

# “Overexposed, Underinformed”<sup>1</sup>: Nail Salon Workers and Hazards to Their Health / A Review of the Literature



## INTRODUCTION

While some attention has been paid in recent years to the risks of exposures to hazardous chemicals in consumer products, and to the effects of certain chemicals on children's health, there has been little sustained attention to occupational and environmental sources of exposure, especially among vulnerable populations. Included in those vulnerable populations are women who work in certain service occupations.

Workers in nail salons<sup>2</sup> — almost exclusively women - are exposed daily to the many hazardous chemicals routinely found in the polishes, removers, gels, shellacs, disinfectants and adhesives that are staples of their work. Some of these chemicals have recognized or probable links to a range of health conditions, both acute and chronic, such as cancer, respiratory, neurological and dermatological problems, as well as reproductive harms and harms to developing fetuses. Some of these chemicals may also alter the body's normal hormonal functions. Women who receive cosmetic services in nail salons are exposed to under-regulated chemicals on every visit; the women who work there are exposed daily.

Given the growth in the nail salon industry in Canada (IBISWorld, 2014), the relative lack of scientific research about this group of workers, as well as the absence of concerted attention by varying levels of government to address the health issues posed

<sup>1</sup> This term was used as a sub-heading in the 10-minute video, “Toxic Trio” made by the California Healthy Nail Salon Collaborative (<https://www.youtube.com/watch?v=oZqinwSz0Tg>). We are grateful to the Collaborative for their guidance and for providing a model for Canadians to consider in making nail salons healthier places in which to work.

<sup>2</sup> The terms “nail salon workers”, “nail technicians”, “manicurists” and “cosmetologists” are used interchangeably throughout this review.

by these exposures are of concern. Fortunately, however, the recent engagement of a number of health and research organizations in this issue is intended to fill some gaps.<sup>3</sup>

To add to the now growing interest in the study of this population, the National Network on Environments and Women's Health (NNEWH) examined the existing literature on the health of nail salon workers, with a particular focus on the effects of endocrine-disrupting chemicals.

This literature review builds on a body of work undertaken by NNEWH in recent years which has focused on women's everyday exposures to toxic substances in the workplace.<sup>4</sup> It is also informed by a community forum held by NNEWH in April 2014<sup>5</sup> that helped identify where there is consensus – and where there are gaps – in the literature. The forum also drew attention to the critical need for policy action research and underlined the importance of directly involving the community affected in that research.

This report comprises a scoping review of available research and includes both academic and “grey” literature. It presents what we found, but does not include an assessment of the quality of this evidence. It is intended to contribute to a growing base of knowledge that will improve conditions for those working in the nail salon industry and those using its services to better protect and promote their health and well-being. While our current interest is focused on nail salon workers in the Greater Toronto Area (GTA), our review of the literature is not limited to information exclusive to this geographical jurisdiction.

## BACKGROUND/CONTEXT (WOMEN AND OCCUPATIONAL HEALTH AND SAFETY)

Individuals are reported to be more likely to suffer a serious injury or disease from their work than they are from travelling in a car or from a crime of violence (Bohle and Quinlan, 2000). Nevertheless, research on occupational health and safety is a comparatively new field of study, and research on women in occupations even newer.

*“Occupational health science and interventions have not often been about women. There is legislation on the length of the workday, but none for the combination of paid and unpaid work. There are standards for how much weight a stevedore can lift and how often, but none for how many shirts a woman can sew on a shift. There is a threshold limit value for exposure to asbestos for miners, but no limit to the number of insults a receptionist may hear per hour without a break.”* (Messing, 1998, p xiv)

Women in certain occupations, such as cosmetology, are particularly under-studied even though they may be at special risk of workplace harm.

Many nail salon workers in the Greater Toronto Area (GTA), for example, are recent immigrants to Canada, speak limited English and lack an understanding of and access to regulatory and health systems that may affect their work and their lives<sup>6</sup>. David (2014) notes that nail technicians in Toronto who emigrated from China have usually learned how to do nails on the job and without formal training. Most (in Canada and elsewhere)

<sup>3</sup> Work in recent years in Ontario has been undertaken by Central Toronto Community Health Centres, Environmental Defence, the Ontario Lung Association, the Centre for Research Expertise in Occupational Disease at the Dalla Lana School of Public Health (University of Toronto), the Occupational Cancer Research Centre at Cancer Care Ontario, and Motherisk.

<sup>4</sup> See Brophy, Keith et al (2012), for their work on women's exposures to EDCs and carcinogens in plastics manufacturing in the automobile sector, putting women at an increased risk for breast cancer: <http://www.nnewh.org/overview.php?section=4>

<sup>5</sup> For a podcast of the event: <http://www.cwhn.ca/en/node/46338/>

<sup>6</sup> Quach et al (2012-1) notes that Vietnamese make up the majority of nail salon workers in the United States and “are drawn to this profession because it does not require long training or high English proficiency”(p.2). It is assumed – though not confirmed – that this same reasoning accounts for the high proportion of immigrant workers in nail salons in Canada.

earn low incomes and work in non-unionized environments. Market researchers for potential investors note that, “the level of regulation is low, permitting easy entry by new operators.” (IBISWorld, 2014) An investigative journalist with the *Globe and Mail* who did research on nail salon workers in 2012 found that women working in this industry in Toronto did not want to be interviewed about their health for fear of repercussions stemming from their immigration status or from their nail salon owners (Balkissoon, 2012). This provides one reason for the many references to these women as “a vulnerable group of workers”.

Cancers resulting from occupational exposures in women is an under-studied area in health research. Cancers and occupational exposures have been studied more extensively in men (e.g., Hodgson and Darnton [2000] on lung cancer and mesothelioma in asbestos workers, LeMasters et al's review of multiple myeloma, non-Hodgkin lymphoma and prostate cancer in male firefighters), as have the effects of some lifestyle factors such as tobacco smoke and diet. But attention to the myriad of environmental and occupational agents that can contribute to new cases of cancer among women each year is not evident (Clapp, 2013). Any serious cancer prevention program must take into account the role of hazardous exposures in environmental and occupational settings, and not just focus on individual-level lifestyle risk factors.

## AN OVERVIEW: HEALTH HAZARDS IN NAIL SALONS

As with many services and products they purchase, consumers often assume that nail salons and the products used in nail salons must be safe. Unfortunately, this is not the case. The chemicals found in most of the products commonly used in nail salons have only begun to be tested in humans<sup>7</sup> and most products carry no labelling of chemicals contained within<sup>8</sup>. Nor are their uses seriously monitored or regulated. This is despite a small but growing body of research that has explored possible links between nail technicians' work and its effects on their respiratory, dermatological, neurological, and reproductive health.

Tye Arbuckle, an epidemiologist at Health Canada with environmental health expertise, has made some observations relevant to nail salon workers in her research. For example, “most of the research on chemical absorption has focused on the dermal route” versus other routes of absorption – GI tract, respiratory tract, eyes, urogenital tract, parenteral and transplacental” (Arbuckle, 2005, p. 199). She also points to research that found dermal absorption of certain chemicals was two-fold greater in female than in male rats. Sex hormones can play a role in the extent of absorption.

Arbuckle has also noted that “either directly or indirectly, sex hormones (estradiol in females and testosterone in males) appear to be involved in male:female differences in transport of chemicals” (Arbuckle 2005, p.200). This is worth keeping in mind in view of the fact that the vast majority of nail

<sup>7</sup> For example, Health Canada's Chemicals Management Plan (CMP) website notes: regarding phthalates: “More research is needed into the possible effects that phthalates may have on people. The science on these chemical substances is constantly evolving, and although they are found in the environment, we need to know more about whether the levels at which they are found are affecting the health of Canadians” (<http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/phthalates-eng.php>); regarding formaldehyde, the CMP notes: “The focus of the human health assessment is airborne exposure, due primarily to the lack of representative data on concentrations in media other than air and limited data on effects following ingestion.” (<http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/psl2-lsp2/formaldehyde/index-eng.php#a02>); regarding toluene, the CMP notes “Therefore, on the basis of available data, toluene is not considered to be “toxic” as interpreted under paragraph 11(c) of CEPA”. (<http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/psl1-lsp1/toluene/index-eng.php#ove>) Note that this analysis did not include studies in occupational settings, nor did it evaluate its endocrine-disrupting properties.

<sup>8</sup> “The Consumer Packaging and Labelling Act and Regulations govern only those cosmetic products sold to consumers. It does not govern cosmetics applied by cosmeticians, hairdressers, and so on, to their clients (unless such persons sell the cosmetics to their clients as prepackaged products).” (<http://www.hc-sc.gc.ca/cps-spc/pubs/indust/cosmetics-cosmetiques/index-eng.php#one2>)

salon workers are women, and some research on chemicals does not differentiate between effects on male and female subjects.

