children will absorb about 40 to 50 per cent (Ziegler, Edwards, Jensen, Mahaffey, & Fomon, 1978; Agency of Toxic Substances and Disease Registry, 2007b; Health Canada, 2009b) and of the 30 to 50 per cent of available particulate matter that is inhaled, adults will absorb 80 per cent (Health Canada, 2009b). Skin contact with lead occurs every day, and the

routine handling of inexpensive jewelry containing high levels can transfer lead to the skin (Agency of Toxic Substances and Disease Registry, 2007b). Some lead has been found to be absorbed through the skin (Health Canada, 2009a) and dermally absorbed lead has been evidenced to be distributed throughout the body (Rastogi & Clausen, 1976; Lilley et al., 1998). The Agency of Toxic Substances and Disease Registry (ASTDR) suggests that not much can be absorbed through the skin (Agency of Toxic Substances and Disease Registry, 2007b). The use of leaded eye powders (e.g., surma, kohl, alkol) has been associated with elevated blood-lead levels in children and women (Ali, Smales, & Aslam, 1978; Healy, Harrison, Aslam, Davis, & Wilson, 1982; Sprinkle, 1995; Bruyneel, De Caluwé, des Grottes, & Collart, 2002; Al-Ashbanab, Aslama, & Shahb, 2004), but this is most likely through the rubbing of the eyes and then licking of the fingers or via the tear duct (Sprinkle, 1995). Cosmetic lead poisoning has been recognized (Sprinkle, 1995).

In the body, lead will either accumulate in tissues, especially bone, but also in the liver, kidneys, pancreas, and lungs (Health Canada, 2010b). Pregnant women and young children are particularly vulnerable because lead can cross the placenta with ease and enter the fetal brain (Campaign for Safe Cosmetics, 2007). Lead can also be transferred to infants via breastfeeding (Agency of Toxic Substances and Disease Registry, 2007b) and lead stored in bone serves source of fetal lead exposure (Rothenberg et al., 2000). After immediate exposure, humans are able to get rid of 50 per cent of the lead within two to six weeks (Health Canada, 1992), but it takes 25 to 30 years to get rid of 50 per cent of lead that has accumulated in the body over time (Agency of Toxic Substances and Disease Registry, 2007b; Health Canada, 2007).

While the good news is that none of the products tested were found to contain mercury, a metal associated with long-term neurological effects and effects on developing fetuses (Health Canada, 2010b), according to EWG's Skin Deep database, it is a possible impurity in 1.9 per cent of products (Environmental Working Group, 2006), including lip gloss, lip liner, eye liner, brow liner, moisturizer, mascara, baby lotion, lipstick, and eye shadow (Environmental Working Group, 2010b).

No safe blood level of lead is known (Centers for Disease Control and Prevention, 2010), with even the lowest levels having shown to affect the fetus and the central nervous system in children (Sprinkle, 1995). Small amounts are recognized as being hazardous to human health (Environment Canada, 2010a). Infants, toddlers, children, fetuses, and pregnant women are most susceptible to its chronic low-dose effects (Health Canada, 2009a; Health Canada, 2010b). Chronic low-level exposure may affect the kidneys, cardiovascular system, blood, immune system, and especially the central and peripheral nervous systems (Agency of Toxic Substances and Disease Registry, 2007b). IQ deficits have been associated with high blood lead levels (Agency of Toxic Substances and Disease Registry, 2007b), including those of low-levels (Sprinkle, 1995). Lead exposure has also been linked to miscarriage, hormonal changes, reduced fertility in men and women, menstrual irregularities, delays in puberty onset in girls (Campaign for Safe Cosmetics, 2007), memory loss, mood swings, nerve, joint and muscle disorders, cardiovascular, skeletal, and kidney and renal problems (Environmental Working Group, 2010a). Lead and inorganic lead compounds have been classified as possibly and probably carcinogenic to humans, respectively (International Agency for Research on Cancer, 2010). It was also one of the first substances to be considered "toxic" in Canada (Environment Canada, 2010a). High-level acute exposures can cause vomiting, diarrhea, convulsion, coma, and death (Health Canada, 2007).

In Canada, lead is restricted in gasoline and controlled from the release from secondary lead smelters and steel mills (Health Canada, 2010b). It is also restricted in surface coatings (e.g., paints), including those used on toys (to 600 mg/kg total lead), children's jewellery (to no

more than 600 mg/kg total lead and 90 mg/kg migratable lead), kettles, and glazed ceramics and glassware (Health Canada, 2010c).

