Vietnamese Healthy Nail Salon Initiative

TOXICITY, SAFETY AND PERFORMANCE EVALUATION OF ALTERNATIVE NAIL PRODUCTS

A project report by

New Ecology Inc. (NEI)

In collaboration with
Vietnamese American Initiative for Development (Viet-AID)
Dorchester Occupational Health Initiative (DOHI)
Pioneer Valley Project (PVP)

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Disclaimer

We do not claim to characterize or otherwise assess the inherent risk of using any particular product or ingredient. The primary purpose of this study was to develop and pilot a methodology for determining whether or not a product would make an incremental improvement to reducing risk associated with use of nail salon products. We make preliminary selections of ‘alternative’ products for further evaluation and testing. However, due to inherent complexities of product chemistry, the lack of data on most ingredients, and limited project resources, we make no claims to product safety. We can only state that ‘alternative’ products have undergone the evaluations we describe.

Glossary

CAS# – Chemical Abstracts Service Registry Number
CDC – The Centers for Disease Control and Prevention (part of the DHHS)
CHEMFinder – Chemical Searching Database
CIR – Cosmetics Ingredient Review
CCRIS – Toxicology Excellence for Risk Assessment (Consortium)
DOHI – Dorchester Occupational Health Initiative
EPA – U.S. Environmental Protection Agency
EWG – Environmental Working Group
DHHS – Department of Health and Human Services
FDA – U.S. Food and Drug Administration
GeneTox – Mutagenicity test data (EPA)
HSDB – Hazardous Substances Data Bank (NLM)
IRIS – Integrated Risk Information System (EPA)
MSDS – Materials Safety Data Sheet
NEI – New Ecology, Inc.
NIOSH – The National Institute for Occupational Safety and Health
NLM – National Library of Medicine
P2OASYS – Pollution Prevention Options Analysis System (TURI)
SCIFINDER SCHOLAR – Science Bibliographic Database
SIRI – Vermont Safety Resources Inc. MSDS Website
TOXNET – Databases on toxicology, hazardous chemicals (NLM)
TURI – Toxics Use Reduction Institute

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Executive Summary

New Ecology and its partners searched for and reviewed nail salon products with potential to serve as alternatives to those commonly used in salons today. Our aim is to assist Vietnamese nail salons to decrease their use of toxics while maintaining and even improving market competitiveness.

Two types of evaluation, technical and practical, helped us to find the most promising alternative products. The technical evaluation sought to reduce toxicity and improve safety using a methodology that eliminated as many chemicals of concern as possible and assured ingredients in alternative products are as benign as possible. Several factors, including lack of reporting by product manufacturers and lack of toxicity data on most ingredients, led us to focus on evaluation of solvents. The practical evaluation looked at product performance because successful introduction of alternatives into a competitive business environment requires the product to be attractive, easy to use, durable as well as cost-effective and accessible.

The most promising alternatives were Honey Bee and Sante Kosmetic for polishes and removers and En Vogue Gels for artificial nails. They passed the toxicity and safety evaluation and performed well in product testing. The challenges of introducing these products widely will vary depending on price, availability and resistance to change among owners, workers and clients.

This study confirms the dearth of alternative products on the market and the need not only to encourage the development of safer products but also to require greater transparency in chemical manufacturing and testing of chemicals.

Introduction

As part of a larger initiative to promote healthy work environments and entrepreneurship in Vietnamese nail salons, New Ecology, Inc. (NEI) and its partners identified and evaluated products already on the market that might be safer and less toxic but just as effective as products currently in use. Our search for product alternatives was fueled by growing concern over health risks to Vietnamese nail technicians and owners who work long hours with potentially hazardous chemicals common in nail salon products. In keeping with the Pollution Prevention Act of 1990 and the Massachusetts Toxics Use Reduction Act of 1988, this project aimed to reduce toxic exposures at the source by eliminating or reducing the use of toxics.

In order to determine whether a product might be a viable substitute in this competitive business environment, we undertook two types of evaluations: 1) toxicity and safety and 2) performance. For the toxicity and safety evaluation, we employed the expertise of the Center for Green Chemistry at Lowell. We scrutinized products by reviewing MSDSs and investigating ingredients. Due to the lack of data and testing on most cosmetic ingredients and products and limited resources, we chose to focus on solvents. We, therefore, did not evaluate the relative toxicity or safety of other major ingredients, such as polymers, plasticizers, and pigments. Fortunately, a focus on solvents in nail products could potentially address commonly expressed health concerns amongst workers.[1] There is also a good data record on most solvents employed in nail care products. Finally, there are alternative nail care products that use safer solvents or are water-based.

Three Vietnamese-owned salons in the Greater Boston area participated in performance tests, using samples of nail polish, polish remover and artificial nail applications.[2] NEI staff recorded the impressions of owners, workers, and volunteers. Despite varied testing procedures at each salon, there were a few clear winners and losers in the three product categories.

Recognizing the small scale of the project, we sought mainly to develop and test a process or methodology. Yet, while the project's primary result is the methodology itself, we also offer tentative recommendations on specific products and we hope researchers and salon owners alike will be able to use similar methods to evaluate other products.

Background

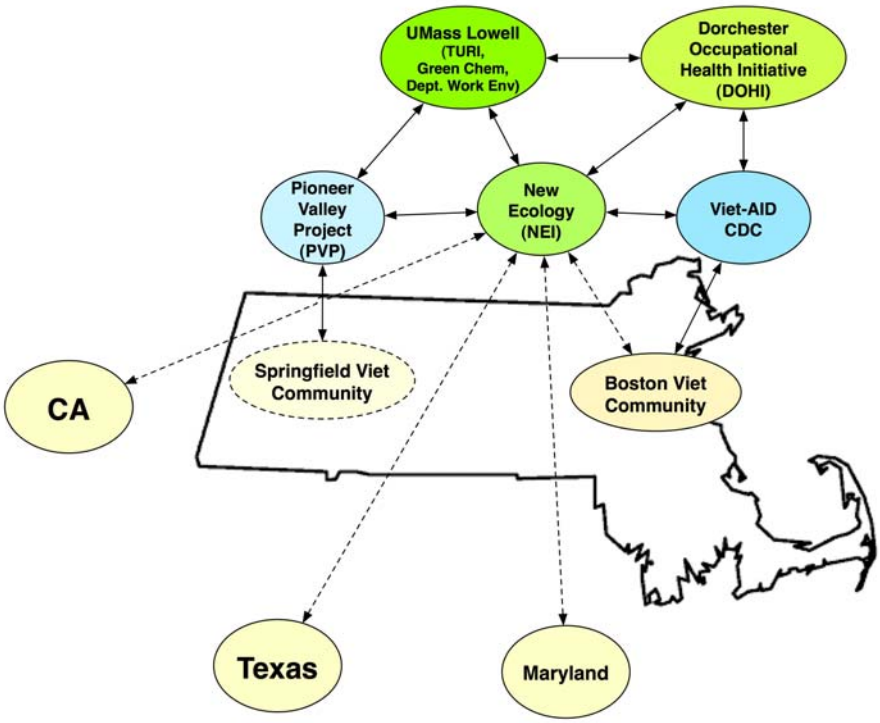
In 2004, after working with partners to assess health impacts and risks associated with nail salon work[3], NEI recognized a key challenge to addressing these issues. Unlike products such household cleaners, where less toxic alternatives have entered a wider market and can be purchased at local retail outlets, few alternative products for nail salons are readily available. Through a community grant from the Toxics Use Reduction Institute (TURI) and the support of the Dorchester Occupational Health Initiative (DOHI), NEI sought to fill this knowledge gap with this project.

Over the last three years, community advocates, scientists, public health agents and nail salon professionals themselves have started projects across the country to address toxic exposures in nail salons. These change agents often balance the desire to improve health outcomes with the economic importance of these nail salons, particularly as a local driver for vulnerable immigrant communities. NEI resolves this tension by framing the problem as one of sustainable development, the careful balancing of environmental, economic and social concerns. This alternatives project fits into this larger nationwide effort, adding a vital piece of knowledge to a complex web of problems. Accordingly, this project included

[1] These include odor, eye and dermal irritation, allergic reactions and sensitization.
[2] These were the three categories of products we evaluated. Other products such as disinfectants and fungicides required more resources.
[3] NEI worked in partnerships with Viet-AID and University of Massachusetts Lowell to do conduct community-based qualitative and quantitative research to understand health impacts, concerns and constraints. NEI also received training from Lynn Rose from the Pioneer Valley Project on health effects.

broad collaboration locally among diverse stakeholders and nationally with practitioners across the country, including California, Texas and Maryland (Figure 1).

Figure 1: Organizations and Communities Linked to NEI Alternatives Project



Like many immigrant groups facing the daunting mainstream labor market, Vietnamese immigrants have developed their own market niches and sub-economies—nail salons and related small businesses[4] being the most prominent. We estimate more than a third of working Vietnamese immigrants in the Boston area work in nail salons.[5] On the national level, according to a trade magazine[6], about 39% of all nail technicians (including salon owners) are Vietnamese. This is a very high concentration given that people of Vietnamese descent are about 1% of the total population. In most cities,[7] every salon you walk into will be owned and operated by Vietnamese immigrants. Needless to say, this is a very important source of income for this population. It is also a source of pride as Vietnamese immigrants have a strong entrepreneurial spirit and perform this work with great craftsmanship.

[4] Nail salon supply stores and cosmetology schools.
[5] A search for licensed nail technicians with common Vietnamese surnames on the Board of Cosmetology online database turns up more than 4000 names in Boston and surrounding suburbs. A precise number is difficult to obtain because licenses and the Board's website may not be up to date. US Census 2000 counted approximately 15,000 Vietnamese in the entire Massachusetts workforce.
[6] Nails Magazine, Industry Stats 2005. Their statistics are largely funded by OPI, the manufacturer of the most widely used nail salon products.
[7] In some cities, like New York, other ethnic groups such as Korean immigrants also dominate this industry.

Despite phenomenal growth in the number of salons and the growing reach of their ownership share,[8] this remains a vulnerable population. Most workers are women of reproductive age. It is not uncommon for women to continue working throughout their pregnancies and to bring children to work. For linguistic, cultural and socioeconomic reasons,[9] Vietnamese immigrants are isolated from mainstream services. Nail salon owners and technicians work long hours but receive few benefits such as paid sick days, worker's compensation and health insurance. This population works with few safety nets and high levels of risk.