A review of this literature revealed that workers in hair salons have been studied more than manicurists alone.<sup>9</sup> Because manicurists are also found within beauty salons, they are sometimes studied together. More often than not, studies do not distinguish between hairdressers and manicurists or their specific tasks (Quach et al, 2010).

### **Air quality and respiratory issues**

Many products used in nail salon contain chemicals that are very volatile, meaning that they evaporate into the air at room temperature, and can subsequently be inhaled by nail salon workers and customers. In addition, a considerable amount of dust is produced when artificial nails are filed and this, if left airborne, can be inhaled by staff and customers. Certain chemicals of concern in nail salons (e.g. methyl methacrylate and formaldehyde) also enter the body primarily through inhalation. Respiratory problems are exacerbated by inadequate ventilation in salons (Marlowe et al, 2012).

Exposure to irritants in the work setting can bring on a respiratory illness where it did not previously exist and/or exacerbate symptoms in someone already ill (Lung Association of Ontario, 2012). These conditions include asthma and Reactive Airway Dysfunction Syndrome (RADS). Because workers in nail salons tend to work in the industry for many years, their continued exposure to irritants is of special concern because continued exposure can exacerbate a respiratory condition. Unfortunately, there are no data available on the number of workers who develop symptoms or who leave the industry because their respiratory illness was getting

worse. However, a report from the Lung Association of Ontario notes, "The costs of unmanaged work-related asthma are high for both employers and employees." (p.12)

Roelofs et al (2007) studied Vietnamese nail salon workers in the Boston area and found that breathing problems and nasal symptoms were not uncommon. In a study by Reutman et al (2009) the authors examined lung function and a marker of airway inflammation, i.e., exhaled nitric oxide, studying nail technicians and control participants in a pilot health assessment. Job latency, acrylic gel contact (specifically methyl methacrylates and ethyl methacrylates) hours and current smoking were all associated with airway inflammation.

### **Dermatological issues**

Exposure to a range of chemicals used in nail salon products can lead to skin irritation and skin diseases such as irritant contact dermatitis (ICD), allergic contact dermatitis (ACD), urticaria (hives) and angioedema (like hives but where swelling occurs under the skin). These chemicals include formaldehyde (found in some polishes) and acetone and alcohol (used in nail polish removers). Acrylates (methyl methacrylates and ethyl methacrylates) used in the creation of acrylic nails, have also been linked to ACD when there is direct contact with the substance (Minamoto, 2014).

More recently, there has been concern about the potential harms of UV lamps used in salons to dry polishes and harden acrylic nails, especially the harms for clients. The wattage used in these lamps can vary significantly, with different wattages producing different amounts of UV radiation. One source notes that "as few as 8 visits using higher wattage lamps may produce enough UV exposure to cause skin damage".<sup>10</sup>

<sup>9</sup> This observation was also made in a recent (November 2014) American review of health effects on salon workers carried out by the not-for-profit organization, Women's Voices for the Earth ("Beauty and Its Beast: Unmasking the Impacts of Toxic Chemicals on Salon Workers").

<sup>10</sup> Skin Cancer Foundation. <http://www.skincancer.org/prevention/uva-and-uvb/nails>. Accessed August 29, 2014.



In one study of Korean nail salon workers compared with a matched control group of office workers (Park et al, 2014) 92% of salon workers complained of eye irritation, significantly higher than the control group.

### Reproductive issues

Research has been done on the health issues relating to chemical exposures for nail salon workers in pregnancy and on the problems in the offspring of women who work in nail salons. This body of research is small but is growing.

Pregnancy is often a time when salon workers seek advice about their chemical exposures (Wright and Quint, 1989) and may represent a teachable moment, for example by public health departments, for educating around this issue.

Major concern has focused on chemicals used in nail salon products that are endocrine disruptors; animal research has established a clear link to reproductive problems in the offspring of animals exposed in utero. For example, two studies found that the levels of dibutyl phthalate, a chemical of key concern in nail salon products, were higher in the blood of nail salon workers than in members of the general population. (Hines, 2009; Kwapniewski, 2008). A study by Garlantezec (2009) found that women exposed to solvents used in products common in hair salons – and which are also used in nail salons – had offspring with higher rates of birth defects than expected, with these problems including oral clefts, urinary malformations and male genital malformations. As well, studies by Savitz and Shy (1994), and Herdt-Losavio et al (2009) have found that cosmetologists are at higher risk for having spontaneous abortions (miscarriages) and low birth weight babies. The work of Herdt-Losavio et al (2009) also showed that cosmetologists were twice as likely as a comparator group (realtors) to experience postpartum hemorrhage and for their newborns to require intubation.

### Carcinogenic compounds

*“The fact that cosmetic products are largely unregulated contributes to inadequate product labelling and limited safety information for cosmetology workers, which may in turn lead to higher exposure....the presence of numerous chemical compounds in beauty salons is likely to be continuous and mixed, the synergistic effects of which is largely unknown.”* (Quach et al, 2010, p. 692)

Known carcinogens used in products commonly found in nail salons include titanium dioxide, formaldehyde, benzoyl peroxide and 1,4-dioxane (Quach, 2010; Rudel et al, 2007). Furthermore, acetone, toluene, paraben and dibutyl phthalates, which are found in a number of nail products, are known endocrine disruptors and raise concern about their possible risks for causing cancers that may be hormonally influenced, such as ovarian and breast cancer (see more below on endocrine disrupting chemicals).

Quach et al (2010) used California state cosmetology licensee records and cancer surveillance files from 1988 to 2005 to see if there were any associations between cosmetologists or manicurists and cancer. Acknowledging the limitations in the demographic information available to them, the researchers did not find evidence of an excess of cancer cases in this population. This contrasts with previous research that did show increased cancer risks in professions where similar chemicals were used. Quach et al did, however, note that a “the healthy worker effect”<sup>11</sup> might have a role in their study and pointed out the need for more research in this population.

Some studies of hairdressers (keeping in mind that they have been studied as a group more extensively and they are exposed to some of the same chemicals as manicurists) have shown an increased

<sup>11</sup> “...a bias in which workers usually exhibit a lower rate of illness compared with that of the general population because people who are sick are more likely to be excluded from employment” (Quach et al, 2010, p. 696)

incidence of specific cancer sites, including bladder (Dryson, 2008), ovarian (Pukkala et al, 1992), non-Hodgkin's lymphoma (Robinson, 1999), lung (Menck et al, 1977) and uterine (Singleton et al, 1989).

## EXPOSURE TO EDCS<sup>12</sup> IN NAIL SALONS

*"No exposure to these chemicals can be considered safe."* Theo Colborne cited in Ginty (2014).

Certain chemicals are capable of disrupting or "tricking" a variety of functions in the body that are connected to the endocrine system. Included in the human endocrine system are all the glands that secrete hormones into the blood and which are then carried to all parts of the body where they can affect all cells, organs, and processes with a role in human growth and development. Endocrine-disrupting chemicals (EDCs), by interfering with normal processes, can have developmental, carcinogenic, mutagenic, immunotoxicological, and neurotoxic effects. Consequently, EDCs have been implicated in a wide range of diseases and health conditions. They are of specific concern in considering the health of nail salon workers because some popular cosmetic products they use routinely contain endocrine-disrupting chemicals.

A key feature distinguishing EDCs from other toxic compounds is that they can be harmful even at very low concentrations in contrast with conventional toxicology where most often "the dose makes the poison". Thus, even low doses of endocrine disrupting chemicals can contribute to the development of breast cancer.<sup>13</sup> Because this challenges traditional thinking about toxins and human health, and because EDCs are ubiquitous,

regulating this class of chemicals (even having them classified as such) has been difficult the world over.

EDCs are found in a range of nail salon products: toluene in nail polishes; acetone in nail polish remover; and parabens and phthalates also in nail polishes (Quach 2010).

## THE TOXIC TRIO

The chemicals of greatest concern in nail products have been referred to as The Toxic Trio. Chemicals found in products that are used in nail salons that have endocrine-disrupting effects can be categorized as volatile solvents – including formaldehyde and toluene – or as semi-volatile solvents, including phthalates (Quach, 2012). While these solvents are the major concerns, many other volatile compounds are found in nail salon products, raising questions about the combined or synergistic effects of a mix of exposures.