On November 29, 2010 the Minister of Health announced that new regulations and amendments will restrict the amount of lead in a variety of consumer products even further (Health Canada, 2010d). According to reports, it will be limited to 90 mg/kg total lead in toys for children under three and in products that could come into contact with users' mouths, with the exception of food and food utensils (Health Canada, 2010c; Schmidt, 2010). As it is considered a "toxic" substance in Canada, toys, equipment, and other products for use by children are also subject to a general prohibition (Health Canada, 2010c). The MAC for Canadian drinking water is 0.010 mg/L (10 μg/L) (Health Canada, 2010b).

NICKEL

Nickel is naturally occurring and may be an essential element in humans (Environment Canada & Health Canada, 1994b). It is used in everything from metal coins and jewellery, to heat exchangers, batteries, and ceramic colouring, in addition to many other applications (Environment Canada & Health Canada, 1994b). Unsurprisingly given its abundance, everyone is exposed to small amounts, mostly through food, although also through air, drinking water, soil, household dust, and skin contact with products containing it, including cosmetics (Agency of Toxic Substances and Disease Registry, 2005; Health Canada, 2010b). Fetal exposures can also occur and it can also be passed to breast-fed infants (Agency of Toxic Substances and Disease Registry, 2005). High levels of exposure can lead to health effects depending on route and the kind of nickel exposed to (Health Canada, 2010b). While certain types of nickel ("oxidic", "sulphidic", and "soluble" nickel) were considered to be "toxic" because of concern to health due to carcinogenicity, and in some cases, effect on the environment in Canada, metallic nickel was not considered a concern for human health (Environment Canada & Health Canada, 1994b) (Environment Canada & Health Canada, 1994b). However, metallic nickel and alloys have been classified as possibly carcinogenic to humans (International Agency for Research on Cancer, 2010). Also, allergy to nickel is common and it can cause severe contact dermatitis (Health Canada, 2010b), with it being one of the most common causes of such (Sainio et al., 2001). Ten years ago, the first case of nickel allergy caused by eye shadow was reported and it has been reported that even 1 ppm may trigger a pre-existing allergy (Sainio et al., 2001).

BERYLLIUM

Beryllium occurs naturally as an essential constituent of about 40 minerals (Christie & Brathwaite, 1999), with bertrandite and beryl being mined commercially. (Agency of Toxic Substances and Disease Registry, 2002). It is used to make alloys (metals mixtures) that are subsequently used in electronics, certain construction materials, automobiles, sports equipment (e.g., golf clubs), and specialty ceramics (Agency of Toxic Substances and Disease Registry, 2002). Individuals are exposed via food, air, and water, but direct exposure via consumer products is generally unlikely (Agency of Toxic Substances and Disease Registry, 2002). Beryllium is most harmful when inhaled as little is absorbed via ingestion and it does not tend to enter the body via the skin unless the skin is scraped or cut (Agency of Toxic Substances and Disease Registry, 2002). When breathed, it can lead to lung damage following acute and long-term exposure resulting in Acute Beryllium Disease and Chronic Beryllium Disease (CBD), respectively. IARC has also classified it

as being carcinogenic to humans (International Agency for Research on Cancer, 2010). When applied to broken skin, it may cause ulcers or rashes (Agency of Toxic Substances and Disease Registry, 2002).

THALLIUM

Thallium exists naturally in the earth's crust in trace amounts (Agency of Toxic Substances and Disease Registry, 1992). However, although it is rare, its presence is widespread and humans are exposed mostly via food, but also air, water, and skin (Agency of Toxic Substances and Disease Registry, 1992). It is gaining importance in the technology fields, with it currently being used mostly in the making of electronics (Agency of Toxic Substances and Disease Registry, 1992). However, it may also be used to make special glasses, certain medical procedures, fireworks, dyes and pigments (Agency of Toxic Substances and Disease Registry, 1992). While there is little data on the effects of long-term exposure to small amounts, some data from the mining industry suggests that chronic exposure has lead to headaches, anorexia, pain in the arms, thighs, and abdomen (Peter & Viraraghavan, 2005). Acutely inhaling large amounts may lead to neurological effects such as numbness of fingers and toes and nail dystrophy and ingestion has been shown to cause vomiting, diarrhea, and temporary hair loss (Agency of Toxic Substances and Disease Registry, 1992). Thallium intoxication can also occur via the skin (Peter & Viraraghavan, 2005). A dose as low as 1 gram can be fatal (Agency of Toxic Substances and Disease Registry, 1992).