Daily, Vietnamese nail salon workers are exposed to an array of potentially hazardous compounds during nearly every service they provide (see Table 1). Many of these product ingredients are highly volatile, irritating, sensitizing and toxic. Solvents, present in many nail products, can defat and irritate skin. Some can do greater harm: toluene is also a neurological and reproductive toxin and formaldehyde is a known carcinogen. Dibutyl phthalate, a common plasticizer in nail polishes, has been linked to damage to reproductive systems in male fetuses. Methyl methacrylate (MMA) has already been banned in several states for its irritating and sensitizing effects.

Table 1: Common Salon Services, Basic Steps & Products Used

Service	Steps	Product Used
Artificial Nail Different types include "acrylic" (liquid + powder), gel (cured by UV), and silk wraps	Preparing the Nail Bed	Nail Scrubs, Sanitizers, Dehydraters, Fungal treatments**
	Applying Primer Basecoat	Primer
	Applying the powder-liquid mixture	Powder Polymer Liquid Monomer
	Filing, Shaping	
Manicure/Pedicure	Prepping	Polish Remover
	Applying Polish	Base Coat Polish Top Coat

Thus, identifying and evaluating alternative nail salon products is a crucial step in long-term projects here and nationwide to support this low-income, immigrant community. Salons are under pressure from heavy competition, limited financial resources, and a market that seldom rewards environmental or health leadership. Fortunately, there are at least a handful of business owners who want to distinguish themselves as healthy salons. This work aims to offer these small business owners and the people who work with them additional tools for sustainable business development.

[8] Over the last two decades, the number of licensed technicians nearly doubled each year in areas such as Southern California, Houston-Dallas and other primary Vietnamese immigrant destinations. Though growth has peaked in these cities, salons are still popping up across America (see the Regional Analysis on the Nails Magazine site: http://www.nailsmag.com/resources/industryStats.aspx). Also, a Vietnamese-owned franchise with at least 600 stores continues to grow; Regal Nails has a contract to set up shop in Wal-Marts across the US.

[9] Vietnamese immigrants are the second largest Asian American subgroup in Boston and the fastest growing ethnic group. More than 20,000 Vietnamese live in Boston, with 50% residing in Dorchester -- the largest concentration of Vietnamese in Greater Boston. Thirty-eight percent (38%) of Vietnamese families in Dorchester live below the poverty line. In a recent Viet-AID survey of Vietnamese residents in Dorchester, 71% of respondents said they had little or no verbal skills in English.

Methodology

Overall

The major activities undertaken in this project were identifying alternative products, obtaining product information (MSDS, ingredient lists), evaluating their toxicity and safety, obtaining samples, and testing their performance in salons.

1. Identify Alternative Products & Obtain Product Information – The search for products included web searches (Google, trade discussion boards) and conversations with natural product distributors, researchers, Vietnamese people in the trade (including the leader of a trade association), and other organizations working on similar projects. Two particularly helpful contacts were Jennifer Reed at Natural Solutions and Brenda Klassen at Vogue Beauty (a full list of distributor and manufacturer contacts is available in Appendix III).

2. Evaluated Toxicity and Safety of Products – This activity required the technical assistance of chemists, epidemiologists, industrial hygienists and toxicologists. NEI worked most closely with Kevin Dye from the Center for Green Chemistry (led by Professor John Warner) and consulted with Carole LeBlanc (TURI), Cora Roelofs (Dept of Work Environment), and Jalal Ghaemghami (Boston Public Health Commission). In further efforts to gather peer advice, we presented our methodology and preliminary results at a handful of meetings to audiences of researchers and environmental practitioners. The outcome of these discussions was a methodology that aimed to rank the major components of nail products (solvents and acrylate compounds) rather than analyze each ingredient in each product and ranking the products themselves.

3. Performance Testing with Salons – In order to test performance, we obtained free or low-cost samples from distributors or manufacturers. Since many of these distributors were running small-scale operations, they often could not offer a large discount. During the same period, we were recruiting salon owners using Viet-AID's networks in the community. Recruitment was challenging since owners (and nail technicians) are very busy, work long hours, and are unsure of the benefits of alternative products.[10] We developed a protocol for testing, delivered the products to salons, trained workers and technicians on how to test the products, and provided materials for recording feedback. We also provided forms for client feedback and offered $10 market gift certificates. Nonetheless, most salons used NEI and Viet-AID staff as volunteers for testing out the products.

Other activities we pursued, mainly through partners Viet-AID and PVP, included building relationships with suppliers. While one distributor in Springfield is hesitant to distribute "consumer" products, another in Dorchester seemed interested as long as she would did not have to carry too much of the risk (i.e. she would like pay for products after the sale is made).

Toxicity and Safety Evaluation

This methodology is a prototypical, non-regulatory approach for identifying alternative products with respect to hazard. The intention is to help find products that offer the hope of an incremental improvement with respect to occupational health and the environment. We presume none of the products are in violation of any regulations. This report is not intended to characterize or otherwise assess the inherent risk of using a particular product or ingredient. Its purpose is to make preliminary selections of products for further evaluation and testing. Due to inherent complexities of product chemistry, the lack of data on most ingredients and limited project resources, we focused on comparisons of solvents in products, including water-based systems.

[10] We had also run into recruitment challenges when we worked with Viet-AID and UMass Lowell to conduct a large survey on health concerns. We knew that the best strategy would be to use social networks instead of just putting out general ads or flyers, especially since we were looking for a small number of participants.

Purpose
The primary purpose of delineating any methodology is to be transparent about the nature of the work and invite critical review of the approach. However, we also hope this methodology makes the work more accessible and invites others to extend it. The method suggests steps for including more people in the evaluation, including additional products, extending the use of data sources, and further developing the method. It serves as a framework to position emerging tools that might increase evaluative capacity and foster collaboration among other initiatives. As there are not yet generally agreed upon standards for conducting this type of evaluation, the following section depicts the context, scope, limitations, and distinctions with respect to other evaluative frameworks.

The general thrust of our methodology was to exclude chemicals previously associated with a health or environmental concern. These chemicals have typically triggered testing and collection of toxicity data. A severe limitation of this approach is to bias selection of alternatives away from where there is a strong data record. For the majority of chemicals employed in commerce, as in nail products, no test data are available that permit conclusive analysis that a chemical is either completely safe or ought to be avoided. A comprehensive comparative evaluation, therefore, can be a highly uncertain endeavor. Yet, when risk assessment and toxicity testing have been triggered, it is usually in response to a serious concern. Conversely, when no testing has been triggered, the absence of data indicates less concern, lower testing priority, or newness to the market. It does not necessarily indicate the chemical is safer but offers a first or second order screen.

After the first round of identification, screening and comparative evaluation of alternative products, a modification to simplify the original proposed methodology emerged. This was based on a review of worker interviews, available toxicity data, and candidate products. Dermal, nasal, and respiratory irritation seemed to be the primary complaints of workers,[11] and previous exposure studies of nail salon workers have focused on indoor air quality. These factors suggest a focus on selecting alternatives that minimize the use of volatile ingredients, such as solvents. Volatile organic chemicals and organic solvents are of longstanding concern in many other application arenas. The widespread use of solvents in industry has previously led to extensive testing and collection of toxicity data. In the search for alternatives, a principle of Green Chemistry is the use of safer solvents and water-based systems.

A focus on the use of solvents in nail products should address commonly expressed health concerns amongst workers. There is a good data record on most solvents employed in nail care products. And there are alternative nail care products that use safer solvents or are water-based.

In the nail product category, this analytic tactic cleaves the problem into product component parts with a focus on solvents and a focus on the polymers / monomers and other auxiliary substances. Manufacturers and distributors are permitted to list these ingredients in a manner that precludes the specific identification of any related data. The methodology, being driven by existing toxicity data of specific substances, cannot address this sub-problem.

The Method as Part of a Toxics Use Reduction (TUR) Model
The Toxics Use Reduction (TUR) model, as practiced in the context of The Toxics Use Reduction Act (TURA) in Massachusetts, has focused on the preparation of Toxics Use Reduction Plans for industrial facilities. In contrast, this study was conducted from the perspective of end-users of chemical products. The only interaction with manufacturers of these products was in requests for information and samples. As such, of the six recommended Toxics Use Reduction techniques, this study is limited to just one – product substitution.[12] Therefore, the primary basis of this study is a comparative analysis. Another distinction from the application of the TUR model in industry is that many of the ingredients in nail products as well as those being evaluated as alternatives are not specifically known. The method of this study is designed to answer the question: “Are there products already on the market, that are likely to be

[11] Based on preliminary summary results from Azaroff and Roelofs.
[12] The closest technique designation is “Input Substitution for Process Operations” - TUR Code 11. Product reformulation, process redesign or modernization, improved operations, or recycling are not considered. For information on TUR techniques see [http://www.turadata.turi.org/WhatIsTURA/FAQ.html#12].

safer and less toxic, which may substitute for products currently in use?" It is not the intention of this study to characterize the absolute toxicity or safety of products. Instead this study addresses stages three and four of the eight stage TURA planning process:[13] identifying and evaluating TUR options.

While nail salons as an industry sector may be covered by TURA[14], and nail salons do employ listed chemicals of concern, nail salons are typically not subject to TURA. Exemption is typically due to their small size (<10 employees) and because their use or emission of chemicals is small (<25,000 lbs of non-PBT chemicals and <10,000 lbs per year of PBT chemicals per annum.) From the perspective of TURA, the participation of salons in this study should be considered as proactive, beyond anything with which they must comply. It is important to note that this analysis does not assess the compliance of nail salons or manufacturers of nail salon products with TURA, FDA, OSHA, or other regulations. In evaluating the comparative toxicity or safety of an alternative, the assessment of hazard is based on test data on specific toxicity endpoints. It says nothing about whether these are within the limits of any regulations nor whether or not they ought to be. This study did not engage manufacturers, and no manufacturers appear to reside in Massachusetts.