### Toluene

Toluene, a known endocrine disrupting chemical<sup>14</sup>, is a colourless liquid. It acts as a solvent and is used in many nail products to reinforce colour and to form a smooth finish on the nail. It has a "sweet, pungent, benzene-like odour"<sup>15</sup> and is rapidly absorbed when inhaled. Although most research has focused on the inhalation of toluene, it can also pass through the skin and into the bloodstream.<sup>16</sup>

Workplace studies have demonstrated that toluene has reproductive effects – including an increased



<sup>12</sup> For definitions and a comprehensive review of the latest scientific research on EDCs, see the website of The Endocrine Disruption Exchange – TEDx, a U.S.-based organization that focuses on health problems caused by low-dose exposure to toxic chemicals. [www.endocrinedisruption.com](http://www.endocrinedisruption.com)

<sup>13</sup> Estrogen is a significant promoter of breast cancer (Clemons and Goss, 2001).

<sup>14</sup> Agency for Toxic Substances and Disease Registry <http://www.caslab.com/Endocrine-Disruptor-Chemical-List/>; Accessed November 23, 2014.

<sup>15</sup> Health Canada: Environmental and Workplace Health. <http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/toluene/index-eng.php> Accessed September 22, 2014.

<sup>16</sup> Agency for Toxic Substances and Disease Registry. <http://www.atsdr.cdc.gov/PHS/PHS.asp?id=159&tid=29>. Accessed September 13, 2014.

risk of spontaneous abortions.<sup>17</sup> It is also an irritant to the eyes, nose and throat and at high exposures can be toxic to the kidneys and liver.<sup>18</sup> It can be transmitted through the placenta to a fetus as well as to a baby through breast milk (Gorman and O'Connor, 2007). Taking note of some of these associations, a Public Health Statement from the United States Agency for Toxic Substances and Disease Registry warns that “low to moderate, day-after-day exposure in your workplace can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, and loss of appetite. These symptoms usually disappear when exposure is stopped. You may experience some hearing and color vision loss after long-term daily exposure to toluene in the workplace.”<sup>19</sup>



## Phthalates

Phthalates are a group of chemicals with demonstrated endocrine-disrupting properties in animals<sup>20</sup>. These chemicals are used primarily to make plastics softer and more flexible and are found in a wide range of products – from children's toys to shower curtains. They are also used in nail polish, perfumes, and skin moisturizers, and can also be found in the outer coating on medicines and in the tubing used in medical devices.

There are a number of different phthalate formulations, and the most common in cosmetics are dibutyl phthalates (DBP) (Koo, 2004). Phthalates are incorporated into nail products as solvents and plasticizers and to strengthen the longevity of a polish

application (i.e. to hold colour and to prevent chipping). Animal research has found particular problems in the male offspring of exposed mammals. When exposure to phthalates occurs during the phase of fetal development when sexual differentiation happens, malformations of the reproductive tract can occur (Foster, 2005, E.L. Gray, 2000, Swan, 2005). Phthalates are also known to trigger asthma. (ChemHAT.org)

In Canada, phthalates are explicitly regulated only in soft vinyl articles for children; their use in the Canadian cosmetics industry is largely unregulated. One phthalate – diethylhexylphthalate (DEHP) - was reviewed in 1994 as part of Health Canada's Priority Substance List and when it was found that it “may enter the environment in a quantity or concentration or under conditions that may constitute a danger in Canada to human health”<sup>21</sup>, it was added to Health Canada's Cosmetic Ingredient Hotlist. However, this is not a phthalate used in nail salon products and those that are, in particular DBP, are not on the Hotlist and remain unregulated.

## Formaldehyde

Formaldehyde, a known carcinogen<sup>22</sup>, is commonly used as a preservative. In nail products, it functions as a nail hardener and for creating a smooth finish on the nail. It is an eye, nose, and throat irritant and can lead to coughing and wheezing. Repeated exposure can lead to a skin condition known as dermatitis.

McNary & Jackson (2007) studied the amount of formaldehyde and toluene exposure experienced by professional nail technicians and their customers during applications using products with either

<sup>17</sup>Ibid.

<sup>18</sup> Agency for Toxic Substances and Disease Registry; Public Health Statement: Toluene <http://www.atsdr.cdc.gov/ToxProfiles/tp56-c1-b.pdf>. Accessed December 11, 2014.

<sup>19</sup> Ibid.

<sup>20</sup> Science and Environmental Health Network [http://www.sehn.org/Endocrine\\_Disruption.html](http://www.sehn.org/Endocrine_Disruption.html). Accessed December 1, 2014.

<sup>21</sup> Health Canada and Environment Canada. <http://hc-sc.gc.ca/ewh-semt/pubs/contaminants/psl1-lsp1/index-eng.php>. Accessed October 2, 2014.

<sup>22</sup> Agency for Toxic Substances and Disease Registry. <http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=39>

of these chemicals. They found that “neither workers nor consumers are at any additional risk from exposure to formaldehyde or toluene in cosmetic nail products beyond daily exposure from commercial products in a work setting and in the home”. Other researchers (Savitz & Shy 1994) who examined the risks of spontaneous abortions among cosmetologists found associations between these events and “the number of hours worked per day in cosmetology, the number of chemical services performed per week, the use of formaldehyde-based disinfectants, and work in salons where nail sculpturing was performed by other employees.” They did caution, however, that including some variables about which they lacked information in the analyses might alter their findings.



## OTHER CHEMICALS OF CONCERN

While most attention has been paid to “the toxic trio”, other chemicals used in the nail salon industry have been shown to have negative effects on health. The following is a partial list.

### Camphor

In its natural form, camphor (which contains turpentine oil) is tapped from a tree bark and used traditionally for its healing properties. Even in that form, however, it can be harmful in large quantities. When produced synthetically, which is the case for its use in nail products, camphor can be toxic when inhaled or absorbed in large amounts. Effects range from eye irritation to uncontrollable muscle contractions (United States Environmental Protection Agency, 2004).

### Formaldehyde resin

Used as a strengthener in nail polishes, formaldehyde resin, like formaldehyde itself, can be toxic if inhaled or ingested in large amounts. It is made by combining formaldehyde and toluenesulfonamide.

### Ethyl and Methyl Methacrylate (MMA)

While toxicologically similar (Spencer et al, 1997), one (methyl methacrylate) has been banned in some countries while the other has not.

Long used in dentistry (as an acrylic), methyl methacrylate (MMA) was discovered many decades ago to be a good nail substitute. This led to its use in nail salons to strengthen natural nails or create artificial nails. Exposure occurs both from fumes when the product is uncapped or left soaking on cotton pads, and through dust created from filing nails that have been coated with the product. Health problems range from skin, eye, nose and throat irritation, to confusion and dizziness, to a deadening of one's sense of smell (Skogstrom, 2012). In animal research, it was shown to cause kidney and liver damage at higher concentrations (WHO, 1998).

MMA was banned for use in nail products by the U.S. FDA in 1974 because of a series of reports about health effects. Yet it was only in 2003 that Health Canada issued a warning to say the sale and use of cosmetic preparations containing MMA (including nail products) was banned.<sup>23</sup> Nevertheless, commonly used products still contain MMA<sup>24</sup>, indicating that this ban has not been widely respected by manufacturers or by nail salon owners. In fact, a quick review of the MSDS sheets for nail products reveals that MMA is still present in a number of them.<sup>25</sup>

<sup>23</sup> Methyl methacrylate appears on Health Canada's Cosmetic Ingredients Hotlist (<http://www.hc-sc.gc.ca/cps-spc/cosmet-person/hot-list-critique/hotlist-liste-eng.php#m1> Accessed November 22, 2014). It is noted that ingredients on this list “must not be present in cosmetic products at all times.”

<sup>24</sup> See list of 12 nail products found to contain MMA at <http://www.goodguide.com/ingredients/37687-methyl-methacrylate> Accessed October 28, 2014.

<sup>25</sup> Nail Supplies (commercial website) MSDS information page (no author) Accessed Dec 2, 2014. <http://www.nailsupplies.us/pages/MSDS.html>



Ethyl methacrylate, which is more expensive and more difficult to apply than MMA, has not been as well-studied as methyl methacrylate and is not on Health Canada's Cosmetic Ingredients Hotlist. Therefore, its use remains permissible in nail products. LoSasso (2002) studied nail technicians using methacrylates against a control group and found neurological deficits including perceived problems with cognitive efficiency, memory and learning among those with highest exposure levels. One study (Spencer et al, 1997) which noted the similarities between ethyl- and methyl methacrylates, found that personal exposure to the chemical during artificial nail application could be reduced more than tenfold when a ventilated manicure table was used.

### THE ISSUE OF SYNERGISTIC EFFECTS

Exposures to potentially harmful chemicals have tended to be studied one at a time. However, it is rarely the case that a salon worker is only being exposed to one chemical at any given time and, additionally, exposure takes place repeatedly and over a protracted period of time. Epidemiological research increasingly points to the importance of considering the synergistic aspects of exposure.