SELENIUM

Selenium occurs naturally too (Health Canada, 2010b), and is also an essential nutrient required for the maintenance of good health (Agency of Toxic Substances and Disease Registry, 2010). It is used in various electrical applications, as well as a colourizing and decolourizing agent for glass and to develop red, orange, and maroon pigments for ceramics, glazes, plastics, enamels, and paints, with the latter generally restricted because of its toxicity (Health Canada, 2010b). It may also be found in stainless steel, enamels, inks, rubber, pesticides, fungicides, batteries, explosives, and some therapeutic shampoos (e.g., anti-dandruff) or lotions (e.g., anti-fungal) (Health Canada, 2010b). Canadians are thus exposed via consumer products, but also via air, drinking water, soil, and mostly food (Health Canada, 2010b). High levels of exposure over time can cause brittle hair and hair loss, brittle and deformed nails, and neurological abnormalities (Agency of Toxic Substances and Disease Registry, 2010). In rats selenium has been shown to have reproductive effects (e.g., decreased sperm counts, increase abnormal sperm levels, reproductive cycle change) (Agency of Toxic Substances and Disease Registry, 2010). Meanwhile high acute levels of exposure can result in nausea, vomiting, and diarrhea (Health Canada, 2010b), with skin contact causing rashes, redness, heat, swelling, and pain (Agency of Toxic Substances and Disease Registry, 2010).

This report only investigated the presence of heavy metal impurities, but that's not to say that there aren't other possible impurities in cosmetics. Cancer-causing chemicals such as formaldehyde and 1,4-dioxane have been found hidden in bath products for babies and children (Campaign for Safe Cosmetics, 2009) and hormone-disrupting chemicals have been found hidden in fragrances (Sarantis, Naidenko, Gray, Houlihan, & Malkan, 2010). And unfortunately, that's not all. The EWG has identified that at least 146 cosmetic ingredients may contain harmful impurities (Environmental Working Group, 2006).

APPENDIX B — **RESEARCH METHODOLOGY**

ENVIRONMENTAL DEFENCE identified six females from across Canada and asked each of them to identify five face makeup products that they use regularly and share the products' name, stated colour, place of manufacture, size, and frequency of use with ENVIRONMENTAL DEFENCE. ENVIRONMENTAL DEFENCE also identified five products that it was interested in having tested. Following this, the identified face makeup, or its closest equivalent if an identified product was no longer available, was purchased new from various locations or individuals in Toronto, Ontario in the summer of 2010. These locations included Shoppers Drug Mart, Sephora, MAC, the Bay, PharmaPlus, and The Body Shop.

The purchased face makeup was then tagged with an identification number, with those products containing multiple parts (e.g., an eye shadow with three different and separate colours) receiving sub-identifiers such as a), b), c), etc. Each product (or multiple part where such was the case) was tested for a total of 8 different heavy metals. Thus, while 35 face makeup products were purchased, a total of 49 items were tested.

ENVIRONMENTAL DEFENCE asked SGS Canada Inc., an accredited laboratory in Lakefield, Ontario to conduct the analysis for heavy metals. SGS Group is a global company that was established in Canada 1948 and currently has more than 20 locations across the country. Consumer product testing is performed in accordance with ANSI, Canadian (CGSB) Standards, and CSA (SGS Canada Inc. 2010).

METHODOLOGY FOR LABORATORY ANALYSIS

The samples were pre-ashed in a muffle furnace at 550˚C to remove organic materials. A portion of the residue was sub-sampled and digested in a high pressure microwave system using hydrofluoric acid (HF), nitric acid (HNO3) and hydrochloric acid (HCl). The acid digested samples were then brought to 50 ml final volume with deionized water and analyzed by ICP-OES and ICP-MS for metals. All results were back calculated and reported on an as received basis in μg/g.

METHODOLOGY FOR DATA ANALYSIS

Raw data was received from SGS Canada Inc. and analyzed by ENVIRONMENTAL DEFENCE. The final values for all 49 items tested within this report were derived by making all raw values less than the detection limit equal to 0. Following this, the lab blank values were subtracted from all of the values. Any value less than 0 was then made equal to 0 for the purpose of calculating the average, etc.

APPENDIX C — **PERCENTAGE OF PRODUCTS CONTAINING TESTED HEAVY METALS OF CONCERN**

HEAVY METAL	MAXIMUM (µg/g)	AVERAGE (µg/g)	% OF ITEMS
Arsenic	70	1.8	20%
Cadmium	3	0.3	51%
Lead	110	4.6	96%
Mercury	0	0	0%
Nickel	230	25.1	100%
Beryllium	8.0	0.8	90%
Thallium	2.2	0.2	61%
Selenium	40	1.48	14%

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environmental
defence
INSPIRING CHANGE

116 Spadina Avenue, Suite 300
Toronto, Ontario M5V 2K6
tel 416 323-9521 fax 416 323-9301
email info@environmentaldefence.ca
www.environmentaldefence.ca