Previous Work

Previous work informing this study and pertaining to the second TURA stage (process characterization) was carried out via a NIOSH Grant No. 1 KO1 OH007956-01 "Nail Salon Hazards and Health Effects," FY 2003-2006. The Principal Investigator was Cora Roelofs, of the Department of Work Environment, University of Massachusetts Lowell, who also served as co-investigator, for "Occupational Health Survey of Vietnamese Americans," with the Harvard School of Public Health, Harvard-NIOSH Education and Research Center during 2003-2004. These previous and ongoing studies are concerned with characterizing the hazards and health effects related to work in nail salons. Indoor Air Quality Programs conducted by several states have included exposure assessment for Volatile Organic Chemicals (VOCs) in nail salons.

Limitations

The methodology is not a risk assessment of products. This study is not promulgated to suggest regulatory criteria or standards. Rather, it is intended as an informal (non-regulatory), interpretive guide to foster the consideration of alternative products that may offer an incremental advance in health and the environment. The approach selects a particular sub-problem to focus on: the potential availability of products that minimize or eliminate the use of solvents. The study is biased towards focusing on where exposure studies have tended to focus, one where there is good toxicity data, and on symptomatic complaints. The study has only preliminary comments on the potential hazard of the non-solvent portions of the existing or alternative products.

Two major challenges limit this methodology. Firstly, manufacturers are able to conceal the exact contents of products when amounts are small or by claiming ingredients are trade secrets. In some instances, manufacturers only report the class of chemicals (e.g. urethane acrylates) or simply the type of chemical (e.g. formers). This means that despite all the screens we applied to ingredients we knew about, there could be other ingredients we could not evaluate. The only way we could have detected unreported ingredients would be to run chemicals assays, which were too resource-intensive for this study.

The second major challenge, already mentioned, was the lack of testing and data on most ingredients. This is an issue other organizations, such as the Environmental Working Group (EWG), have run into as well (see Appendix IV for comparative methodologies).

[13] The eight stages of the TURA planning process are: 1) Pre-planning, 2) Process characterization, 3) Identifying TUR options, 4) Screening and Evaluating TUR Options, 5) Developing the plan, 6) Certifying the plan, 7) Implementing the plan, and 8) Measuring success.

[14] TURA includes coverage of personal services with respect to the Standard Industrial Classification as an SIC 72. Nail Salons are SIC 7231.

DETAILED METHODOLOGY

1. **Identify Processes and Products to Target for Substitution**
   - 1.1. Keep list of problematic chemicals as they appear in nail salon processes and products.
   - 1.2. Match health concerns expressed by nail salon workers[15] with common chemicals of concern in typical nail salon products and processes.
   - 1.3. Review previous industrial hygiene studies of nail salons (e.g. NIOSH), and indoor air quality studies (e.g. EPA and state programs).
   - 1.4. Examine other nail product reviews (EWG, CIR, FDA). Note the disposition of the review with respect to each product.
   - 1.5. Determine desirability of an alternative by considering frequency of product use, impact on health and likelihood of alternative availability.
2. **Identify Candidate Alternatives for Evaluation While Screening for Problematic Chemicals**
   - 2.1. Conduct web research, including searching trade discussion websites.
   - 2.2. Consult suppliers and distributors.
   - 2.3. Consult other practitioners in similar initiatives across the country.
3. **Collect Ingredient Names, Chemical Synonyms and CAS Registration Numbers**
   - 3.1. Locate ingredient lists and MSDSs on distributor or manufacturer websites. If not available online, request directly from distributor or manufacturer. MSDSs can also be downloaded from databases such as SIRI and one maintained by Cornell
   - 3.2. If ingredient lists were not available, extract ingredients list from product MSDSs.
   - 3.3. Run ingredients list through Chemfinder & CHemIDplus for synonyms and CAS numbers.
   - 3.4. In cases where Chemfinder determines an ingredient name is not specific enough to yield a CAS or the ingredient is a brand or proprietary name (this is typically not the case for solvents), it is sometimes possible to determine a using other sources such as SciFinder.
   - 3.5. If the name is not identified as a brand name it is likely to be the name of a broad class of chemicals. Alternative means of assessment become necessary. This is usually the case for polymers and auxiliary substances. The law protects a manufacturer's right to keep some ingredients proprietary.
4. **Avoid Problematic Chemicals**
   - 4.1. As a first screen, confirm stated ingredients or synonyms in candidate alternatives and minimize cross-hits with the problematic chemicals list.
5. **Check for Toxicity Test Data**
   - 5.1. Select toxicological categories to focus on.
   - 5.2. Align these categories with the data fields in HSDB and ToxNet.
   - 5.3. Matching areas of concern with toxicity database fields, form a table for each product. As a first pass, consider the use of ToxNet and the HSDB at the NLM/NIH.
   - 5.4. Identify whether a specific chemical has any testing data by employing the CAS#.
   - 5.5. Note whether the testing indicates any untoward effects. If so, indicate there may be a health effect (either confirmed or suspected) in the table.
   - 5.6. Gather available toxicity/safety data. Starting with ToxNet HSDB, download data on ingredients for later evaluation (if needed).
   - 5.7. Extend the review to other databases, including CCRIS, IRIS, GeneTox, Scorecard and P2Oasys.
   - 5.8. A brief review of data fields in these databases will provide the reviewer background on why chemicals with testing data may be chemicals of concern. A caveat is the data set just for a dozen ingredients in this review yielded thousands of pages of text.
   - 5.9. Upon completing the above for all ingredients, we found little information for anything but the solvent portion of nail products. Based on this discovery, we decided to focus task 7 on solvents as a subproblem.

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[15] NEI participated in a large health survey led by researchers Cora Roelofs and Lenore Azaroff and including interviews with 71 nail salon technicians. NEI and Viet-AID also conducted focus groups and in-depth interviews.

6. Compare Product and Ingredient MSDSs

6.1. Compare MSDSs of common products with candidate alternatives by inspection. MSDSs can be problematic as tools for evaluating toxicity and safety. We looked for flammability, volatility (using vapor pressure), reactivity and standardized codes of safety (either NFPA or HMIS).

6.2. If candidates still look more promising, then compare ingredients MSDSs. Determine if this review confirms conclusion in 7.1.

7. Rank Scorecard Chemical Profiles

7.1. Query the Scorecard database using the CAS#. Ingredients for which there is test data will likely appear in the Scorecard database and visa versa. Print and collate the graphic summaries.

7.2. Select a method for ranking the profiles. One approach is to employ a consensus method with experts or people knowledgeable in the field. If a reviewer is working individually this may be accomplished by inspection, sorting via pairwise comparisons, or creating a tabular comparison of quantified summaries. In the inquiry regarding solvents there were very few cases where a pairwise comparison seemed close enough to warrant a quantitative comparison or for which a quantitative comparison would yield enough information to change a consensus opinion.

7.3. Based on the ranking of chemical profiles, determine if a candidate alternative tends to include ingredients identified as more benign. In the subproblem of solvents, products that already passed the first screening contained solvents that were very different from the solvents commonly considered problematic. In other words, the candidate products identified seemed to offer a significant opportunity for improvement, albeit using this constrained criteria.

7.4. More background on the use of Scorecard is indicated below.

8. Quantify if Necessary

The proposed method provided for use of a quantitative method for comparing combinations of ingredients in products. P2OASYS, a spreadsheet program developed by TURI, offers this function. This approach is selected in the case where there is a question of the sensitivity or robustness of previous choices and ranking in the screening procedures. Data for this can be derived from the Toxnet data fields. As solvents are a commonly reviewed set, TURI has already assembled data for entry into P2OASYS.

If it is reasonable to believe that an alternative product, identified through the previous screens, is too close to call in comparison to current products, P2OASYS or another tool can be deployed. We found for the specific products and alternatives in this study this case did not arise. The judgment was that more detailed, quantitative evaluation would not yield additional information value.

We did perform a P2OASYS analysis on solvents in this study, but this strategy did not produce meaningful results. Water-based candidate alternatives had no test data or entries into the P2OASYS spreadsheet. Other identified candidates used fewer and more benign solvents – a simple qualitative observation.

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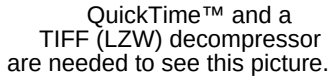
Figure 2: Toxicity and Safety Evaluation Methodology



Performance Testing

NEI set up sampling sessions to explore issues with introducing alternative products and to solicit the expert opinions of salon owners, nail technicians, and their clients on the performance of identified alternatives. Due to time constraints, we proceeded with the performance tests before the technical evaluations were completed. Only alternatives most likely to pass through the toxicity and safety screens were used in performance tests. The testing protocol aimed to discover whether alternative products were as attractive, easy to apply, and durable as conventional products. Ultimately, we wanted to know whether Vietnamese salon owners would be interested in using these products in their salons. We also allowed for performance testing to reveal unanticipated issues with implementation. NEI chose to test products in the field, and not in the laboratory, because we wanted immediate feedback on product usability, we were interested in building relationships with salon owners for future projects, and we had limited resources for laboratory testing. These aims and the exploratory nature of this part of the project led to more qualitative and less structured results.

Three salons participated in this pilot performance test. The salons were located in Winthrop, Cambridge and Dorchester and the owners lived in Chelsea and Dorchester. Detailed instructions and surveys were developed for owners, nail technicians and volunteers (see Appendix 8). All samples and materials to assist in recruiting volunteers were supplied. However, owners had different feelings about which method would be most effective or feasible. Though our preference was to control testing procedures as much as possible, we quickly recognized that due to limitations on the availability of owners and other logistical issues,[16] we needed to be flexible.

In Salon A, the owner and her assistant used sample nail polishes and polish remover on NEI and Viet-AID staff. They did not use base-coat or top-coat for this trial. They decided not to try the artificial nail applications because they were unfamiliar with the gel system and the instructions that came with both the gel and organic powder system were unclear. We asked both the owner and assistant to use all 3 of the nail polish and polish removers on us. The trial took about 1 hour. Then we left the products at Salon A for 3 days with instructions for use on volunteer clients. We compensated owners, technicians and volunteers with $10 gift certificates to a local market. Unfortunately, no regular clients of this salon participated in this trial.

In Salon B, the owner preferred to use the samples on NEI staff rather than his own clients. The entire visit took about 4 hours because the owner needed to read the instructions for the artificial nail products. The application procedure in Salon B was the full regimen, including preparation of the nail for the artificial nail applications (abrading the nail surface, pushing the cuticles back, etc.), artificial nail application, nail polish and top coat (see Figure 3). The top-coat used was a standard product (not an alternative) and may have improved durability of the alternative polishes.