"...the presence of numerous chemical compounds in beauty salons is likely to be continuous and mixed, the synergistic effects of which are largely unknown... Although exposure levels for individual compounds may be generally low by legal or recommended standards (many of which were established decades earlier) multiple chemical and multiple routes of exposure (often via inhalation and skin absorption) combined with inadequate ventilation underscore the need for systematic health assessments in this workforce." (Quach et al 2010, p. 692)

Nail salon workers also bring with them, like any other workers, exposures to other chemicals from the home and the outside environment.

### WHAT IS KNOWN ABOUT THE EXPOSURES OF NAIL SALON WORKERS TO EDCs IN THE WORKPLACE?

The literature on nail salon workers' exposure to EDCs in the work setting is modest but growing. What is certain, however, is that the products used by nail salon workers contain endocrine disrupting hormones such as phthalates and toluene. We also know that these compounds appear in the urine of those who work in nail salons; in one study, concentrations of DBP were found to be 2-fold higher than in the general population (Hines JC et al 2009). By contrast, there is not yet full consensus on the effects of these products on those exposed to them. But there are reasons for concern.

For example, animal research has established links between EDCs and reproductive and other effects. And over a decade ago, studies by Foster (2005), E.L. Gray et al (2000), Swan (2005), among others, demonstrated clear reproductive effects on rats exposed in utero to EDCs.

Human research, specifically research on hairdressers and cosmetologists, is not as certain, largely due to the lack of direct research on this population as well as to the small sample sizes often used. The variation in findings on reproductive health in research undertaken with human subjects become apparent in considering results from the few studies that have been reported:

- Halliday-Bell, Gissler and Jaakkola (2009) found that "work as a hairdresser or cosmetologist may reduce fetal growth". Similarly, Herdt-Losavia et al (2009) found "a slight increase for having a child born low birth weight among cosmetologists compared to another group of licensed professionals" --with the risk greater among non-white races in each comparison group.
- In a relatively small self-reporting study, Gallicchio et al (2009) found that the "risk of adverse pregnancy outcomes among cosmetologists is not increased compared with women of the same age working in other occupations" even though the

risk of adverse pregnancy outcomes was evident in animal research studying the same solvents as those used in nail salon work.

- Albeit not specifically addressing nail salon workers, the National Toxicology Program Centre for the Evaluation of Risks to Human Reproduction (2003) concluded that when women of reproductive age were exposed orally to high levels of exposure to dibutyl phthalates (DBP), a substance in many products used in nail salons, “there is some concern for DBP causing adverse effects to human development, particularly development of the male reproductive system”.

### **WHAT IS KNOWN ABOUT THE RELATIONSHIP OF PRODUCTS USED BY WORKERS IN NAIL SALONS AND THE DEVELOPMENT OF BREAST CANCER?**

Because of the known link between exposure to endocrine disrupting chemicals and breast cancer<sup>26</sup>, there is concern that nail salon workers may be at increased risk. This has not yet been studied fully, but there are some data to consider.

Robinson and Walker (1999) looked at cancer rates among workers in a range of fast-growing professions and found Hodgkin's disease to be more frequent among hairdressers and cosmetologists than other groups. Similarly, a Canadian study published in 1984 (Spinelli et al, 1984) found an elevated risk of death from multiple myeloma and ovarian cancer among female cosmetologists in British Columbia.

### **Exposures of the current and future children of nail salon workers**

Public health researchers Cooper and Vanderlinden (2009) have observed that “the physiological mechanisms that normally help protect the body from any chemicals that do invade it, such as the

immune, excretory, and detoxifying systems, are developing in utero and are underdeveloped in the earliest stages of life” (p. 185). Women working in settings such as nail salons, where they are not only exposed on the job but bring to their work a lifetime body burden of exposures, find themselves in the difficult situation of how long to stay on the job when they find they are pregnant. Research by Arbuckle et al (1999) and others have demonstrated that toxic substances are found in both semen and in the fluid surrounding the female egg, meaning that human eggs and sperm are directly exposed to chemical contaminants.

Considering the degree of chemical exposures in this line of work, there is remarkably little research on the effects of the in utero exposures on the children born to nail salon workers. In one study (Laslo-Baker et al, 2004) nail salon workers were identified as a group highly exposed to organic solvents such as toluene. The researchers found that children who were exposed to organic solvents in utero performed at a lower level in neurological testing that measured auditory memory, general verbal information and attention. This type of exposure was also found to contribute to higher rates of inferior manipulative dexterity and greater inattention and hyperactivity.

A study by Halliday-Bell et al of adverse pregnancy outcomes in hairdressers and cosmetologists (2009) found that, in cosmetologists, the risk of the baby being born small for gestational age (SGA) and the risk of perinatal death were elevated. There were no substantial differences between male and female babies. Another study by Herdt-Losavio et al (2009) similarly found a slightly increased risk for having a child born low birth weight among cosmetologists compared to another group of licensed professionals. The risk was greater among non-white races in each comparison. Research

<sup>26</sup> Brophy, Keith et al (2012); Brody JG et (2007), Gray J et al (2009), Soto AM, Sonnenschein C (2010)

by Swan et al (2005) found a decrease in the anogenital distance among male infants with prenatal exposure to phthalates.

Given that many nail salon workers become pregnant while working in this environment, and that some women bring their young babies and children into the work environment while they are working<sup>27</sup>, the effects of exposures to the toxic trio and other substances is ripe for further research.

### WHAT CAN BE DONE TO CONTROL EXPOSURE TO THE MOST PROBLEMATIC CHEMICALS?

*"I want to protect myself at work, because I like this job, so I want to do it and protect myself."*<sup>28</sup>

If it is not possible, to date, to eliminate potentially harmful exposures in the workplace, can they at least be controlled? Quach et al (2012) summarize the options for controlling exposures to the most problematic chemicals as the following:

- i) source reduction (i.e. use less toxic products);
- ii) improved ventilation (e.g. general and local exhaust ventilation that divert contaminants at the point of generation);
- iii) use of personal protective equipment (e.g. N95 masks and nitrile gloves);
- iv) workplace practice controls (e.g. safe handling, transfer and storage of compounds) and
- v) other administrative controls (e.g. regular break time outside the salon).

They further note, however, that there are complexities and barriers specific to this sector that make achieving these changes challenging. Some of these include:

- i) language barriers that require attention in developing appropriate outreach and education;



prevalent mistrust of regulatory agencies by nail salon owners;

- ii) the absence of workplace rights and benefits (e.g. health benefits, breaks, job security) unless the salon workers are themselves actual employees (as opposed to being contractors);
- iii) salon owners have traditionally been viewed as gatekeepers by those working in the salon; these owners may block or otherwise not allow their workers access to outreach programs that would be useful.

<sup>27</sup> Personal communication with Thu Quach, 2014.

<sup>28</sup> "Participant 4" in David (August 2014).

Some municipalities in the United States have made serious efforts to work directly with nail salon owners and workers to improve working conditions. Their initiatives have recently motivated some Canadians to do similar work, and one example was a focus group conducted by staff at the Central Toronto Community Health Centre (CTCHC) to explore barriers to mitigating exposures of Chinese nail salon workers in that city. Although the findings are preliminary and based on only a small group that took part, they did show that, for the most part, “workers were not taught about any of the risks of exposures or of any steps that they could take to protect themselves.” However “they knew that the chemicals they worked with could cause health problems but they encountered barriers to learning about how to protect themselves”. Some noted fear about learning more as it “might make them feel they need to leave their job, on which they depend for their salary”. (David, 2014, p.5).

### **A MODEL FOR CANADIAN CITIES? THE SAN FRANCISCO ORDINANCE<sup>29</sup>**

With fresh interest in Toronto and the Greater Toronto Area in working to improve the health and safety of nail salon workers, consideration should be given to models from other municipalities in other countries where some success has been achieved. Of special note is the work that has been done in San Francisco, California, summarized here.

After many years of preparatory work, in 2013, the City of San Francisco implemented a Healthy Nail Salon Recognition Program (HNRP) - the first of its kind in the United States - giving official recognition to salons that implement safer practices and use safer products. The goal of the HNRP is to “reduce the occupational hazard for San Francisco’s nail salon workers as well as the exposure of City residents to toxic chemicals in nail products, through recognition and promotion of nail salons

that voluntarily discontinue the purchase and application of products containing chemicals as outlined in our criteria.”