The owner of Salon C chose to use his own volunteers. Though the products were left at his store for over 2 weeks, he was unable to recruit more than one volunteer to use the products. The volunteer tried one of the nail polishes, was unhappy with it and came back a few days later to have her nails redone. Though the owner was encouraged to till out a survey regarding this product, he did not record the name of the product and could not be reached after he returned the survey. We were unable to use data from this trial.

[16] Due to limited funding, we were only able to obtain one full set of samples, which NEI delivered to each salon in succession.

Figure 3: Application of Alternative Products
Pictured from left to right, 3 different artificial nail applications:
(1) powder & glue, (2) odorless acrylic, (3) & (4) gel and UV light

Data and Results

Toxicity and Safety Evaluation Results

Avoiding chemicals of concerns
Screening for common chemicals of concern (Table 2, excerpted from Appendix I), we developed a preliminary list of candidate alternative products (Table 3, excerpted from Appendix II). In the nail polish and polish remover categories, we were able to avoid the harsher solvents and plasticizers. In the artificial nail category, we had to settle for potentially more benign acrylate compounds.

Table 2: Common chemicals of Concern (Partial)

Chemical	Use in Products	Possible Health Effects
Acetone	Solvent	Can irritate eyes, nose and throat when inhaled. Prolonged or repeated contact de-fats the skin and cause dermatitis. High exposures may damage the liver and the kidneys; long-term exposure can cause chronic nose and throat irritation.[17] Solvents like acetone can also aid in the transport of more harmful compounds across the skin barrier.
Formaldehyde	Solvent	A known carcinogen, linked to nasal and lung cancer with possible links to brain cancer and leukemia. Short-term exposure to formaldehyde can be fatal. Long-term exposure to low levels of formaldehyde may cause respiratory difficulty, eczema, and sensitization.[18]
Toluene	Solvent	A strong sensitizing agent and neurological and reproductive toxin. Often found in samples of human body fat.[19]
Dibutyl Phthalate	Plasticizer[20]	Linked to in-utero damage to the male reproductive system.[21]

[17] http://www.nsc.org/ehc/chemical/Acetone.htm
[18] http://www.osha.gov/SLTC/formaldehyde/recognition.html
[19] http://www.checnet.org/healthehouse/chemicals/chemicals-detail2.asp?Main_ID=287, http://www.cosmeticscop.com/shop/toluene.asp
[20] Plasticizers are chemical agents added to plastics to make them softer and more flexible.

Methyl Methacrylate (MMA)	Used to form a polymer or plastic	Irritating to the skin, eyes, and mucous membranes in humans. Possible dermal and respiratory effects over short and long term exposure. Respiratory symptoms following acute exposures include chest tightness, dyspnea, coughing, wheezing, and reduced peak flow. Neurological symptoms also reported in humans following acute exposure. Fetal abnormalities have been reported in animals exposed by injection and inhalation. Not likely to be carcinogenic according to the EPA.22
Ethyl Methacrylate (EMA)	Used to form a polymer or plastic. (Interestingly, EMA is not significantly different from MMA. Yet, it is touted by some nail product companies as a safer alternative.)	Less is known about the toxicity of EMA but it is believed to have similar health effects as MMA.23 Currently, there is no OSHA standard for EMA. Industrial hygiene recommendations are the same for both MMA and ethyl methacrylate.2425

Table 3: Candidate Alternatives After Screen 1 (Partial)

Company	Product Name	Published Claims & Ingredient Lists
Honey Bee	No-Peel Watercolor Enamels	No toluene, xylene, formaldehyde, dibutyl phthalate and NO FD&C colors, only natural mineral pigments." CONTAINS: water, water-miscible acrylic, polyurethane formers and thickeners, non-ionic soaps. May contain: ultramarine blue, carmine, mica, iron oxides, titanium dioxide or chromium hydroxide.
Honey Bee	Remover	Our acetone-free fragrance-free formula is enriched with horsetail extract to strengthen nails, and fortified with vitamin E and aloe to soothe and protect cuticles. This totally odorless blend of alcohols works to remove our WaterColors Nail Enamel as well as conventional polish. CONTAINS: methanol, methyldiglycol, trimethyl hydroxypentyl isobutyrate, equisetum arvense (horsetail) extract, tocopheryl acetate (vitamin E), aloe barbadensis leaf juice, denatonium benzoate (bittering agent).
Sante Kosmetic	Polish	NO formaldehyde; NO toluene; NO colophony (rosin); NO

[21] Environmental Working Group, Skin Deep Report, http://www.ewg.org/reports/skindeep/report/pregnancy_concerns.php#phthalates http://www.cosmeticscop.com/learn/article.asp?PAGETYPE=ART&REFER=SKIN&ID=79

[22] EPA Hazard Summary-Created in April 1992, http://www.epa.gov/ttnatw01/hlthef/methylme.html

[23] SENSOR Occupational Lung Disease Bulletin - October 1997, A project of the Massachusetts Department of Public Health's Occupational Health Surveillance Program, the Massachusetts Thoracic Society, and the Massachusetts Allergy Society. http://www.mass.gov/dph/bhsre/ohsp/sensor/mts1097.htm

[24] Spencer AB, Estill CF, McCammon JB, Mickelsen RL, Johnston OW (1997): Control of Ethyl Methacrylate Exposures During the Application of Artificial Fingernails. AIHA Journal 58:214-218.

[25] Froines JR, Garabrant DH (1986): Quantitative Evaluation of Manicurists Exposure to Methyl, Ethyl, and Isobutyl Methacrylate During Production of Synthetic Fingernails. Appl. Ind. Hyg 2:70-74.

		phthalate; NO synthetic preservatives; NO synthetic fragrances; NO color lakes; highly-refined colorants. CONTAINS: Ethyl Acetate, Butyl Acetate, Phthalic Anhydride/Trimellitic Anhydride/Glycols Copolymer, Nitrocellulose, Acetyl Tributyl Citrate, Isopropyl Alcohol, Stearalkonium Bentonite, Acrylates Copolymer, Hydrogenated Polyisobutene, Palmitic Acid, [+/- Mica, Titanium Dioxide, Iron Oxides, Tartrazine, D&C Red 7, Carmine, Chromium Oxide Greens, Ferric ferrocyanide, D&C Red 34, Tin Oxide]
Suncoat	Water-based Nail Polish	Water, acrylic copolymer (film former, plastic) styrene-acrylic copolymer (film former, plastic), PPG ether (film forming aid), PEG/PPG benzoate (indirect food additive, film forming aid), soap. minerals: mica, titanium dioxide, carmine, iron oxide, Ferric Ferrocyanide
SunCoat	Remover	Corn ester, soya ester
Primavera Life	Remover	Organic Alcohol 96% Pure, non-denatured alcohol, distilled from organic spelt corn from Germany
En Vogue	Gel acrylic nail - Prep & Clean - Connector - Modeling Resin - Ultra White Fill - Sealer	 Alcohol, Ester 2-propenoic acid 2-methyl-7,7,9 (or 7,9,9)-trimethyl-4,13-dioxo,14-dioxa-5,12-diazahexadecane-1,16-diyl ester, Methacrylated Resin Xi-R36/38 Urethaneacrylate, Epoxyacrylate, Polyesteracrylate, Phonoinitiator, Urethaneacrylate, Acrylate Monomer, Polyesteracrylate, Phonoinitiator, Pigment Urethaneacrylate, Acrylate Monomer, Phonoinitiator
Nails at Last	Artificial nail	Glue + Edible powder + oil/buffing Glue is ethyl cyanoacrylate
Amoresse Ultima	Odorless acrylic - Liquid - UltraBond	 2-hydroxyethyl methacrylate, trimethylol propane, trimethacrylate esters ethyl acetate, 2, 2-bis-(4-(2-hydroxy-3-methacrylaoxpropoxy)BIS-GMA, 2-hydroxyethyl ethyl methacrylate, MEHQ

Checking for Ingredient Data in Toxicity Databases
Very few ingredients in alternative products appear in the most relevant and comprehensive hazardous substance databases (their full names are in the Glossary). Ingredients with entries in these databases are shown in Table 4. Many of these ingredients, however, are not found in candidate alternative products, listed in red to the right of the databases in Table 4.

Brand Abbreviations
HB = Honey Bee
SC = Suncoat
SK = Sante Kosmetics
PV = Primavera Life
AU = Amoresse/Ultima Odorless Acrylic
EV = En Vogue Gel System
NL = Nails at Last (Artificial Nail System)

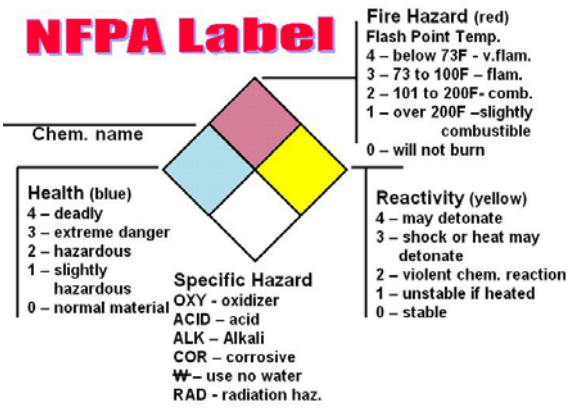
Table 4: Ingredients with Test Data in Alternative Products

	CCRIS	Genetox	HSDB (Toxnet)	IRIS	MSDS	HB Remover	HB Polish	SK Polish	SK Remover	SC Polish	SC Remover	Primavera Remover	AU Odorless Acrylic	EV Gel Artificial Nail	NL Artificial Nail
Acetone	x	x	x	x	x										
acrylic acid	x		x	x	x										
benzoyl peroxide	x	x	x		x										
dibutyl phthalate	x	x	x	x	x										
ethanol	x	x	x						x						
ethyl acetate	x	x	x	x	x			x	x				x		
formaldehyde	x	x	x	x	x										
isopropyl alcohol	x	x	x		x			x							
methacrylic acid	x		x	x											
methanol	x	x	x	x	x										
methyl methacrylate	x		x	x	x										
methylene chloride	x	x	x	x	x										
n-butyl acetate	x		x		x										
phthalic anhydride	x	x	x	x	x										
titanium dioxide	x	x	x		x		x	x		x					
toluene			x	x											

Checking and Comparing MSDSs
The MSDSs of alternative products did not raise significant warning signs, except the acrylic products, which indicated possible respiratory and dermal irritations. For products where an MSDS was available, NFPA ratings were often included. They serve as a useful point of comparison (Table 5). The rating system is explained below as well.

Table 5: NFPA Rating Comparison

	Health	Flammability	Reactivity	Contact
HB Polish	1	0	0	
SC Polish				
SK Polish				
HB Remover	1	3	0	
SC Remover				
SK Remover				
Primavera Remover				
AU Odorless Liquid	2	1	1	
AU Ultrabond (primer)	2	4	2	2
EV Gel Artificial Nail	1	1	1	
EV Prep & Clean	1	3	0	
NL Powder				
NL Adhesive	2	2	1	



Scorecard Ranking
Scorecard entries for common solvents and solvents found in alternative products are shown in Table 6. This is the "human health" ranking. While these results are confusing, we include them here to show the limits of any one ranking system to help us determine relative safety. Scorecard uses percentages or percentage ranges to show risk: the higher the percentage, the higher the risk. The more benign solvents are on top. Not only are the percentages confusing but there is so much overlap, there is no way to do a fine-grained comparison.

Table 6: Scorecard Ranking for Solvents

Solvent	Human Health Ranking
Methanol	**25-50%**
Ethyl Ester	**25-50%**
Acetone	**25-50%**
N-Butyl Acetate	**50%**
Ethanol	**50%**
Toluene	**25-50%**
Ethyl Acetate	**25-75%**
Isopropyl Alcohol	**25-75%**
Formaldehyde	**25-100%**

The list below shows how the chemists in the Center for Green Chemistry would rank solvents from most benign to least benign. This ranking has been presented to other experts in the field and no disagreement has yet been voiced.

Rough Solvent Ranking
Water
Ethyl lactate
Ethyl acetate
Ethanol
Isopropyl alcohol
Methanol
Acetone
Toluene
Methylene Chloride
Formaldehyde

Results with regard to solvents
Since the Honey Bee and Suncoat polishes are water-based, they are likely to be safer than Sante Kosmetic. However, since Sante's main solvent is one of the safer ones, this is also a good potential alternative. Of the polish removers, the Suncoat and Primavera Life are likely made of ethyl esters, which may be more benign than the methanol in the Honey Bee remover.

Artificial Nail Products
Methacrylates are all potential sensitizers and pose similar hazards (see Appendix V). They can cause workers or customers to develop an allergic reaction that usually manifests as skin irritation on the face and hands. The alternative artificial nail salon products examined in this study use larger methacrylates molecules such as 2-hydroxy ethyl methacrylate. Heavier molecules are less volatile and therefore less likely to give off strong odors or cause respiratory irritation. Still, these products are not necessarily less sensitizing or toxic. They may just have a harder time making contact with human systems.

The benefit of gel systems with the UV curing is workers and clients do not come into contact with unreacted, unbonded methacrylates in their liquid form, when they are single molecules waiting to meet up with longer polymer chains. Gels are oligomers or short chains that form longer ones when cured under UV light. We believe this may add a layer of safety for a group of products where there is no clear alternative.

The unusual edible powder and glue system from Nails at Last is not favorable with either the toxicity/safety screen or the performance screen. The glue is ethyl cyanoacrylate, it was difficult to apply and did not last long.

Performance Test Results

Table 7 captures comments made by owners and technicians as they applied test products.

Table 7: Major Comments from Performance Tests

Product	Owner A, Tech A (NB)	Owner B, Tech B (TK)	Owner C (TN)
Polish 1: HB	No odor Some lines/streaks Easier to apply than SC Thinner than OPI	No odor Dries too fast	
Polish 2: SC	No odor Not smooth/streaky Not as easy to use as OPI Good brush/bottle	No odor Does not dry quickly enough – mixes w/top coat	

Polish 3: SK	N/A	Smells about the same as OPI "Pearl" color is nice Easy to use	
Remover 1: HB	Almost the same as acetone*	Odor of each was better than acetone. HB and SC about the same and better than PV.	
Remover 2: SC	Harder to use and takes longer than HB		
Remover 3: PV	Hard to dispense		
Artificial 1: AU		Odor lighter than OPI. Same ease of application (but takes more time than OPI).	
Artificial 2: EV		White part (of French modeling) may not be white enough. Connector/sealer don't have brushes, not easy to use. Gel always takes longer. Itchy near cuticle. Likes the Prep&Clean, work better than alcohol.	
Artificial 3: NL		Easy to use. Drying time is about the same as OPI. Nail was itchy when it came into contact with Prep&Clean Itchy near cuticle (volunteer)	

* This tech had not applied top-coat when she used the remover and she may have used the remover on the water based polish.
** One owner asked about ventilated filing equipment

Of the polishes, HB and SK were both favored over SC. Both were easy to apply, looked good, had a nice selection of colors, and appeared durable. HB was harder to remove with regular nail polish but easy to remove with the remover it comes with. SK may be easier to sell to customers in the first pass at substitution, because it is the most similar to traditional products like OPI. It looks and feels the most like OPI. HB is a little thin. SC was the least favorite due to a streaky appearance.

Of the polish removers, again HB was the most popular. Participants consistently mentioned the SC remover was too greasy and the PV took too much effort.

We were only able to document durability and ease of removal with our one NEI volunteer who took pictures of her nails and removed them about 2 weeks after they were applied. We also asked the owner who applied them to look at her nails. He was impressed by the durability, since only a couple nails showed chipping or scratching. He said he would definitely feel comfortable trying these products in his salon. He did, however, ask whether they were sold in drugstores or other stores nearby. I explained that I have only found them on the web or by calling distributors.

Our volunteer's comments in Table 8 reveal the difficulty of removing the acrylic products. Some products took 45 minutes to soak before she could peel them off. Also, the water-based polishes were difficult to remove using a standard polish remover. We should have asked her to use different combinations of remover with the different nail polish and artificial nail systems or at least to use the remover that came with the polish.

Table 8: Comments on Removal

Product	Comment about removal or appearance after 2 weeks of wear
Polish 1: HB	"hard to remove using SH*" "also used isopropyl alcohol"
Polish 2: SC	When applied on EV (gel) artificial nails: "It was very hard to remove the polish using the Sally Hansen remover. It took several passes and pressure on the nail to remove the polish." When applied on AU (acrylic) artificial nails: "It was easier to remove the polish from this nail, but not as easy as the standard nail polish [OPI]."
Polish 3: SK	"easy as OPI"
Artificial 1: AU	"30 mins of soaking in SH to peel off"
Artificial 2: EV	"45 minutes of soaking in SH to peel off easily"
Artificial 3: NL	"I don't remember if I actually tried to remove this one. It might have chipped off over time…but thin layers of it remain."

*SH is Sally Hansen polish remover (acetone)

Table 9: Summary of Responses Along Performance & Market Criteria*

Product	Appearance (incl. shine, color)	Odor & other irritation	Ease of Use (incl. drying time)	Durability (incl. removal)	Cost**
Polish 1: HB	Good	Almost none	Easy	Durable (w/ top coat)	Competitive
Polish 2: SC	Not so good (streaky)	Almost none	Slower drying time	Durable (w/top coat)	Almost 2x standard
Polish 3: SK	Very good	Some (similar but not as strong as OPI)	Easy	Durable (w/top coat)	Almost 2x standard
Remover 1: HB		Low	Easy		About 6x standard ***
Remover 2: SC		Low	Not as easy		About 10x standard
Remover 3: PV		Low	Not as easy		About 20x standard
Artificial 1: AU	Good	No odor but some itchiness	Easy	Very durable	Slightly higher
Artificial 2: EV	Good	None	Requires some skill	Very durable	About 2x standard
Artificial 3: NL	Not so good	Odor in glue & peripheral products that came with.	Easy	Not durable (came off by itself over 2 week period)	Slightly higher

*As compared to standard products such as OPI.
**At retail price, not bulk (the price at which some salons purchase supplies).
***This is because acetone is so inexpensive when bought in bulk.

Discussion

Given the methodology we developed, the alternative products that passed through the screens appear less toxic and safer than conventional products currently in use. Without more available data on ingredients and health effects, we cannot say these alternatives will not cause the adverse health impacts. Of the alternatives used in performance test, a few performed well enough to serve as substitutes in salons, as long as some application procedures are followed. For example, alternative products from the same manufacturer, or product line, appear to work well together in the case of water-based nail polishes.

Consolidating the technical and practical evaluations, the following conjectures emerge:

1) Honey Bee and Sante Kosmetic nail polishes are good alternatives, with Honey Bee likely to be less toxic because it is water-based.

2) Honey Bee polish remover is the best performing remover and most promising alternative, but it may not be as benign as Suncoat and Primavera Life grain alcohols.

3) The Amoresse Ultima Odorless performed best and did not irritate users. The En Vogue gel system was comparable in performance but required more skill to apply. The gel system may be safer.

Challenges and Opportunities for Substitution

Cost. The alternative nail polishes, even the water-based ones, actually cost about the same as conventional products, about $5 per bottle. The polish removers ranged from slightly more costly (HB) to much more costly (SC and PV); the grain alcohols were as much as ten times more expensive than acetone which is very inexpensive. The gel system was about twice as expensive as standard acrylic systems and it is uncertain whether it takes less time to apply. The odorless acrylic system was only slightly more expensive. For the products that were substantially more expensive, it is uncertain whether bulk purchasing, shorter application times, or other benefits might outweigh the higher premium.

"Professional" vs. "consumer" grade. Some salons refuse to carry products that can be found at other retail outlets such as drugstores, claiming products available at these outlets are consumer grade, or lower quality. It is likely that there is very little difference in the composition of professional and consumer grade products, but salons like to have a marketing edge that facilitates retails sales from their stores. Vietnamese owners may feel less strongly about this difference, but it has been documented as a concern among other salon owners.[26]

Resistance to change. Our difficulty finding salons interested in testing alternative products further indicates the challenge for substitution of these products. There seems to be resistance on the part of owners, workers and customers. Among the salons that did participate, two said their clientele were set in their ways and it would be hard to convince them to use new products.

Competition among salons. Related to the point above, the large number of salons, often in very close proximity to one another, creates intense pressure on prices. Not only are salons pressed to keep their clientele, but they also do not have much room to change their pricing structures. At least one salon we have worked with, however, feels alternative products give him a competitive advantage. Exploring how a healthy business model could distinguish salons and actually improve economic outcomes is an important next step.