The California Healthy Nail Salon Collaborative (HNSC), which involves all stakeholders — manufacturers, nail salon workers and owners, public health and environmental advocates, and governmental agencies - was a key player in spearheading the movement towards the San Francisco Ordinance. Advocating on behalf of workers in this industry—primarily immigrant women, many of whom speak limited English, are of reproductive age, and have limited access to health care coverage - the HNSC was crucial in lobbying support for worker safety and health. Having recognized that penalizing the use of toxic chemicals and antagonizing nail salon workers might be ineffective in generating change, they created a model for a voluntary recognition program to promote healthy practices, and developed a program that outlines ten requirements to protect the health of workers and clients.

A City Ordinance was created with a commitment to develop and implement a program to help local nail salons adopt safer practices and then to recognize them for their efforts, including the development of guidelines in appropriate languages.

After an extensive assessment and consultation process in which 1100 nail product formulations used in salons were evaluated by the Department of Environment, they concluded that only products that do not contain dibutyl phthalates (DBP), toluene, formaldehyde, and methyl ethyl ketone (MEK) could be deemed as “safer.”

Guided by this research, officials then outlined ten criteria required for a nail salon to be considered “healthy.” These included:

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<sup>29</sup> This section is based on an interview conducted by Osgoode Hall Law School PhD student Hongyi Geng with Swati Sharma from the Department of Environment in San Francisco. The text of the full interview can be found in Appendix A. We are grateful to Hongyi for this contribution to the literature review.



- i) choosing nail polishes that do not contain the toxic trio (DBP, toluene, and formaldehyde);
- ii) using safer nail polish;
- iii) avoiding the use of nail polish thinners unless absolutely necessary and not using any that contain toluene and methyl ethyl ketone (MEK);
- iv) ensuring that all nail salon staff wear nitrile gloves when using nail products;
- v) ventilate the salon to improve air quality;
- vi) installing mechanical ventilation unit(s) within one year of entering the recognition program if one does not already exist;
- vii) training all nail salon staff onsite (on payroll and on contract) and owners on safer practices using SF Environment's guide if one does not already exist;
- viii) allowing SF Environment program staff to monitor air quality within the salon;
- ix) being committed to trying and adopting safer artificial nail products; and
- x) not allowing customers to bring in products unless they meet program criteria.

Training on safer practices by the Department of the Environment was an additional requirement. Staff conducted extensive outreach to salons and salon owners, materials were prepared in appropriate languages and the training is occurring. Salons that have completed the training and complied with all the needed changes receive public recognition, encouraging participation by additional salons throughout the city.

Lessons learned from the San Francisco experience include: 1) the need for those working in outreach or as intervenors to have linguistic and cultural competency; 2) the need for "buy-in" by salon owners; and 3) sensitivity to handling medical issues.

## THE NEED FOR CHANGE AT THE CANADIAN REGULATORY LEVEL – FEDERALLY

Under Canada's Chemicals Management Plan, the Government of Canada is currently evaluating 14 substances in the phthalates family, as well as other cosmetic ingredients including formaldehyde, to determine the risks posed by these chemicals. Whichever of these are found to have an impact on human health and are used in cosmetics will be added to Health Canada's Cosmetic Ingredient Hotlist (Health Canada, Safety of Cosmetic Ingredients).

There is also the potential to regulate DBP in Canada using the rationale behind the regulation of phthalates in soft vinyl toys that was to follow the lead of the European Union which (Commission Directive 2004/93/EC) "prohibits the use in cosmetic products of substances classified as carcinogenic, mutagenic, or toxic for reproduction" (Official Journal of the European Union, 2004). This prohibition has led to banning cosmetic products containing DEHP and DBP, since both are classified as category 2 reproductive toxicants (Koo, 2004). Given the EU prohibition of DBP in cosmetics, it could be possible to encourage similar regulations for the Canadian cosmetic industry.

## WORKING WITH MUNICIPAL AND PROVINCIAL AUTHORITIES

Health and occupational health and safety come under provincial jurisdiction in Canada and there is great variety across provinces with respect to licensure and certification of nail technicians. Only four of the 10 provinces and three territories require certification for manicuring (i.e. require enrolment in formal training and passing a final written exam): British Columbia, Manitoba, New Brunswick, and Nova Scotia (Oropeza, 2000). A report to the Toronto Board of Health in Ontario (January 2014) indicated that "there are currently no legislated worker licensing or certification requirements at either the municipal or

provincial level for PSS [Personal Service Setting] workers providing services other than hairstyling in Ontario”.<sup>30</sup> The report also notes that “a substantial segment of PSS workers in Toronto have received no formal IPAC [Infection Prevention and Control] education or training”<sup>31</sup>.

The regulation of toxic chemicals in Ontario falls under the jurisdiction of the provincial Ministry of Labour (Occupational Health and Safety Act - OHSA). Its mandate is to “advance safe, fair and harmonious workplace practices that are essential to the social and economic well-being of the people of Ontario” by “develop[ing] and enforc[ing] labour legislation.”<sup>32</sup> In the ministerial Table of Occupational Exposure Limits<sup>33</sup>, only two of the chemicals in The Toxic Trio, formaldehyde and toluene are listed; DBP is not. However, the Ministry of Labour has recognized that occupational exposure to DBP must be controlled and recommends a time-weighted average limit (TWA) of 5 mg/m.<sup>34</sup> Although this has not yet been adopted formally, the Ministry recommended it be included under the official version of the Regulation. This 5 mg/m limit has been adopted by other provinces, such British Columbia and Saskatchewan, which may encourage Ontario to adopt it, too.

Though occupational exposure limits (OELs) are meant to protect workers by regulating the levels of their exposure, OELs are not industry-specific and so cannot reflect what exposures workers actually have. And these can, depending

on workplace circumstances, be either lower or higher than what is permitted. Air monitoring studies in the State of Massachusetts, for example, revealed that permissible exposure limits (the equivalent to occupational exposure limits in the State of Massachusetts) were rarely exceeded in nail salons<sup>35</sup>. A study conducted in California on three other chemicals—toluene, ethyl acetate, and isopropyl acetate, also discovered that the measured values were much lower than the occupational limits set by the California Division of Occupational Safety and Health.<sup>36</sup>

Moreover, chemical levels themselves may not tell the whole story: as noted above, scientific studies of occupational exposure to DBP in nail salon workers confirm that they show a statistically significant increase of DBP metabolite in urine samples taken after a shift<sup>37</sup>. As well, salon chemicals have the potential to cause health effects at concentrations below OELs, and manicurists, in particular, may be at risk. Therefore, though the occupational exposure limit for DBP is set at 5 mg/m, and though exposure in nail salons may not exceed this limit, this does not address concerns relating to chronic, long-term exposure at lower concentrations of the chemical. It also fails to take into account the effect of exposure to DBP in combination with other chemicals in the nail salons.

<sup>30</sup> <http://www.toronto.ca/legdocs/mmis/2014/hl/bgrd/backgroundfile-66295.pdf>, p. 5

<sup>31</sup> Ibid.

<sup>32</sup> Ontario Ministry of Labour, About the Ministry. <<http://www.labour.gov.on.ca/english/about/index.php>>

<sup>33</sup> Ontario Ministry of Labour. Current Occupational Exposure Limits for Ontario Workplaces Required under Regulation 833. [http://www.labour.gov.on.ca/english/hs/pubs/oel\\_table.php](http://www.labour.gov.on.ca/english/hs/pubs/oel_table.php).

<sup>34</sup> Ibid.

<sup>35</sup> Labor and Workforce Development, “Nail Salon Ventilation”, online: The Official Website of the Commonwealth of Massachusetts <<http://www.mass.gov/lwd/docs/dos/mwshp/hib418.pdf>>. Accessed August 28, 2014.

<sup>36</sup> See Quach et al (2011) The study showed that though the results were lower than the occupational health limits set by the State of California, they exceeded the Environmental Protection Agency's recommended ambient air level.

<sup>37</sup> See Rachel Kwapniewski et al (2008), p 705.

## CONCLUSION

A 2007 Time magazine article listed manicurists and pedicurists as being among “The Worst Jobs in America” (Caplan and Fitzpatrick, 2007). Whether they get their information from English language media or not, however, those working in these fields are increasingly confronted with bad news about their profession. Sadly, this literature review contributes to that bad news. But it also can serve as motivation for change, and that is the goal. Those of us concerned with the health risks for workers in nail salons must now work to assure employees and their employers that change is possible. And that this change will not threaten their livelihood or their businesses and, indeed, might actually make them healthier and more prosperous. Work towards these changes must include:

- 1) Direct involvement of the community affected. Lessons from the experiences of the California Healthy Nail Salon Collaborative offer guidance here. And our own work with workers in Toronto reinforces how important this is.
- 2) Work with municipalities to i) ensure necessary safety information (about minimizing risks, etc.) is prepared and disseminated to nail salons in appropriate languages; ii) mandate improved ventilation in nail salons; and iii) study the model to make nail salons safer that has been used in San Francisco for possible replication or adaptation in Canadian municipalities.
- 3) Applying pressure on manufacturers to respect laws already in place with respect to labelling of nail salon products;
- 4) Further encouragement of manufacturers to undertake “green chemistry” research that will lead to new, non-toxic alternatives which do not compromise business.
- 5) Convincing the federal government of the need to use the precautionary principle in assessing chemicals under review within the Chemicals Management Plan, with special attention to toxic exposures in occupational settings that include a large proportion of women of reproductive age.