[26] Based on a conversation between Pioneer Valley Project and a local distributor in Springfield.

Supply chain issues. There are several dynamics at play when it comes to the nail salons industry and its supply chains. First, we must recognize the power of large product and chemical manufacturers in promoting their products in this market. For example, “retailing” products is a common function for many salons (according to Nails Magazine 2005 Industry Statistics) and salons receive commissions for retailing certain products. This could contribute toward the monopoly that manufacturers such as OPI have on the industry and explain some of the resistance to change. On the other hand, because most salon owners purchase products at local professional supply stores, owned by other Vietnamese immigrants, there is a strong possibility that salon and supply shop owners would support other companies if they perceived benefits to Vietnamese immigrants. A number of Vietnamese entrepreneurs are interested in a Vietnamese-owned product manufacturer, but they do not have the capital necessary to start one. Also, during this project, Viet-AID established a relationship with a local supply shop in Dorchester. The owner there was interested in trying samples and distributing as long as we helped make the connections and possibly set up a system where the store would only pay for inventory that sold.

Conclusions

The most promising alternative products were Honey Bee and Sante Kosmetic nail polish, Honey Bee polish remover, En Vogue Gel Systems and Amoresse Ultimata odorless acrylics. A couple of these products, HB polish remover and AU acrylics, represent the best compromise between reduced toxicity and performance while others (Honey Bee nail polish) represent the optimal solution given the current market supply of alternatives.

Areas for further alternative product research include other product categories such as disinfectants and fungicides and other product components such as polymers and plasticizers. Given the limited selection of alternative products on the market and the underdevelopment of some of currently on the market, another project could look at ways to improve product performance and bring alternatives into the mainstream through marketing and distribution.

Health and safety advocates should continue to direct change efforts at different levels of the supply chain, however this study does point toward the importance of work targeting manufacturers of the most popular conventional products. They have the greatest resources for testing toxicity and safety and for reformulating products.

Appendix I: Chemicals of Concern

We used three lists, with overlap likely between them. List 1 was developed by NEI as a first cut for screening products.

List 1: Common chemicals of Concern (Partial)		
Chemical	**Use in Products**	**Possible Health Effects**
Acetone	Solvent	Can irritate eyes, nose and throat when inhaled. Prolonged or repeated contact defats the skin and cause dermatitis. High exposures may damage the liver and the kidneys; long-term exposure can cause chronic nose and throat irritation.[27] Solvents like acetone can also aid in the transport of more harmful compounds across the skin barrier.
Formaldehyde	Solvent	A known carcinogen, linked to nasal and lung cancer with possible links to brain cancer and leukemia. Short-term exposure to formaldehyde can be fatal. Long-term exposure to low levels of formaldehyde may cause respiratory difficulty, eczema, and sensitization.[28]
Toluene	Solvent	A strong sensitizing agent and neurological and reproductive toxin. Often found in samples of human body fat.[29]
Dibutyl Phthalate	Plasticizer[30]	Linked to in-utero damage to the male reproductive system.[31]
Methyl Methacrylate (MMA)	Used to form a polymer or plastic	Irritating to the skin, eyes, and mucous membranes in humans. Possible dermal and respiratory effects over short and long term exposure. Respiratory symptoms following acute exposures include chest tightness, dyspnea, coughing, wheezing, and reduced peak flow. Neurological symptoms also reported in humans following acute exposure. Fetal abnormalities have been reported in animals exposed by injection and inhalation. Not likely to be carcinogenic according to the EPA.[32]
Ethyl Methacrylate (EMA)	Used to form a polymer or plastic. (Interestingly, EMA is not	Less is known about the toxicity of EMA but it is believed to have similar health effects as MMA.[33] Currently, there is no OSHA standard for EMA. Industrial hygiene recommendations are the same for both MMA and ethyl

[27] http://www.nsc.org/ehc/chemical/Acetone.htm
[28] http://www.osha.gov/SLTC/formaldehyde/recognition.html
[29] http://www.checnet.org/healthehouse/chemicals/chemicals-detail2.asp?Main_ID=287, http://www.cosmeticscop.com/shop/toluene.asp
[30] Plasticizers are chemical agents added to plastics to make them softer and more flexible.
[31] Environmental Working Group, Skin Deep Report, http://www.ewg.org/reports/skindeep/report/pregnancy_concerns.php#phthalates http://www.cosmeticscop.com/learn/article.asp?PAGETYPE=ART&REFER=SKIN&ID=79
[32] EPA Hazard Summary-Created in April 1992, http://www.epa.gov/ttnatw01/hlthef/methylme.html

[33] SENSOR Occupational Lung Disease Bulletin - October 1997, A project of the Massachusetts Department of Public Health's Occupational Health Surveillance Program, the Massachusetts Thoracic Society, and the Massachusetts Allergy Society. http://www.mass.gov/dph/bhsre/ohsp/sensor/mts1097.htm

[34] Spencer AB, Estill CF, McCammon JB, Mickelsen RL, Johnston OW (1997): Control of Ethyl Methacrylate Exposures During the Application of Artificial Fingernails. AIHA Journal 58:214-218.

	significantly different from MMA. Yet, it is touted by some nail product companies as a safer alternative.)	methacrylate.[34][35]

Tin Nguyen, President of the Vietnamese Nail Care Professionals Association (VNCPA) provided this list as part of a possible longer term collaboration with New Ecology's nail salon project.

List 2: Common chemicals of Concern

Ingredient	Product
acetone	nail polish removal
acrylic	(make fake nails)
acrylic ester copolymer	powder to make fake nails
acrylic stearalkonium hectorite	nail polish
alizural purple	nail polish
alkyl dimethyl ethylbenzalammonium chloride	fungicide
alkyl dimethyl benzylammonium chloride	fungicide
bentone	nail polish
benzophenone	liquid acrylic
benzoyl peroxide	powder to make fake nails
bismuth oxychlorite	nail polish
butyl acetate	nail polish
camphor	nail polish
citric acid	nail polish
cocoamide	cuticle softener
D & C Red #34 Calcium Lake	nail polish
D & C Red #6 Barium Lake	nail polish
D & C Red #7 Calcium Lake	nail polish
D & C Violet #2	nail polish
D & C Yellow #5 Aluminum Lake	nail polish
diacetone alcohol	nail polish
dibutyl phthalate	nail polish
dimethyl-p-toluidine MEHQ	liquid acrylic
ester monomers	liquid acrylic
ethanol	fungicide
ethyl acetate	nail polish
ferric ammonium ferrocyanide	nail polish
glycol stearate	cuticle softener
iron dioxide	nail polish
iron oxides	nail polish
isobutyrate	nail polish
isopropyl alcohol	nail polish
lanolin	cuticle softener

[35] Froines JR, Garabrant DH (1986): Quantitative Evaluation of Manicurists Exposure to Methyl, Ethyl, and Isobutyl Methacrylate During Production of Synthetic Fingernails. Appl. Ind. Hyg 2:70-74.

lauric DEA amide	cuticle softener
methyl methocrylate	liquid acrylic
methyparaber	cuticle softener
mica	nail polish
n-alkyl dimethylbenzoyel ammonia chloride	fungicide
n-alkyl dimethylethylbenzyl ammonium chloride	fungicide
nitrocellulose	nail polish
Octrizole	nail polish
octyl decyldimethylammonium chloride	fungicide
polyester resin	nail polish
silica	nail polish
silica nylon fiber	nail polish
sodimether sulfate	cuticle softener
sodium hypochlorite	bleach
sodium sulfate	cuticle softener
Sodium chloride	cuticle softener
stearalkonium hectorite	nail polish
sucrose acetate	nail polish
talc	nail polish
titanium dioxide	nail polish
toluence	nail polish
tosylamide fromaldehyde resin	nail polish
ethyl acetate	base coat
butyl acetate	base coat
alcohol	base coat
dibutyl phthalate	base coat
magnesium sulfate	pedicure soak
sodium tripolyphosphate	pedicure soak
methol	pedicure soak

List 3, below, was compiled by the Center for Green Chemistry.

dibutyl phthalate	bithionol
diethyl phthalate	mercury compounds
di-n-butyl phthalate	vinyl chloride
diisobutyl phthalate	halogenated salicyanilides
bis(2-ethylhexyl)phthalate	zirconium complexes in aerosol cosmetics
benzyl butyl phthalate	chloroform
Nonylphenol, 4-nonylphenol	methylene chloride, dichloromethane
nonylphenol monoethoxylate	chlorofluorocarbon propellants
nonylphenol diethoxylate	hexachlorophene
4-tert-butylphenol	
polybrominated diphenyl ether	Ethyl acetate
benzo(a)pyrene	Butyl acetate
PCB 52	Ethyl alcohol
chlordane	Acetone
dieldrin	Xylene
chlopyrifos	Toluene
Permethrin, trans-permethrin	Methyl ethyl ketone
o-phenyl phenol, oPP?	Ethyl cyanoacrylate
bisphenol A	Ethyl ether
Parabens, methyl paraben	
bis(2-ethylhexyl)adipate	acetonitrile
OP2EO	nitromethane
DDT	
PCP	
piperonyl butoxide	
APEOs	
PAHs	
PDBEs	
Methoxychlor	
Methylene Chloride	
Methacrylic acid	
Methacrylates, Methacrylate compounds	
Ethyl methacrylate (EMA)	
Methyl methacrylate (MMA)	
Butyl methacrylate	
Acetone	
Formaldehyde	
Color Additives	