## References

### Agency for Toxic Substances and Disease Registry

"ATSDR is directed by congressional mandate to perform specific functions concerning the effect on public health of hazardous substances in the environment. These functions include public health assessments of waste sites, health consultations concerning specific hazardous substances, health surveillance and registries, response to emergency releases of hazardous substances, applied research in support of public health assessments, information development and dissemination, and education and training concerning hazardous substances." Retrieved from: <http://www.atsdr.cdc.gov/substances/indexAZ.asp>

**Arbuckle TE. (2005).** Are there sex and gender differences in acute exposure to chemicals in the same setting? *Environmental Research*, 101 (2): 195-204. doi:10.1016/j.envres.2005.08.015

**Arbuckle TE, Schrader SM, Cole D. et al. (1999).** Dichlorophenoxyacetic acid residues in semen of Ontario farmers. *Reproductive Toxicology*, 13(6): 421-29.

**Balkissoon, Denise. (2012, July 13) .** Your manicure looks beautiful. But the health effects are ugly. *Globe and Mail*. Retrieved from: <http://www.theglobeandmail.com/life/health-and-fitness/health/your-manicure-looks-beautiful-but-the-health-effects-are-ugly/article4416784/>

**Bohle, Philip and Quinlan, Michael. (2000).** Managing occupational health and safety: A multidisciplinary approach. Macmillan Education Australia. Retrieved from: <http://books.google.ca/books?id=xNKqMjs4c28C&pg=PA178&lpg=PA178&dq#v=onepage&q&f=false>

**Brody JG, Moysich KB, Humblet O, Attfield KR, Beehler GP, Rudel RA. (2007).** Environmental pollutants and breast cancer: Epidemiological studies. *Cancer*, 109 (12 Suppl): 2667-2711.

**Brophy JT, Keith MM, et al. (2012).** Breast cancer risk in relation to occupations with exposure to carcinogens and endocrine-disruptors: A Canadian case control study. *Environmental Health*. 11:87 Retrieved from: <http://www.ehjournal.net/content/11/1/87>

**Caplan, Jeremy and Fitzpatrick, Laura. (2007).** The worst jobs in America. *Time Magazine*. Monday, July 30, 2007. Retrieved from: <http://content.time.com/time/business/article/0,8599,1648055,00.html>

### ChemHAT.org – Chemical Hazard and Alternatives Toolbox

Retrieved from: <http://www.chemhat.org/chemical/cmg10535/phthalates>

**Clapp RW, Jacob MM, Loechler EL. (2008).** Environmental and occupational causes of cancer: New Evidence, 2005-2007. *Review of Environmental Health*.

**Clemons M, and Goss P.(2001).** Estrogens and the risk of breast cancer. *New England Journal of Medicine*, 344(4): 276-285.

**Cooper K, and Vanderlinden L. (2009).** Pollution, chemicals, and children's health: The need for precautionary policy in Canada (Chapter 8). *Environmental Challenges and Opportunities: Local-Global Perspectives on Canadian Issues*. Toronto: Emond Montgomery Publications.

**David, Linor. (August 2014).** Focus Group Results: How training and employment conditions impact on Toronto nail technicians' ability to protect themselves at work. Central Toronto Community Health Centres.

**Dematteo, Robert et al. (2012).** Chemical exposures of women workers in the plastics industry with particular reference to breast cancer and reproductive hazards. *New Solutions*, 22(4): 427-448.

**Dryson E, 't Mannetje A, Walls C, et al. (2008).** Case control study of high risk occupations for bladder cancer in New Zealand. *International Journal of Cancer*, 122 (6): 1340-1346.

**Environment Canada. (1996).** Toluene: PSL1. Archived; available online or by written request. Retrieved from: <http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/psl1-lsp1/toulene/index-eng.php>

**Foster PM. (2005).** Disruption of reproductive development in male rat offspring following in utero exposure to phthalate esters. *International Journal of Andrology*, 29: 140-147.

**Gallichio L, Miller S, Greene T, Zacur H, Flaws JA. (2009).** Cosmetologists and reproductive outcomes. *Obstet Gynecol*, 113(5): 1018-26.

**Garlantezec R., Monfort C., Rouget F, Cordier S. (2009).** Maternal occupational exposure to solvents and congenital malformations: A prospective study in the general population. *Occupational and Environmental Medicine*, 66: 456-463.



- Ginty, Molly M. (2014).** Nemesis of the chemical giants. In *These Times*. Retrieved from: <http://inthesetimes.com/article/17051/theo-colborn-nemesis-of-the-chemical-giants>
- Gorman A, O'Connor P. (February 2007).** *Glossed Over: Health Hazards Associated with Toxic Exposures in Nail Salons*. Missoula, MT: Women's Voices for the Earth. Retrieved from: <http://www.womensvoices.org/wp-content/uploads/2010/06/Glossed-Over.pdf>
- Gray EL, et al. (2000).** Perinatal exposure to phthalates DEHP, BBP and DINP, but not DEP, DMP or DOTP, alters sexual differentiation of the male rat. *Toxicological Sciences*, 58, 350-365.
- Gray, Janet, et al. (2009).** State of the Evidence: The Connection between Breast Cancer and the Environment. *International Journal of Occupational and Environmental Health*, 15(1): 43-78.
- Halliday-Bell JA, Gissler M, Jaakkola JJ. (2009).** Work as a hairdresser and cosmetologist and adverse pregnancy outcomes. *Occupational Medicine*, 59(3): 180-184
- Health Canada Cosmetic Ingredient Hotlist.** Retrieved from: <http://www.hc-sc.gc.ca/cps-spc/cosmet-person/hotlist-critique/hotlist-liste-eng.php> "...is a scientifically-based, administrative tool that helps industry satisfy the requirements for sale of a cosmetic, by providing a list of substances that are restricted or prohibited in cosmetics. The listed substances may contravene the general prohibition found in section 16 of the *Food and Drugs Act* or a section of the *Cosmetic Regulations*."
- Health Canada and Environment Canada.** First Priority Substances List Assessments. Retrieved from: <http://hc-sc.gc.ca/ewh-semt/pubs/contaminants/psl1-lsp1/index-eng.php>
- Herd-Losavio ML, Lin S, Druschel CM, Hwang SA, Mauer MP, Carlson GA. (2009).** The risk of having a low birth weight or preterm infant among cosmetologists in New York State. *Maternal Child Health Journal*, 13(1): 90-97.
- Hill, Suzette (1994, July 1).** The truth about toluene. *Nails Magazine*. Retrieved from: <http://www.nailsmag.com/article/92025/the-truth-about-toluene>
- Hines JC, et al. (2009).** Urinary phthalate metabolite concentrations among workers in selected industries: A pilot biomonitoring study. *The Annals of Occupational Hygiene*, 53(1): 1-17.
- Hodgson JT and Darnton A. (2000)** The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure. *The Annals of Occupational Hygiene*. Vol 44, No 8: 565-601.
- IBISWorld (2014).** Hair and Nail Salons in Canada: Market Research Report NAIC S81211CA. Retrieved from: <http://www.ibisworld.ca/industry/hair-nail-salons.html>
- Kiec-Swierczynska M, Chomiczewska-Skora D, Swierczynska-Machura D, Krecisz B. (2013).** Manicurists and pedicurists - occupation group at high risk of work-related dermatoses. *Med Pr* 64(4): 579-591.
- Koo, Hyun Jung and Lee, Byung Mu. (2004).** Estimated exposure to phthalates in cosmetics and risk assessment. *Journal of Toxicology and Environmental Health* 1901. Retrieved from: <http://chem.rutgers.edu/~kyc/pdf/491/wilson/cosmetics2.pdf>
- Kwapniewski R, et al. (2008).** Occupational exposure to dibutyl phthalate among manicurists *Journal of Occupational and Environmental Medicine*, 50(6): 705-711.
- Laslo-Baker D, Barrera M, Knittel-Keren D, Kozer E, Wolpin J, Hackman R, Rovet J, Koren G. (2004).** Child neurodevelopmental outcome and maternal occupational exposure to solvents. *Archives of Pediatrics and Adolescent Medicine*, 158: 956-961.
- LeMasters GK, et al. (November 2006)** Cancer risk among firefighters: A review and meta-analysis of 32 studies. *Journal of Occupational and Environmental Medicine*. Vol 48, No 11: 1189-1202.
- LoSasso GL. (2002).** Neurocognitive sequelae of exposure to organic solvents and (meth) acrylates among nail studio technicians. *Neuropsychiatry, Neuropsychology, and Behavioral Neurology*, 15(1): 44-55.
- Lung Association of Ontario (2012).** *Hair, Nail and Beauty Salons: Work-Related Asthma*. Available online or hard copy by written request. Retrieved from: <http://www.on.lung.ca/document.doc?id=1128>
- Marlow D, Looney T, Reutman S. (2012).** *An Evaluation of Local Exhaust Ventilation for Controlling Hazardous Exposures in Nail Salons; EPHB Report No 005-164*. National Institute for Occupational Safety and Health. Retrieved from: <http://www.cdc.gov/niosh/surveyreports/pdfs/005-164.pdf>