Appendix II. List of Candidate Alternative Products

Company	Product Name	Published Claims & Ingredient Lists
HB	No-Peel Watercolor Enamels	No toluene, xylene, formaldehyde, dibutyl phthalate and NO FD&C colors, only natural mineral pigments." CONTAINS: water, water-miscible acrylic, polyurethane formers and thickeners, non-ionic soaps. May contain: ultramarine blue, carmine, mica, iron oxides, titanium dioxide or chromium hydroxide.
HB	Remover	Our acetone-free fragrance-free formula is enriched with horsetail extract to strengthen nails, and fortified with vitamin E and aloe to soothe and protect cuticles. This totally odorless blend of alcohols works to remove our WaterColors Nail Enamel as well as conventional polish. CONTAINS: methanol, methyldiglycol, trimethyl hydroxypentyl isobutyrate, equisetum arvense (horsetail) extract, tocopheryl acetate (vitamin E), aloe barbadensis leaf juice, denatonium benzoate (bittering agent).
SK	Polish	NO formaldehyde; NO toluene; NO colophony (rosin); NO phthalate; NO synthetic preservatives; NO synthetic fragrances; NO color lakes; highly-refined colorants. CONTAINS: Ethyl Acetate, Butyl Acetate, Phthalic Anhydride/Trimellitic Anhydride/Glycols Copolymer, Nitrocellulose, Acetyl Tributyl Citrate, Isopropyl Alcohol, Stearalkonium Bentonite, Acrylates Copolymer, Hydrogenated Polyisobutene, Palmitic Acid, [+/- Mica, Titanium Dioxide, Iron Oxides, Tartrazine, D&C Red 7, Carmine, Chromium Oxide Greens, Ferric ferrocyanide, D&C Red 34, Tin Oxide]
NM	Remover	Fruit Acid Solvent (Methyl-Pentan-2-one, Multi-fruit acids), Amber Acid (derived from plant lichens), Deionized Water, Vitamin A, Natural Vanilla Fragrance
SC	Water-based Nail Polish	Water, acrylic copolymer (film former, plastic) styrene-acrylic copolymer (film former, plastic), PPG ether (film forming aid), PEG/PPG benzoate (indirect food additive, film forming aid), soap. minerals: mica, titanium dioxide, carmine, iron oxide, Ferric Ferrocyanide
SC	Remover	Corn ester, soya ester
PL	Remover	Organic Alcohol 96% Pure, non-denatured alcohol, distilled from organic spelt corn from Germany
EV	Gel acrylic nail - Prep & Clean - Connector - Modeling Resin	 Alcohol, Ester 2-propenoic acid 2-methyl-7,7,9 (or 7,9,9)-trimethyl-4,13-dioxo,14-dioxa-5,12-diazahexadecane-1,16-diyl ester, Methacrylated Resin Xi-R36/38 Urethaneacrylate, Epoxyacrylate, Polyesteracrylate,

	- Ultra White Fill - Sealer	Phonoinitiator, Urethaneacrylate, Acrylate Monomer, Polyesteracrylate, Phonoinitiator, Pigment Urethaneacrylate, Acrylate Monomer, Phonoinitiator
OO	Artificial nail	Glue + Edible powder + oil/buffing Glue is ethyl cyanoacrylate
NL	Artificial nail	Glue + Edible powder + oil/buffing Glue is ethyl cyanoacrylate
AU	Odorless acrylic - Liquid - UltraBond	 2-hydroxyethyl methacrylate, trimethylol propane, trimethacrylate esters ethyl acetate, 2, 2-bis-(4-(2-hydroxy-3-methacrylaoxpropoxy)BIS-GMA, 2-hydroxyethyl ethyl methacrylate, MEHQ

Appendix III. List of Distributor Contacts

Company	Contact Name	Phone Number	Email	Product
Honey Bee Gardens	Melissa	610-396-9225	melissa@honeybeegardens.com	Polish & Remover
Suncoat Products	Ying	888-870-3334	suncoatproducts@yahoo.com	Polish & Remover
No-Miss (via Vegan Unlimited)	Diana		diana@veganunlimited.com	
Sante Kosmetics	Patrick (works for the distributor Lagona in Florida)	800-648-6654		Polish
Primavera Life	Jennifer (of Be Well, Stay Well in Cleveland, Ohio) referred me to a German distributor in Montana	877-232-5359		Remover
Original Organics	Mary	800-231-1635		
Nails at Last	Cindy Ledoux	800-653-1097	nailsatlast@comcast.net	Artificial
Vogue Nails	Brenda Klassen (distributor in Washington for Amoresse and En Vogue Nails, a Canadian company)			

Appendix IV. Comparative Product Evaluation Methodologies: Environmental Working Group and GreenSeal

A. Environmental Working Group (EWG)

Methodology used for their Skin Deep Report, which can be found at:
http://www.ewg.org/reports/skindeep/report/executive_summary.php
http://www.ewg.org/reports/skindeep/report/methodology.php

1. **Populated the product database**. Product descriptions and ingredients were copied from online retailers including products sold on drugstore.com, beauty.com, vitaminshoppe.com, terressentials.com, hairboutique.com, cvs.com, and walgreens.com.
2. **Parsed the ingredients lists**. Each ingredient list was parsed to populate a database of ingredients.
3. **Created synonym list**. Synonyms of each ingredient were looked up at ChemFinder.com to simplify the database. [link]
4. **Ingredients were matched to the following lists**:

List	Abbreviation	Reference / Link
Carcinogen/ Mutagen/ Repro Toxic List	CMR	EU Directive 67/548/EEC. United Nations Economic Commission for Europe (UNECE) (2004). The Globally Harmonized System of Classification and Labelling of Chemicals (GHS). [link] (Part 3: Health and Environmental Hazards);
Cosmetics Ingredient Review Compendium	CIR	Cosmetics Ingredient Review (CIR) (2003). 2003 CIR Compendium, containing abstracts, discussions, and conclusions of CIR cosmetic ingredient safety assessments. Washington DC.
10th Report on Carcinogens	Rep10	National Toxicology Program (2002). Report on Carcinogens, Tenth Edition; U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, December 2002. Available online at [link]
International Agency for Research on Cancer	IARC	International Agency for Research on Cancer (2004). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans and their Supplements: A complete list. Available online at [link]
California's Proposition 65 List	Prop65	Office of Environmental Health Hazard Assessment (OEHAA) (2004). State of California Environmental Protection Agency. Chemicals known to the state to cause cancer or reproductive toxicity. [link]
FDA's Banned in Cosmetics list	FDA	Food and Drug Administration (FDA) (2000). Prohibited Ingredients and Related Safety Issues. Office of Cosmetics and Colors Fact Sheet. March 30, 2000. Accessed online May 20 2004. [link]
American Conference of Governmental Industrial Hygienists Carcinogen List	ACGIH	American Conference of Governmental Industrial Hygienists (2004). ACGIH cancer classification system. [link]
NTP Breast Cancer List	NTP	National Toxicology Program (2004). Chemicals Associated with Site-Specific Tumor Induction in Mammary Gland. Available online. [link]
Our Stolen Future Endocrine Disrupters	OSF	Our Stolen Future

5. **Scored each ingredient**. Scores were assigned to each ingredient according to the list(s) on which it appears and how that list categorized it. The scores were assigned relative to known carcinogens (100 points.)

6. **Scored the products.** Add up the scores of the ingredients according to product use and the following rules:
   - Lung carcinogens scored only if the product was intended to be used in a way that it might be inhaled.
   - Titanium Dioxide and Talc (possible carcinogens) scored as possible carcinogens only if the product was intended to be used in a way that it might be inhaled.
   - Coal tar dyes: a product with one coal tar dye scores 55 points. a product with 2 or more coal tar dyes scores 100 points.
   - Photo sensitizers were only scored once per product and were not scored in oral products (mouthwash/toothpaste).
   - Compounds with Concentration of Use Limitations were only scored once per product.

7. **Normalized the scores**. Each product score was log normalized to a 0-10 scale where 10 corresponds to the product with the highest raw score. The following formula applies: Score = { 10*Log(Raw Score)/Log(Highest Raw Score); 0.1 iff Raw Score=1; 0 iff Raw Score=0 }.

EWG Scoring System

Description	Source	Score
Carcinogen / Mutagen score only highest applicable category		
Known Carcinogen	CMR: Carc. Cat. 1. report10: "known" ACGIH: "Category 1" IARC: "Category 1"	100
Probable Carcinogen	CMR: Carc. Cat. 2 or R45 report10: "suspected" ACGIH: "Category 2" IARC: "Category 2a or 2b" prop65: "cancer"	55
Known Mutagen	CMR: Muta. Cat. 1	30
Probable Lung Carcinogen (Inhalable Product)	CMR: R49 silica	0 to 55
Probable Mutagen	CMR: Muta. Cat. 2 or R46	15
Possible Carcinogen	CMR: Carc. Cat. 3 or R40 ACGIH: "Category 3 or 4" IARC: "Category 3"	15
Possible Mutagen	CMR: Muta. Cat. 3	5
Reproductive Toxics score only highest applicable category		
Known Reproductive Toxics	CMR: Repr. Cat. 1	100

Probable Reproductive Toxics	CMR: Repr. Cat. 2 or R60/R61/R45 prop65: "repro" or "developmental"	55
Compounds with Concentration of Use Limitations	CIR	15
Possible Reproductive Toxics	CMR: Repr. Cat. 3	15
Special Case (score if none of the above categories apply)		
Endocrine Disruptor (may alter hormone levels)	OSF: listed	15
Safety Violation Categories score only highest applicable violation -- low score applies to other products		
Unsafe for Use in Cosmetics	FDA CIR	90
Safe For Brief Use/Rinsing (Leave On Product)	CIR	5 to 90
Avoid Skin Contact (Skin Contact Product)	CIR	5 to 55
Not Safe For Use on Infant Skin (Infant Products)	CIR	5 to 55
Not Safe For Use on Injured or Damaged Skin (Advertised for Dry/Damaged Skin)	CIR	5 to 25
Unsafe for Leave On Products (Leave On Product)	CIR	5 to 25
Not Safe For Use if Inhalable (Inhalable Product)	CIR	5 to 25
Use Independent Categories score all that apply		
Coal Tar Dyes	CIR	55 to 100
Amine or Nitroso Compounds (Product Contains Both)	CIR	30 to 55
Manufacturing Impurity Concerns	CIR	30
Penetration Enhancer	CIR	20
Endocrine Disruptor/Estrogen-like Compound	OSF: listed	15
Skin Sensitizer	CIR CMR: R43	15
Photo Sensitizer	CIR AHAs & BHAs	15
Insufficient Data - All Uses	CIR	1
Not Assessed by the CIR	CIR: not listed	1

Surrogate Chemical Used for Safety	CIR	1
Wildlife and Environment Concerns	CMR: R50 - R59	1
Use Dependent Categories high score applies dependent on the intended use -- low score applies to other products		
Avoid or Minimize Skin Exposure (Skin Contact Product)	CIR	5 to 15
Lung Sensitizer (Inhalable Product)	CMR: R42	0 to 15
Skin Irritant (Skin Contact Product)	CMR: R38 CIR	0 to 1
Lung Irritant (Inhalable Product)	CMR: R37	0 to 1
Eye Irritant (Near-eye Product)	CMR: R36	0 to 1
Insufficient Data - Leave On (Leave On Product)	CIR	0 to 1
Insufficient Data - Inhalation (Inhalable Product)	CIR	0 to 1
Insufficient Data - Mucus Memb. (Eye/Mouth Product)	CIR	

B. Green Seal Methodology

1. Formulates criteria for the category or applies Green Seal's existing standards. The criteria emphasize pollution prevention and take a life-cycle approach to the category.
2. Surveys the market to determine all leading national brands. Requests information from each manufacturer on whether its products meet the criteria and where they can be purchased. Follows up with the manufacturers to obtain this data and, where necessary, clarify it.
3. Makes specific recommendations of brands and models that meet the criteria. Green Seal's recommendations always include enough manufacturers to provide a competitive purchasing climate.
4. Reviews data on recommended products with the manufacturers who provided it to ensure accuracy.
5. Prepares a draft Report and sends it for peer review to a panel typically including manufacturers, users, academics, and government.
6. Based on peer review comments, revises the Report.
7. Publishes and distributes the *Choose Green Report*.