- McNary JE, Jackson EM. (2007).** Inhalation exposure to formaldehyde and toluene in the same occupational and consumer setting. *Inhalation Toxicology*, 19: 573-576.
- Menck HR, Pike MC, Henderson BE, et al. (1977).** Lung cancer risk among beauticians and other female workers: brief communication. *J Natl Cancer Inst.* 59(5): 1423-1424.
- Messing, Karen. (2014).** *Pain and Prejudice: What Science Can Learn About Work from the People Who Do It.* Toronto: Between the Lines Press.
- Messing, Karen. (1998).** *One-Eyed Science: Occupational Health and Women Workers.* Philadelphia: Temple University Press.
- Minamoto, Keiko. (2014).** Allergic contact dermatitis from two-component acrylic resin in a manicurist and dental hygienist. *Journal of Occupational Health*, 56: 229-234.
- The National Toxicology Program Centre for the Evaluation of Risks to Human Reproduction (2003).** Monograph on Di-n-butyl Phthalate (DBP) Brief. March, 2003.
- Office of Environmental Health Hazard Assessment. (2008).** *Toluene: Chronic Toxicity Summary. (Methyl benzene; methyl benzol; phenyl methane; toluol).* State of California. Retrieved from: [http://oehha.ca.gov/air/chronic\\_rels/pdf/108883.pdf](http://oehha.ca.gov/air/chronic_rels/pdf/108883.pdf)
- Oropeza, Patricia. (2000).** The state of nails up north. *Nails Magazine*. Retrieved from: <http://www.nailsmag.com/article/92983/the-state-of-the-nails-up-north-canadian-nail-industry>
- Park SA, Gwak S, Choi S. (2014).** Assessment of occupational symptoms and chemical exposures for nail salon technicians in Daegu City, Korea. *J Prev Med Public Health* 47(3):169-176.
- Pukkala E, Nokso-Koivisto P, Roponen P. (1992).** Changing cancer risk pattern among Finnish hairdressers. *Int Arch Occup Environ Health*, 64 (1): 39-42.
- Quach, Thu, Julia Varshavsky, Julie Von Behren, Erika Garcia, My Tong, Tuan Nguyen, Alisha Tran, Robert Gunier, and Peggy Reynolds. (2012-1).** Reducing chemical exposures in nail salons through owner and worker trainings: An exploratory intervention study. *American Journal of Industrial Medicine*, 56(7): 806-17.
- Quach T, Liou J, Fu L, Mendiratta A, Tong M, Reynolds P. (2012-2).** Developing a proactive research agenda to advance nail salon worker health, safety, and rights. *Progress in Community Health Partnerships*, Spring, 6(1): 75-82.
- Quach T, et al. (2011).** Characterizing workplace exposures in Vietnamese women working in California nail salons. *American Journal of Public Health*, Supplement 1 Vol 101, No. S1, S271-S276.
- Quach T, et al. (2010).** Cancer incidence in female cosmetologists and manicurists in California, 1988-2005. *American Journal of Epidemiology*, 172: 691-699.
- Reutman S, Rohs AM, Clark JC, Johnson BC, Sammons DL, Toennis CA, Robertson SA, MacKenzie BA, Lockey JE. (2009).** A pilot respiratory health assessment of nail technicians: Symptoms, lung function, and airway inflammation. *American Journal of Industrial Medicine*, 52(11): 868-75.
- Robinson CF, Walker JT. (1999).** Cancer mortality among women employed in fast-growing U.S. occupations. *American Journal of Industrial Medicine*, 36(1): 186-192.
- Roelofs, Cora. (2009).** *How Can Working in a Nail Salon Effect (sic) Your Health?* Conference presentation: Framing a Research Agenda to Advance Worker Health and Safety in the Nail Salon and Cosmetology Communities. Oakland, CA, April 27, 2009. Retrieved from: [http://www.valentinobeautypure.com/articles\\_pdf/How\\_Nail\\_Salons\\_Can\\_Effect\\_Health.pdf](http://www.valentinobeautypure.com/articles_pdf/How_Nail_Salons_Can_Effect_Health.pdf)
- Roelofs C, Azaroff LS, Holcroft C, Nguyen H, Doan T. (2007).** Results from a community-based occupational health survey of Vietnamese-American nail salon workers. *Journal of Immigrant Minority Health*, 10(4): 353-61.
- Rudel RA, Attfield KR, Schifano JN, et al. (2007).** Chemicals causing mammary gland tumours in animals signal new directions for epidemiology, chemicals testing, and risk assessment for breast cancer prevention. *Cancer*, 109(12 suppl): 2635-2666.
- Savitz JD, Shy C. (1994).** Spontaneous abortions among cosmetologists. *Epidemiology*, 5(2): 147-155.
- Scranton, Alexandra. (November 2014).** *Beauty and Its Beast: Unmasking the Impacts of Toxic Chemicals on Salon Workers.* Women's Voices for the Earth.
- Singleton JA, Beaumont JJ. (1989).** COMS II—California Occupational Mortality 1979–1981, Adjusted for Smoking, Alcohol and Socioeconomic Status. Sacramento, CA: California Department of Health Services.

**Skogstrom, Tiffany.** The Safe Nail Salon Project (PPT presentation). *Boston Public Health Commission*. Retrieved from: <https://www.aiha.org/localsections/html/neaia/IH%20in%20Salons-1.pdf>

**Soto AM, Sonnenschein C. (2010).** Environmental causes of cancer: endocrine disruptors as carcinogens. *Nature Reviews Endocrinology*, 6: 363-370.

**Spencer AB, Estill CF, McCammon JB, Mickelsen RL, Johnston OE. (1997).** Control of ethyl methacrylate exposures during the application of artificial fingernails. *American Industrial Hygiene Association Journal*, 58:214-218.

**Spinelli JJ, Gallagher RP, Band PR, Threlfall WJ. (1984).** Multiple myeloma, leukemia, and cancer of the ovary in cosmetologists and hairdressers. *American Journal of Industrial Medicine*, 6(2): 97-102. doi: 10.1002/ajim.4700060204

**Swan SH, Main KM, Liu F, Stewart SL, Kruse RL, Calafat AM, Mao CD, Redmon JB, et al. (2005).** Decrease in ano-genital distance among male infants with prenatal phthalate exposure. *Environmental Health Perspectives*, 113: 1056-1061.

**United States Environmental Protection Agency (Region 6). (2004).** *A Guide to Protect the Health of Nail Salon Workers and Their Working Environment*, EPA 906-F-04-001. Office of Pollution Prevention and Toxics. Dallas, TX.

**World Health Organization. (1998).** Concise International Chemical Assessment Document 4: Methyl Methacrylate (First draft prepared by Dormer W., Gomes W.R., and Meek M.E., Environmental Health Directorate, Health Canada).

**Wright, C and Quint J (1989).** Analysis of pregnancy-related calls to an occupational hazard hot line. *Western Journal of Medicine*. Vol 151, No 6: 670-675.

## Appendix A

### Implementation of a Healthy Nail Salon Program: San Francisco

Memo (abbreviated) prepared by Hongyi Geng, graduate student, Osgoode Hall Law School, August 2014

#### BACKGROUND AND AUTHORIZATION OF THE PROGRAM:

The San Francisco Healthy Nail Salon Recognition Program (HNSRP) became effective in 2013. It is the first program in the United States to give official recognition to salons that implement safer practices and use safer products. The goal of the HNSRP is to “reduce the occupational hazard for San Francisco’s nail salon workers as well as the exposure of City residents to toxic chemicals in nail products, through recognition and promotion of nail salons that voluntarily discontinue the purchase and application of products containing chemicals as outlined in our criteria.” As such, it seeks to benefit the health and wellbeing of the nail salon workers as well as to provide a nail salon with recognition and promotion from the San Francisco Department of Environment. This program is further enhanced with the potential of attracting new customers who are seeking out safer salons.

Prior to passage of this Ordinance, several organizations in San Francisco had already begun training and educating nail salon workers on the occupational health hazards of their industry. City programs such as the King County Hazardous Waste Management Program and the Labor Occupational Health Program (LOHP) all worked to raise awareness of the issues and conducted outreach through the creation of brochures and free training programs. The California Healthy Nail Salon Collaborative (HNSC) was also a key player in spearheading the movement towards the San Francisco Ordinance.

Formed in 2005, the HNSC “coordinates, leverages, and builds upon the respective expertise and activities of its diverse members and partners to advance a preventative environmental health agenda for the nail salon sector in California.”<sup>38</sup> It seeks to involve all stakeholders—manufacturers, nail salon workers and owners, public health and environmental advocates, and governmental agencies—in addressing health and safety concerns through the creation of policy, outreach programs, research, and education strategies. It is especially sensitive to the role of social determinants in affecting the health of workers, and seeks to understand health and safety through the eyes of the workers in this industry—primarily immigrant women, many

of whom speak limited English, are of reproductive age, and have limited access to health care coverage.

The organizations in the HNSC were crucial in lobbying support and advocating for worker safety and health. They were able to do what the City’s Department of Environment could not do: lobby their own government officials and department. Their advocacy also included garnering media support, raising public awareness, and acting as the link between nail salon workers and the City.

The Healthy Nail Salon Collaborative created a model for a voluntary recognition program to promote healthy practices. The group recognized that penalizing the use of toxic chemicals and antagonizing nail salon workers might be ineffective in generating change. Instead, they focused on partnership and collaboration, and developed a program that outlines ten requirements to protect the health of workers and clients. Nail salons that voluntarily abide by the ten requirements are recognized and promoted by the program, thereby making the removal of toxic chemicals and implementation of better work practices “good”<sup>39</sup> for their businesses.

Formal recognition programs require authorization by an ordinance in San Francisco, and in 2010, one supervisor (equivalent to a councillor in the Canadian system) began the process by introducing Ordinance No 269-10 to create a recognition program for nail salons that use safer products and practices. This was subsequently approved<sup>40</sup>, and it was then included in Chapter 27 of the San Francisco Administrative Code. This requires the San Francisco Department of Environment to develop and implement a program to help local nail salons adopt safer practices and then to recognize them for their efforts. The head of the Department of Environment was committed to ensuring that guidelines would be developed, likely because it emerged from an open and collaborative process with various stakeholders during which all opinions were heard at public hearings that were accessible — including appropriate translations — for all stakeholders.

<sup>38</sup> See California Healthy Nail Salon, “History & Mission”, online: <<http://www.cahealthynailsalons.org/>>.

<sup>39</sup> California Healthy Nail Salon Collaborative, “About Healthy Nail Salons”, online: <<http://www.cahealthynailsalons.org/what-is-hns/about-healthy-nail-salons/>>. The requirements include improved ventilation, support and education to salons to adopt the requirements, personal protective equipment and using less toxic products.

<sup>40</sup> Board of Supervisors City and County of San Francisco, “Meeting Minutes – Tuesday October 26, 2010 – 2:00PM”, online: <<http://www.sfbos.org/ftp/uploadedfiles/bdsupvrs/bosagendas/minutes/2010/m102610.pdf>>.



## PROGRAM DEVELOPMENT:

With the authority of the ordinance, the Department of Environment assessed the health and environmental effects of 1100 nail product formulations used in salons. A list of products, ingredients and hazards was compiled, and each ingredient was assessed for acute and chronic health impacts. After consulting reports from other researchers, weighing the feasibility and availability of alternatives, and holding discussions with manufacturers, the Department of Environment concluded that only products that do not contain dibutyl phthalates (DBP), toluene, formaldehyde, and methyl ethyl ketone (MEK) could be deemed as “safer.”

Guided by this research, officials then outlined ten criteria required for a nail salon to be considered “healthy.” These included

- xi) choosing nail polishes that do not contain the toxic trio (DBP, toluene, and formaldehyde);
- xii) using safer nail polish;
- xiii) avoiding the use of nail polish thinners unless absolutely necessary and not using any that contain toluene and methyl ethyl ketone (MEK);
- xiv) ensuring that all nail salon staff wear nitrile gloves when using nail products;
- xv) ventilate the salon to improve air quality;
- xvi) installing mechanical ventilation unit(s) within one year of entering the recognition program if one does not already exist;
- xvii) training all nail salon staff onsite (on payroll and on contract) and owners on safer practices using SF Environment’s guide if one does not already exist;
- xviii) allowing SF Environment program staff to monitor air quality within the salon;
- xix) being committed to trying and adopting safer artificial nail products; and
- xx) not allowing customers to bring in products unless they meet program criteria.

The Department of the Environment also requires those who want to be recognized under the Ordinance to ensure their salon workers receive training from their department on safer practices. This is important, since some nail products may contain chemicals that fall beyond the scope of the program and might not yet be recognized as toxic. Importantly, the Department is committed to continually monitoring additional chemicals.

## IMPLEMENTATION OF THE PROGRAM IN ACTUAL NAIL SALONS:

Together with the Collaborative, the Department reached out to interested salons and those owners who had already expressed an interest in safety issues. To begin the outreach process, all nail salons located in the city that were in compliance with California’s State Board of Barbering and Cosmetology (BBC) were identified. The Department then adopted a multi-faceted approach which involved door-to-door visits as well as mailed material and the posting of notices about the program in community centres, temples, churches, and community organizations that workers were known to visit. The Department ensured that all materials disseminated through mail or by staff was available in both English and Vietnamese.<sup>41</sup>

Interested nail salons were first asked to register by mail, e-mail or phone. The program’s staff then completed initial consultations to gather information about the products in the salons, the health impacts experienced, and air quality data. The staff would visit a salon and note the salon’s practices—products used, ventilation systems (or lack of) in place, and disposal methods. This information was then synthesized into a report for the salon that included a list of recommendations for product changes. The staff also provided MSDS binders when a salon (and this was frequently the case) did not have this material. The program staff also trained workers at sessions open to all technicians who wanted to learn more about the program and occupational health. Because training during off-hours was often not feasible, the Department offered sessions in the salons that were registered.

Once these steps were completed, each nail salon had to submit a signed application form that included a list of safer products they committed to using and a declaration that all individuals in the nail salon had received training. With respect to improving safer ventilation practices, the program offered nail salons a \$1000 reimbursement for the installation of mechanical ventilation units. Once the Department is able to confirm all criteria have been met, a salon is given public recognition. To maintain their status with the program, salons must submit a new application annually.

## PROGRAM STATISTICS AND NEXT STEPS:

When the program was first introduced, interest was low. Following subsequent media attention, additional salons have

<sup>41</sup> The Department focused on Vietnamese because a majority of the nail salon workers are Vietnamese in San Francisco.

signed up and, as of Spring 2014, about 9% of the city's nail salons are recognized as healthy nail salons. The next step for the program is to conduct a survey to obtain information that will help the Department understand reasons why nail salon workers have chosen to participate in the program. The results of this survey will be used to generate more targeted outreach aimed to further increase the number of participating nail salons. The Department will also continue conducting air-monitoring research, and will join with the HNSC .

### LESSONS LEARNED FROM THE SAN FRANCISCO EXPERIENCE:

- The need for someone with linguistic and cultural competency. A particularly difficult challenge for the Department of the Environment came from the cultural and language barriers separating their team from the nail salon owners and workers. For example, approximately 85% of all nail technicians in San Francisco spoke Vietnamese. The Department recognized its need to develop a serious understanding of a community to which none of its workers belonged. To this end, someone fluent in Vietnamese who could understand the industry, salon culture, and nail salon workers themselves and who was able to communicate the health and scientific research relevant to workers was hired.
- The need for “buy-in” by salon owners. In doing outreach, when a registration form must be signed, it is important for a salon owner to be present to complete the form. Therefore, organizations planning to develop a similar recognition program in their jurisdictions must be willing to make several visits and follow-ups (if necessary) with the nail salons.
- Sensitivity to handling medical issues. The Department realized that nail salon technicians are very much aware of how asthma and cancer may be health problems for them and did not need constant reminders of the occupational health hazards they face. Consequently, rather than discuss the negative aspects of their

occupation, the Department emphasized positive messages about how participation in the program could provide ways to promote their health and reduce the health risks faced.

### ESTABLISHMENT IN OTHER LOCATIONS:

Other counties in California have followed the lead of San Francisco and adopted similar recognition programs. However, they have moved forward with their programs without first passing an ordinance for them as did San Francisco.