Appendix V. Methacrylate Comparison

Cora Roelofs, Research Faculty in Work Environment at University Massachusetts Lowell, generously shared her working notes with **NEI.**

Methacrylate	CAS	VP	Tox	Health Effects
Methyl Source: Fischer MDSD	80-62-6	28 mm Hg @ 20C	Draize test, rabbit, eye: 150 mg; Inhalation, mouse: LC50 = 18500 mg/m3/2H; Inhalation, rat: LC50 = 78000 mg/m3/4H; **Oral, mouse: LD50 = 3625 mg/kg**; Oral, rabbit: LD50 = 8700 mg/kg; Oral, rat: LD50 = 7872 mg/kg; Skin, rabbit: LD50 = >5 gm/kg	Eye: Contact with eyes may cause severe irritation, and possible eye burns. May cause eye injury. Skin: May cause severe skin irritation. May cause skin **sensitization**, an allergic reaction, which becomes evident upon re-exposure to this material. Ingestion: May cause central nervous system depression, kidney damage, and liver damage. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause allergic reaction. Exposure may cause headache, anorexia, and irritability. Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause allergic respiratory reaction. May cause respiratory tract irritation. May cause effects similar to those described for ingestion. Chronic: Prolonged or repeated skin contact may cause sensitization dermatitis and possible destruction and/or ulceration. May cause **reproductive** and fetal effects. Repeated exposure may cause tingling in the extremities and other nervous system abnormalities.
Ethyl Source: Fischer MSDS	97-63-2	16 mm Hg @ 20C	Inhalation, rat: LC50 = 8300 ppm/4H; **Oral, mouse: LD50 = 7836 mg/kg**; Oral, rat: LD50 = 14800 mg/kg;	Eye: Causes eye irritation. Lachrymator (substance which increases the flow of tears). Skin: Causes skin irritation. May cause skin **sensitization**, an allergic reaction, which becomes evident upon re-exposure to this material. Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. Inhalation: Causes respiratory tract irritation. Vapors may cause dizziness or suffocation. Central nervous system effects, which appear to predominate in acute cases are characterized by abnormal fatigue, memory difficulties and dizziness. Chronic: Repeated exposure may cause sensitization dermatitis.
2-Hydroxyethyl Source: Fischer MSDS	868-77-9	0.01 mm Hg @ 25C	**Oral, mouse: LD50 = 3275 mg/kg**; Oral, rat: LD50 = 5050 mg/kg; Same tox effects as EMA listed	Eye: Causes severe eye irritation. Skin: May cause severe skin irritation. May be absorbed through the skin in harmful amounts. May cause skin **sensitization**, an allergic reaction, which becomes evident upon re-exposure to this material. Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. Inhalation: Causes respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. Chronic: May cause **reproductive** and fetal effects.
Triethylene Glycol Di- Source: HSDB	109-16-0		No LD50s available; one contact derm, one metabolic inhibition	Sensitization

Appendix VI. Performance Testing Materials and Questions

(Below is the letter given to each owner in addition to the training NEI staff provided.)

Dear ___ :

Thank you for participating in this project. We need your expert opinion as we search for ways to improve the work environment for Vietnamese immigrants and lower their health risks. If you are interested, there will be other ways to participate. We would love to work with you further to help you promote your salon as a healthy place to receive high quality service.

If you have any questions, please feel free to contact Tam at New Ecology at 617-354-4099, x24 or Kim at Viet-AID at 617-822-3717, x13.

Thank you again,

Tam Doan
Project Manager

General Instructions

You will be testing 3 groups of products. Each group contains 3 brands:

Group 1: Nail Polish	**Group 2: Nail Polish Remover**	**Group 3: Artificial Nail System**
__ Honey Bee Polish	__ Honey Bee Remover	__ Ultima Odorless Acrylic
__ Sante Kosmetics Polish	__ Suncoat Remover	__ En Vogue Gel (Regular)
__ Suncoat Polish	__ Primavera Life Alcohol	__ En Vogue Gel (Self-Leveling)
		__ Nails at Last

1. If you like, you may use the green sign to let your clients know you are testing alternative nail products. This may spark their interest.

2. Inform your frequent clients that you are trying out new products and ask if they would like to

participate in a study. Let them know it will involve filling out a short survey.

3. Perform the nail services the way you normally would. For artificial nails, please follow the specific instructions for the gel (En Vogue) and fishbone powder (Nails at Last) products.

4. Please use all three brands in each product category. For samples in limited supply, please make sure there is some available for the next tester.

5. Please try to use all the products over a 3 or 4 day span.

6. Please fill out one of the feedback forms for ***each*** product – you will be willing out a total of ***9*** of these. When you are done testing all 9 products, please fill out ***one*** summary form for all the products.

Product Survey

FOR OWNERS

Please fill out one for each product.

Which service did you perform using the alternative products?
Circle One: Manicure
Pedicure
Artificial Nail

Which product did you use?

Group 1: Nail Polish	**Group 2: Nail Polish Remover**	**Group 3: Artificial Nail System**
__ Honey Bee Polish	__ Honey Bee Remover	__ Ultima Odorless Acrylic
__ Sante Kosmetics Polish	__ Suncoat Remover	__ En Vogue Gel (Regular)
__ Suncoat Polish	__ Primavera Life Alcohol	__ En Vogue Gel (Self-Leveling)
		__ Nails at Last

These questions may not cover all the things you will think of when you use these products. Please feel free to add your own thoughts and comments.

1. What products do you usually use for this service (please use name brands if possible):

2. Please give your opinion on these products using the following questions. You can check all the boxes that apply (that is, you can check more than one box). Also, feel free to add your own comments:

A. How was the odor?
__ Stronger than the products I usually use
__ About the same as products I usually use
__ Lighter
__ Less irritating

Comments: _____

B. How was the appearance in terms of shine?
__ Not shiny enough
__ About the same as products I usually use
__ Shiny enough
__ Very shiny

Comments: _____

C. How was the appearance in terms of color?
__ I did not like the color because _____
__ About the same as products I usually use
__ I liked the color because _____

Comments: _____

D. Application
Was it as easy to use as the products you usually use?

__ Not as easy
__ The same
__ A little easier
__ Much easier!

Comments: _____

Did you use the same number of coats you normally use (for polish)?

__ Yes
__ No

Comments: _____

How was the drying time?

__ Too slow
__ Average
__ Good
__ Faster than I expected

E. Removal
(For polish and artificial nails)

Was it easy to remove?

__ Not as easy
__ The same
__ A little easier
__ Much easier!

Comments: _____

3. Do you feel comfortable using this product? Yes/No
If NO, please explain:

4. Do you think your clients would like this product? Yes/No
If NO, please explain:

5. Did you have any allergic reactions or discomfort using the product?

Anything else?

THANK YOU!!

Summary Ranking

Please fill this out only once.

For each group, rank them from 1 to 3, with 1 being your favorite.

Group 1: Polishes
__ Honey Bee Polish
__ Sante Kosmetics Polish
__ Suncoat Polish

Group 2: Polish Removers
__ Honey Bee Remover
__ Suncoat Remover
__ Primavera Life Alcohol

Group 3: Artificial Nail System
__ Ultima Odorless Acrylic
__ En Vogue Gel (Regular)
__ En Vogue Gel (Self-Leveling)
__ Nails at Last

(Owners seemed reluctant to use the above survey. To simplify, another format was offered below.)

Product Survey

FOR OWNERS AND NAIL TECHS

Please fill out one for **each product group**. Please write the name of the specific products. These questions may not cover all the things you will think of when you use these products. Please feel free to add your own thoughts and comments.

Characteristic	***Standard:*** _____	***Alternative 1:*** _____	***Alternative 2:*** _____	***Alternative 3:*** _____
Look - Shine - Color				
Odor				
Ease of use - Drying time - # of coats				
Lasting effect - How long? - Chipping - Lifting				
Other _____				

Product Survey

FOR CLIENTS

Which product did you try?

Nail Polish	**Nail Polish Remover**	**Artificial Nail System**
__ Honey Bee Polish	__ Honey Bee Remover	__ Ultima Odorless Acrylic
__ Sante Kosmetics Polish	__ Suncoat Remover	__ En Vogue Gel (Regular)
__ Suncoat Polish	__ Primavera Life Alcohol	__ En Vogue Gel (Self-Leveling)
		__ Nails at Last

1. How often do you come to this salon?

   1a. What do you get done when you're here?

2. What do you like about this salon?

3. What brand of nail products do you usually select?

4. How did you like the product in terms of the following characteristics?

   a. appearance (shine, color, etc.):

      How about compared to what you normally use?

   b. feel

      How about compared to what you normally use?

   c. staying power (peeling, lifting, etc.)

      How about compared to what you normally use?

   e. removability (easy or tough to remove?)

      How about compared to what you normally use?

5. How much would you be willing to pay if this salon offered safer, healthier products?

   __ Not willing to pay more
   __ Willing to pay $0.50 to $2 more...
   __ Willing to pay $2 to $5 more...
   __ Willing to pay up to $10 more...
   __ Depends on _____

Thank you!! To receive a $10 gift certificate for groceries, please include **your address** below: