



Preliminary Results of Nail Products Lab Study

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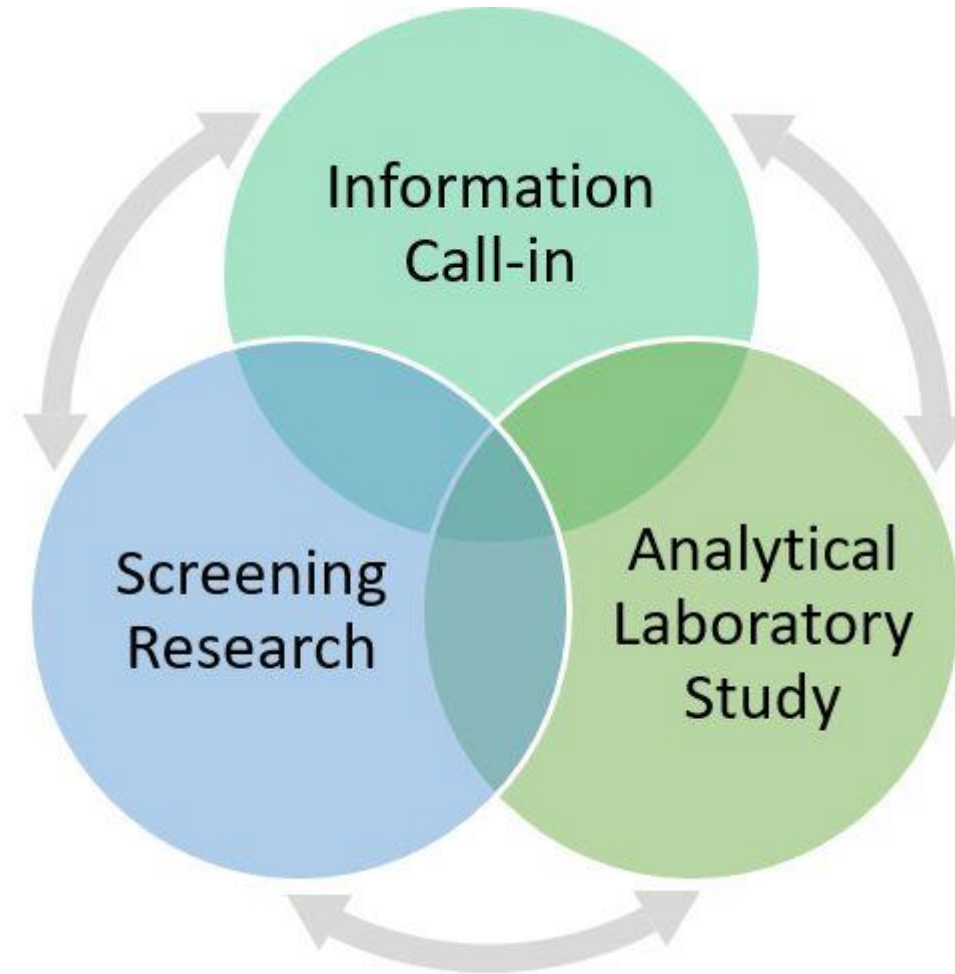


Department of Toxic Substances Control



CalEPA

Methodology



Overview

- Goals
- Research questions
- Products evaluated
- Analytical methods overview
- Preliminary results
- Summary



Goals

- Measure chemicals in both retail and professional-use nail products
- Follow up on DTSC's 2012 nail product study
 - [DTSC 2012 Lab Study of Nail Products](#)
- Potentially identify additional Priority Products



Research Questions Discussed Today

- Detection frequency and concentrations of chemicals considered for prioritization or further research

Proposed Priority Products – Nails Products Containing:

- Toluene
- Methyl methacrylate
- Triphenyl phosphate

Research:

- Formaldehyde
- N-Methyl pyrrolidone
- N,N-Dimethyl-p-toluidine

- Detection frequency and concentrations of other Candidate Chemicals



Research Questions Discussed Today (cont.)

- Do the ingredient labels accurately list ingredients?
- What Candidate Chemicals are identified qualitatively as tentatively identified compounds (TICs) using a National Institute of Standards and Technology (NIST) mass spectrum library?
- Was dibutyl phthalate (DBP) or Di(2-ethylhexyl)phthalate (DEHP) detected in nail products?



Research Questions Yet to be Evaluated

- Do low-, mid-, and high-priced nail polishes contain different Candidate Chemicals or concentrations?
- Are there different Candidate Chemicals or concentrations in professional versus retail products?
- What Candidate Chemicals are detected in products marketed to children or marketed as safe for children or pregnant women?



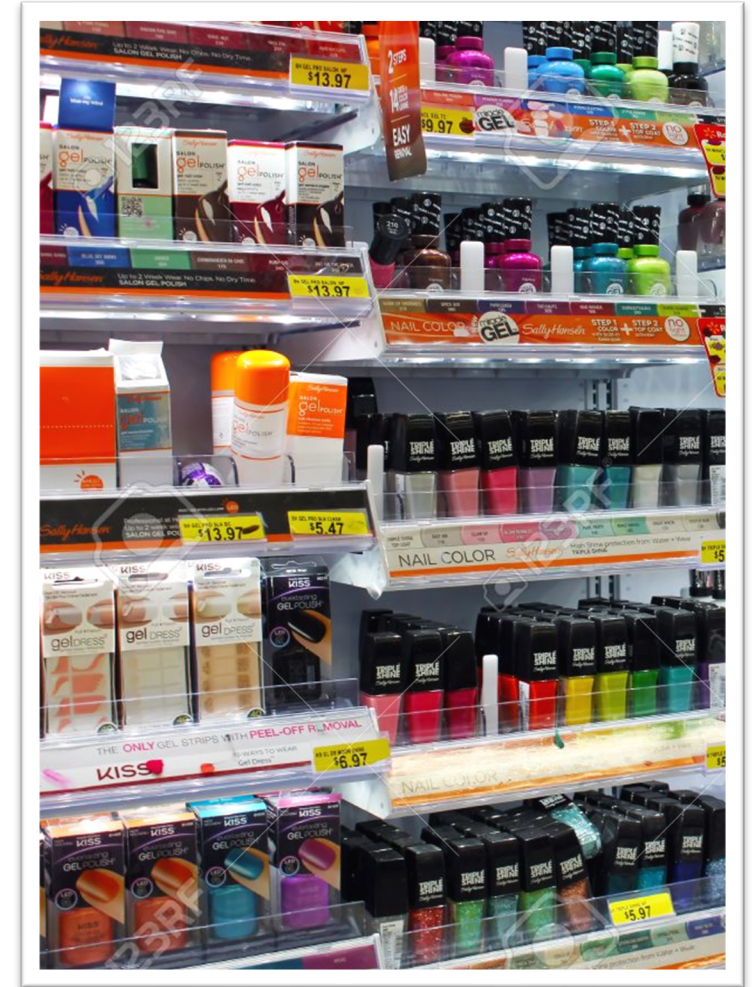
Research Questions Yet to be Evaluated

- Do products that were found to contain DBP or toluene in DTSC's 2012 study still contain those chemicals?
- Have retail stores met their public commitments not to sell nail products with certain chemicals?



How Products Were Chosen

- Variety of nail products
- Research questions
- Suggestions from stakeholders
- Reviewed ingredient labels



How Products Were Chosen (continued)

- Products being evaluated in screening research
- Retested brands from DTSC's 2012 Study
- Availability

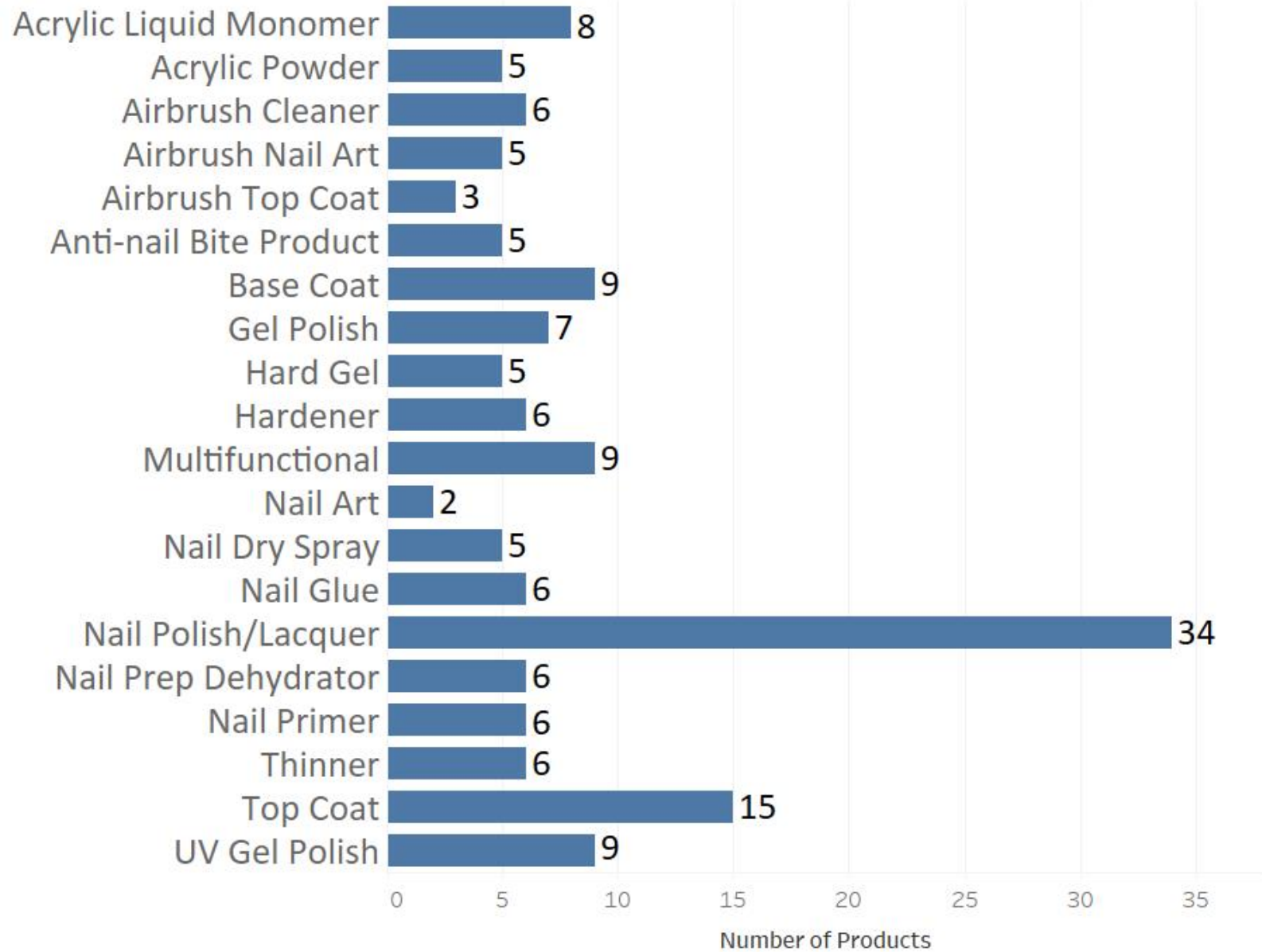


Additional Criteria Used to Choose Products

- Professional
- Retail
- Professional & Retail
- Price
- “Non-toxic” or “n-free”
- Marketed to children or as safe for children or pregnant women



Product Types



Analysis

- 157 different nail products
- Target analytes – 52 total
- Instrumentation
 - Gas chromatography/mass spectrometry (GC/MS)



Analytes	Quantitation Limit ($\mu\text{g/mL}$)
Formaldehyde	50
Volatile Organic Compounds (VOCs)	25 - 250
Semi-Volatile Organic Compounds (SVOCs)	1,000 or 5,000



Target Analytes – VOCs

1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,2,3-trichloropropane
1,2,3-Trimethylbenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
2-Butanone (MEK)
2-Hexanone (MBK)
4-Methyl-2-pentanone (MIBK)
Acetone
Acetonitrile
Acrolein
Benzene
Butyl acetate

Dimethyl-p-toluidine (DMPT)

Ethyl acetate
Ethylbenzene
Ethyl methacrylate (EMA)

Formaldehyde

Isopropyl alcohol (IPA)

Methyl methacrylate (MMA)

Methyl tert-butyl ether (MTBE)

Methylene chloride

meta and para-Xylene

n-Butanol

ortho-Xylene

Propyl acetate

r and s-Camphor

tert-Butyl alcohol (TBA)

Tetrahydrofuran

Toluene



Target Analytes – SVOCs

Benzyl alcohol
bis(2-Ethylhexyl) phthalate (DEHP)
Butyl benzyl phthalate (BBP)
Butyl paraben
Diethyl phthalate (DEP)
Dimethyl phthalate (DMP)
Di-n-butyl phthalate (DBP)
Di-n-octyl phthalate (DNOP)
4-Ethoxyphenol
2-Ethylhexyl diphenyl phosphate

Ethyl paraben
1-Ethyl-2-pyrrolidone
Ethyl tosylamide
Hydroquinone
4-Methoxyphenol
Methylisothiazolinone
Methyl paraben
N-Methyl-2-pyrrolidone (NMP)
Propyl paraben
Triphenyl phosphate (TPhP)



Overview of Preliminary Results

- **148 products (94%)** with detected **Candidate Chemicals**
- **148** products with a detected **VOC**
 - 19 different VOC analytes detected
- **37** samples with **formaldehyde**



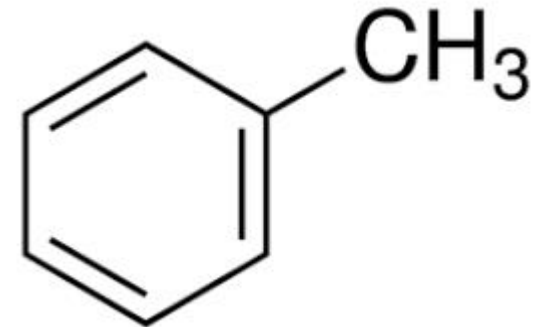
Overview of Preliminary Results (cont.)

- **24** products contained **SVOCs**
 - 6 different SVOC analytes detected
- Tentatively identified compounds (CCs)
 - **12 VOCs** **10 SVOCs**

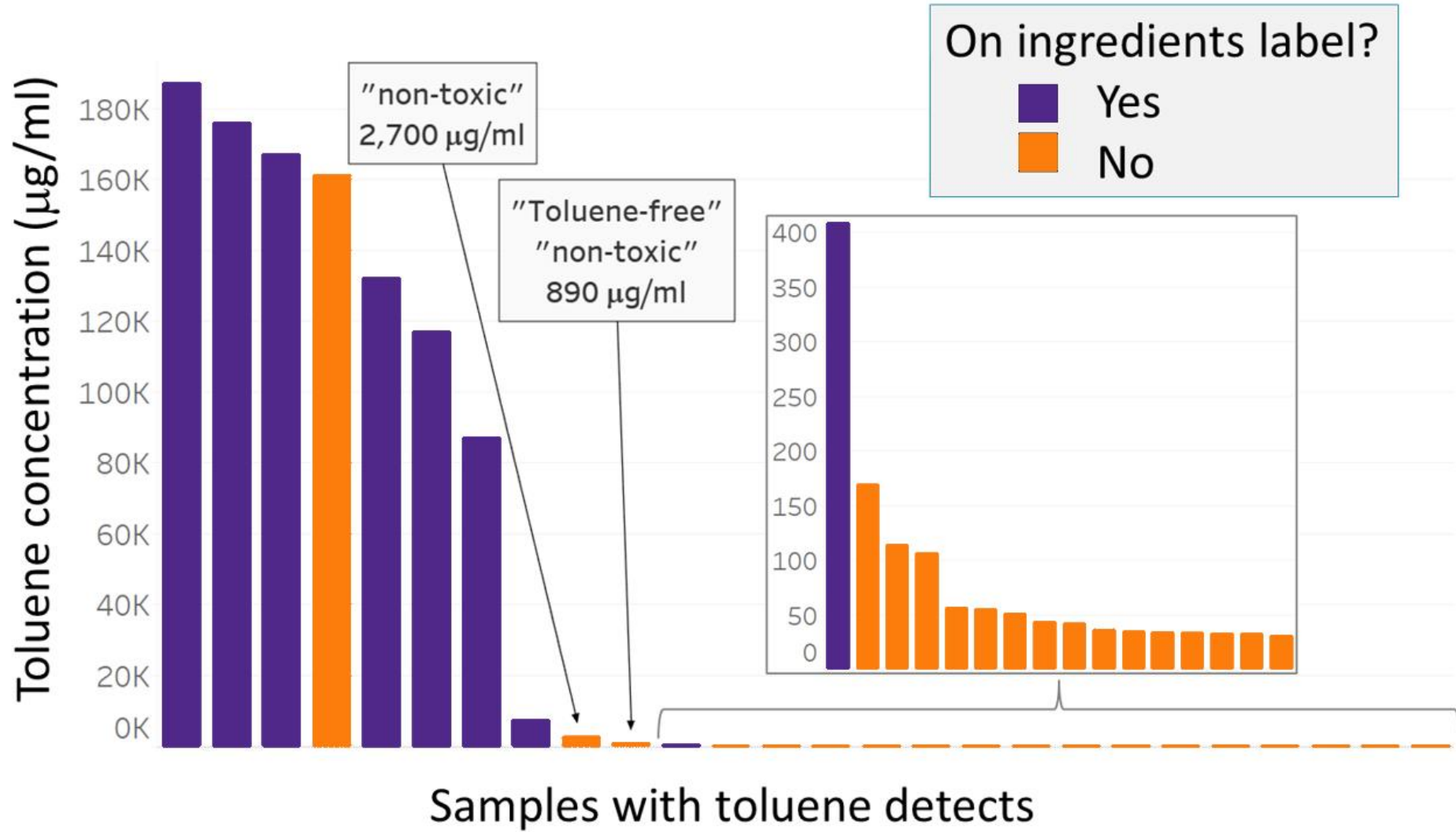


Preliminary Results – Toluene

- Detected in **27 samples**
- 31 - 187,000 $\mu\text{g/ml}$ (~ 0.00314 - 18.7% w/v)
- Highest concentrations ($> 10\%$ w/v)
 - Airbrush topcoat
 - Nail hardener
 - Thinner
 - Topcoat

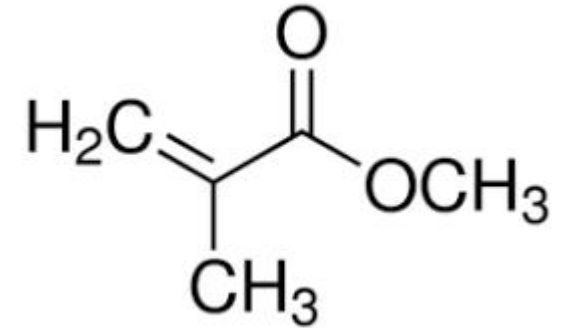


Preliminary Results – Toluene

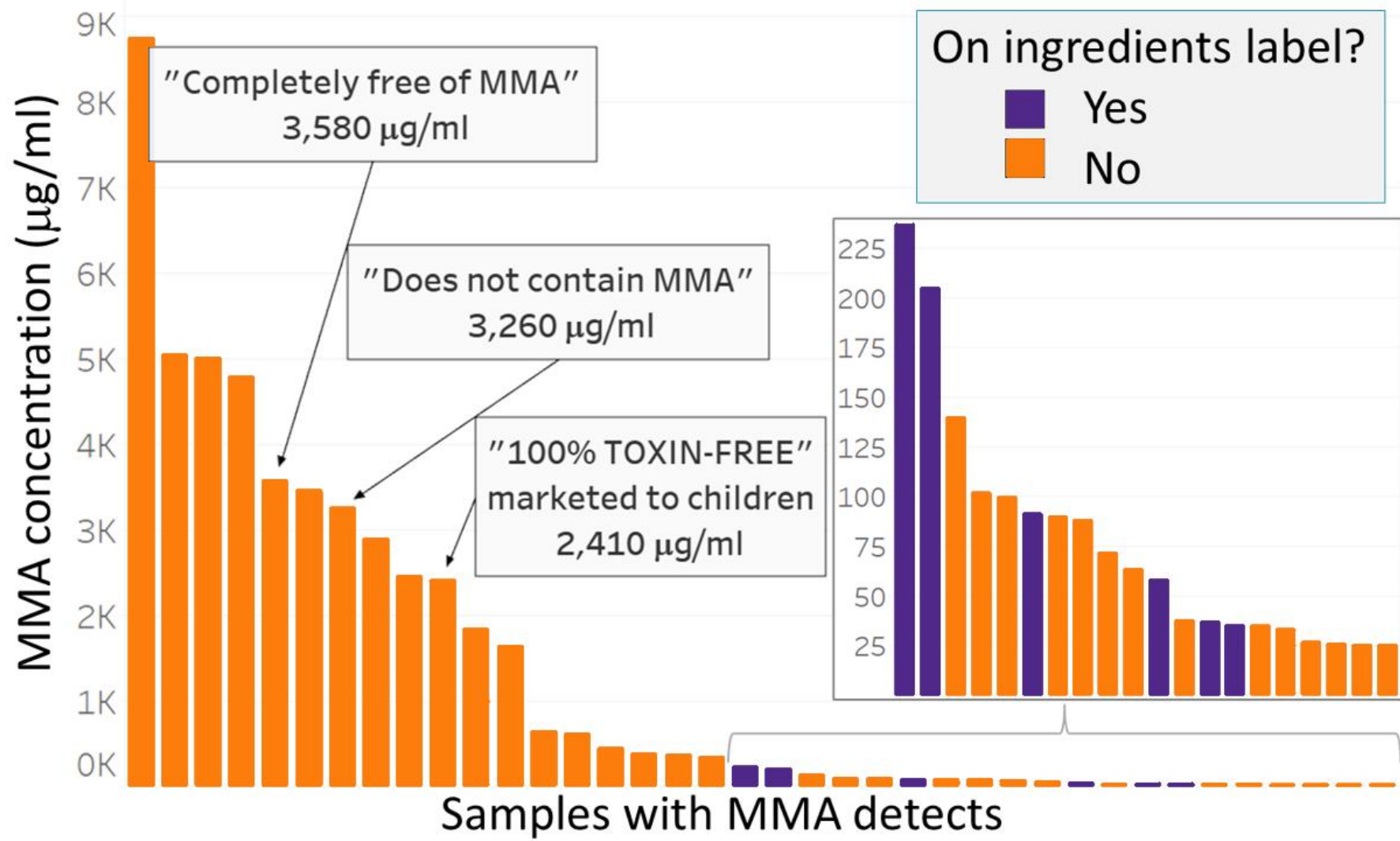


Preliminary Results – Methyl Methacrylate (MMA)

- Detected in **38 samples**
- 26 - 8,760 $\mu\text{g/ml}$ (~ 0.00256 - 0.876% w/v)
- Highest concentrations ($> 0.1\%$)
 - Acrylic liquid monomer
 - Air brush top coat
 - Anti-nail bite polish
 - Brush cleaner
 - Multi-functional top/base coat
 - UV gel polish

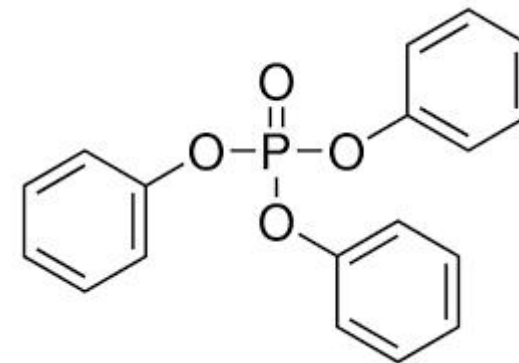


Preliminary Results – MMA (label ingredients are PMMA)

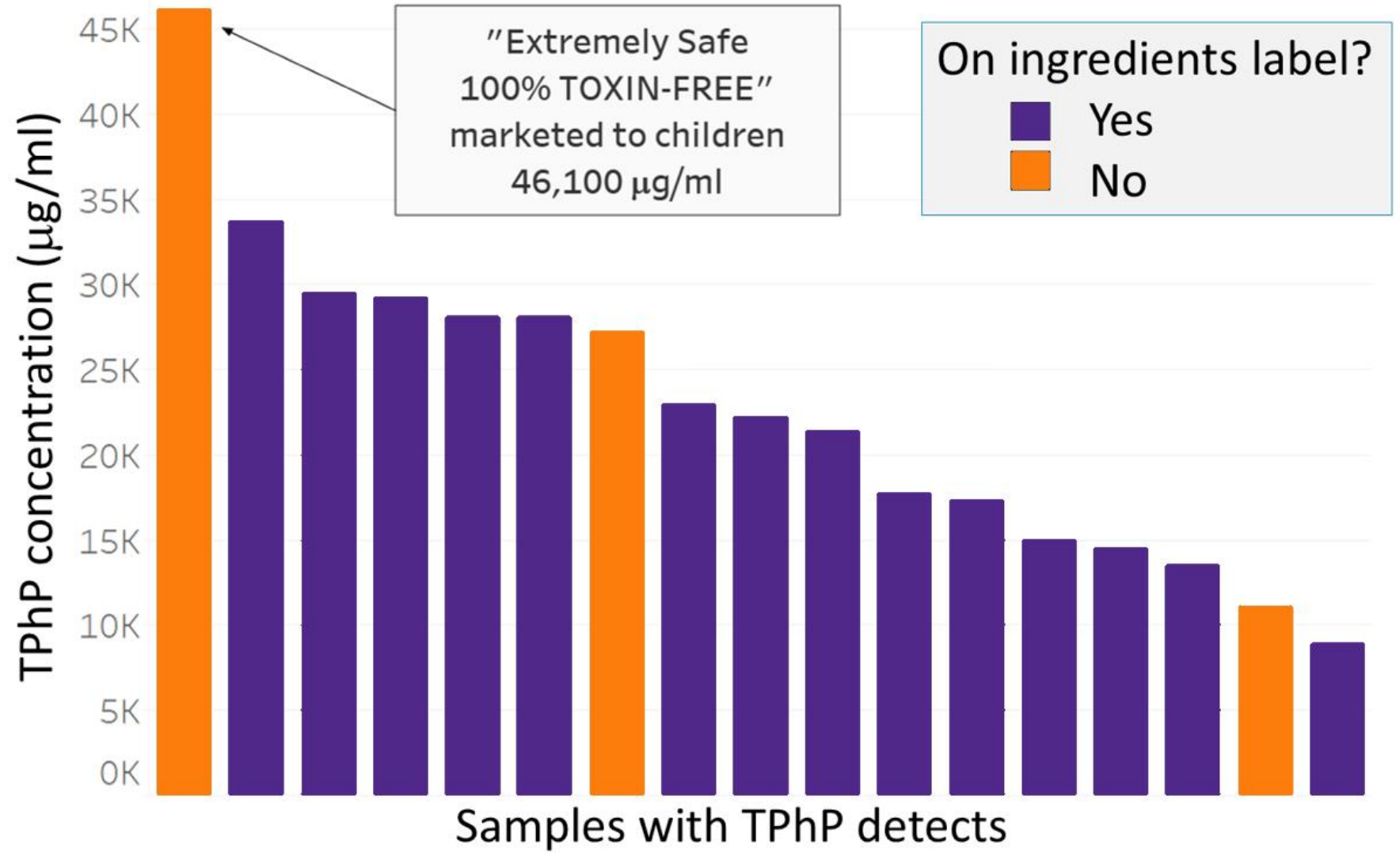


Preliminary Results – Triphenyl Phosphate (TPhP)

- Detected in **17 samples**
- 8,880 to 46,100 µg/ml (~0.88 – 4.6 % w/v)
- Highest concentrations (> 1%)
 - Anti-nail bite products
 - Nail hardener
 - Multi-functional products
 - Nail polish/lacquer
 - Top coats
 - UV gel polishes

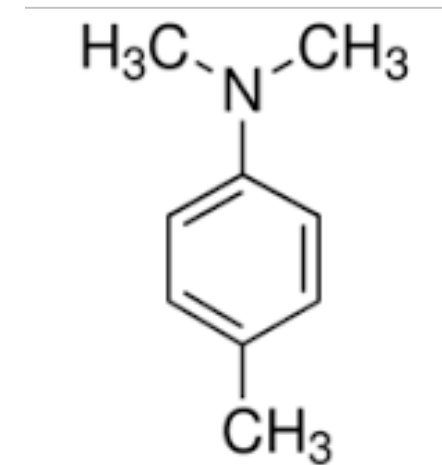


Preliminary Results – TPhP

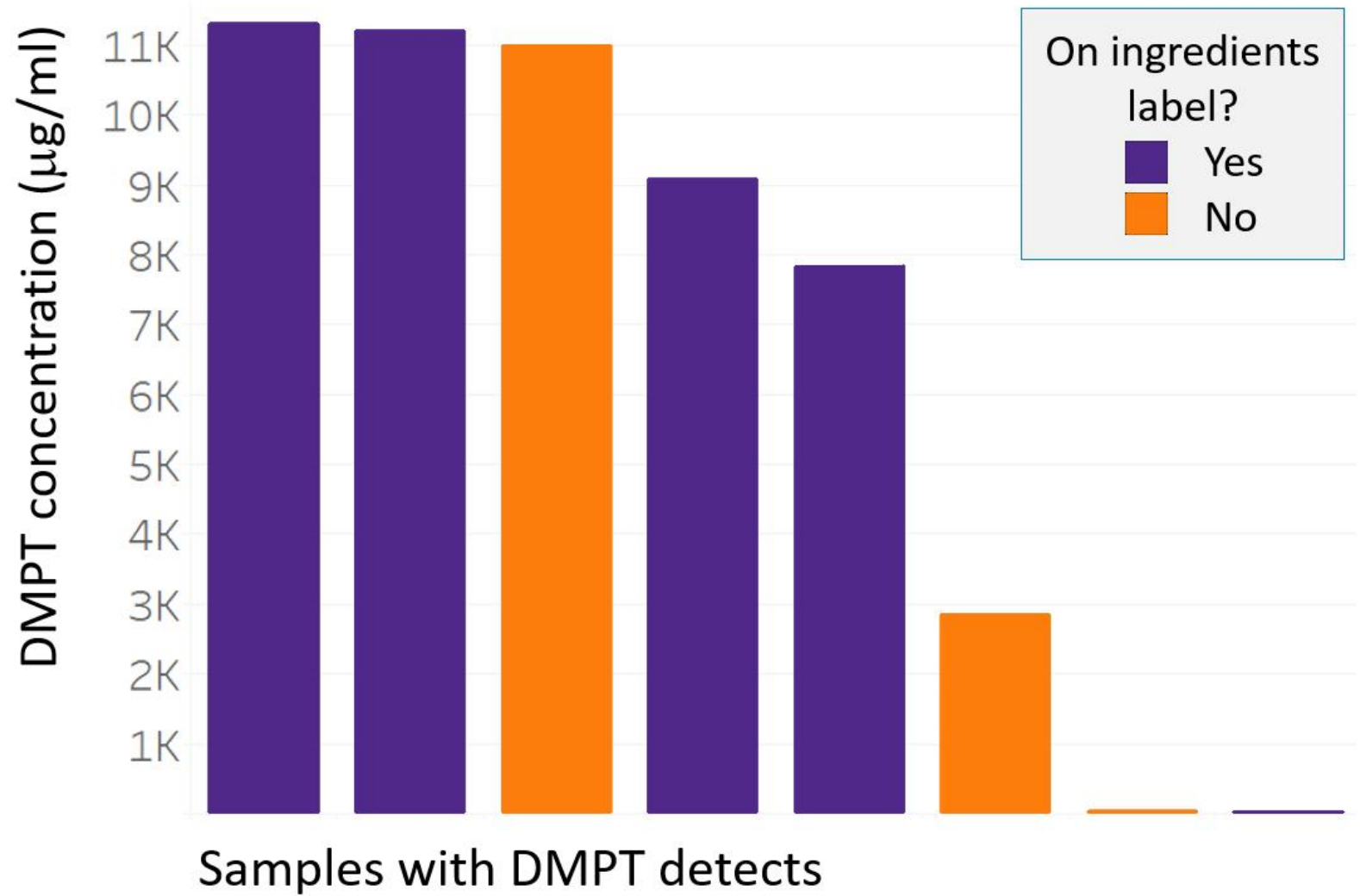


Preliminary Results – N, N-Dimethyl- p-Toluidine (DMPT)

- Detected in **8 samples**
- 26 - 11,300 $\mu\text{g/ml}$ ($\sim 0.0026 - 1.13\%$ w/v)
- Highest concentration in acrylic liquid monomer
- No marketing claims on products with detects



Preliminary Results – DMPT



Preliminary Results – N-Methyl Pyrrolidone (NMP)

- Detected in **2 samples**
- 1,650 and 39,000 µg/ml (~0.165 and 3.9 % w/v)
- Highest concentration in nail polish
- Neither product included NMP on ingredients list
- **Products marketed to children**

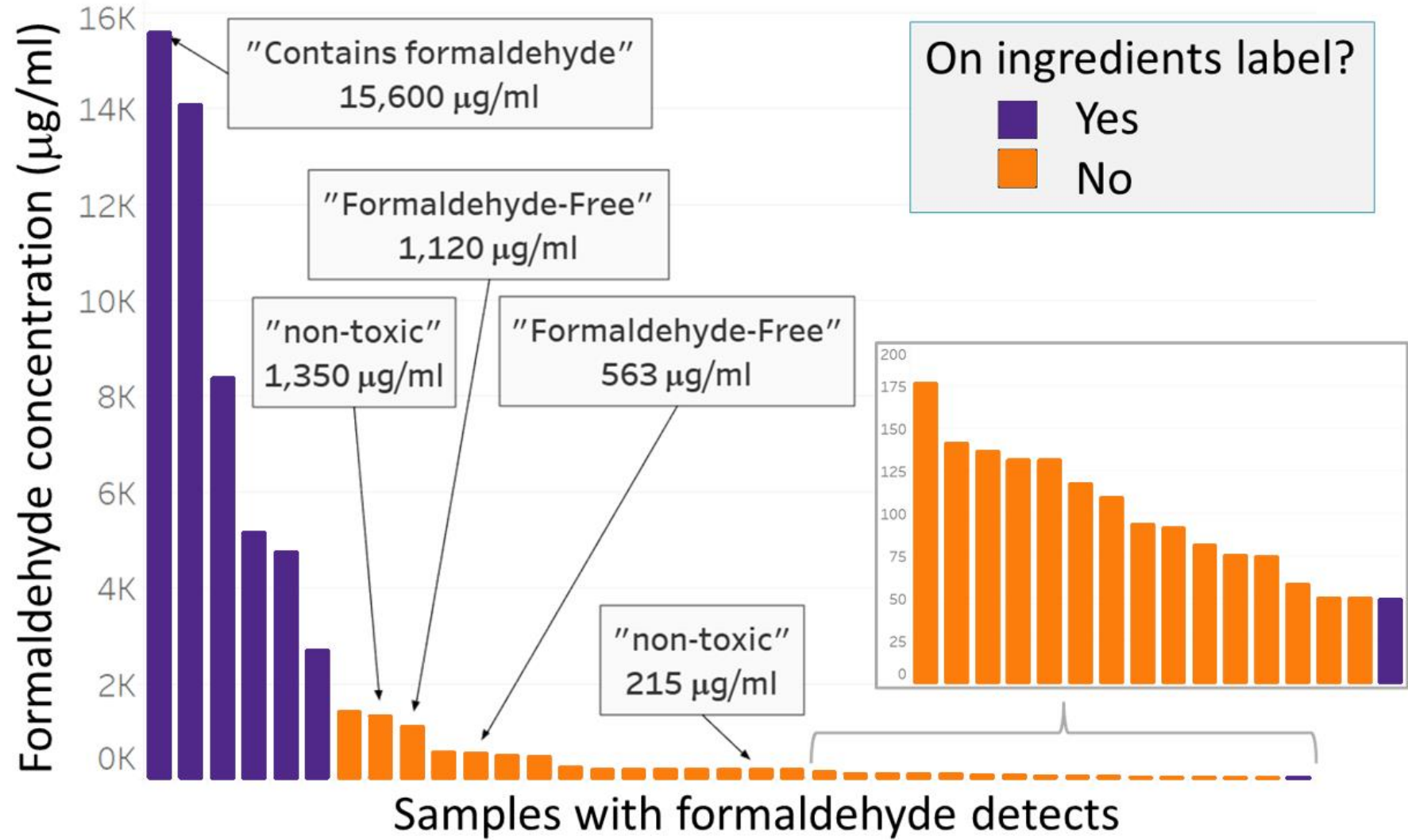


Preliminary Results – Formaldehyde

- Detected in **37 samples**
- 50 - 15,600 $\mu\text{g}/\text{ml}$ ($\sim 0.005 - 1.56\%$ w/v)
- Highest concentrations in nail hardeners ($> 1\%$)



Preliminary Results – Formaldehyde



DBP and DEHP

- One sample had **DBP at 51,100 µg/ml** (~5.11 % w/v)
 - Nail hardener
 - DBP was not on the ingredient list
- DEHP was not detected in any products



Other Candidate Chemicals Detected

1,3,5-Trimethylbenzene	1	Methyl ethyl ketone	9
Acetone	92	Methyl isobutyl ketone	2
Acetonitrile	28	Methylene chloride	5
Benzene	8	n-Butanol	86
Ethyl acetate	113	N-ethyl-2-pyrrolidone	4
Ethyl paraben	2	o-xylene	8
Ethylbenzene	10	tert-butyl alcohol (TBA)	9
Isopropanol	83	Tetrahydrofuran	1



Tentatively Identified Candidate Chemicals

Volatile Organic Compounds

Heptane	8	n-Hexane	2
Acrylonitrile	3	Ethyl acrylate	2
Isopropyl benzene	3	1-Butanol	1
Butane	3	1,2-Dichloroethane	1
Isobutane	3	2-Ethylhexyl acrylate	1
Methyl acrylate	3	Vinyl acetate	1



Tentatively Identified Candidate Chemicals

Semi-Volatile Organic Compounds

Isophorone diisocyanate	11	Pyromellitic dianhydride	1
Phthalic anhydride	5	Benzophenone-3	1
2-Butoxyethanol	3	α -Methylstyrene	1
D5	3	Diglyme	1
Ethyl methanesulfonate	2	D4	1



Summary/Take Aways

- One of the largest sample testing of nail products
- Candidate Chemicals were detected in most products (148 of 157 products)
- Ingredient labels are sometimes inaccurate
- Products marketed to children or as safe for children sometimes contain specific Candidate Chemicals
- This study will inform DTSC efforts as well as contribute to the publicly available information on chemicals in nail products.



Next Steps - Nail Products Lab Study

- Further evaluate lab study data
- Compare findings with DTSC's information call-in
- Publish findings in a technical report
- Publish findings in a journal article



Team Acknowledgements

SCP Team

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- Diana Phelps

ECL Team

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- Join our E-list to get updates: bit.ly/scpupdates
- Submit comments: calsafer.dtsc.ca.gov

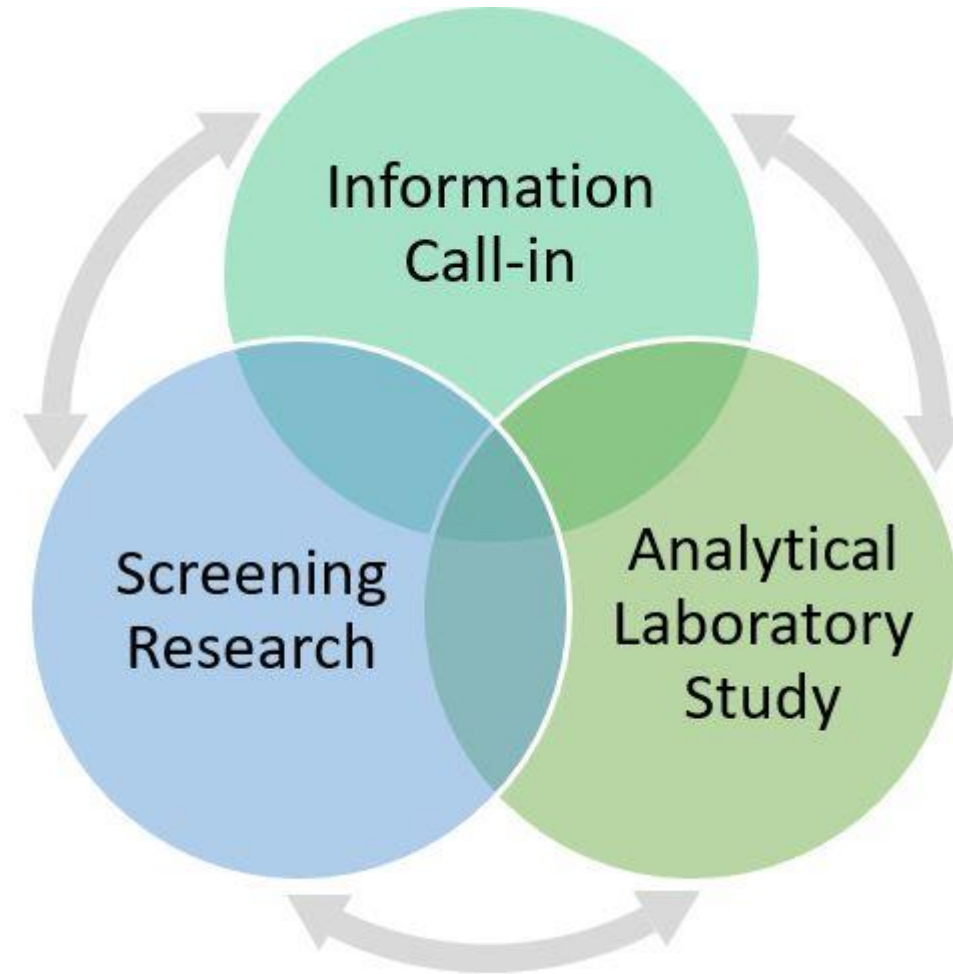


Summary

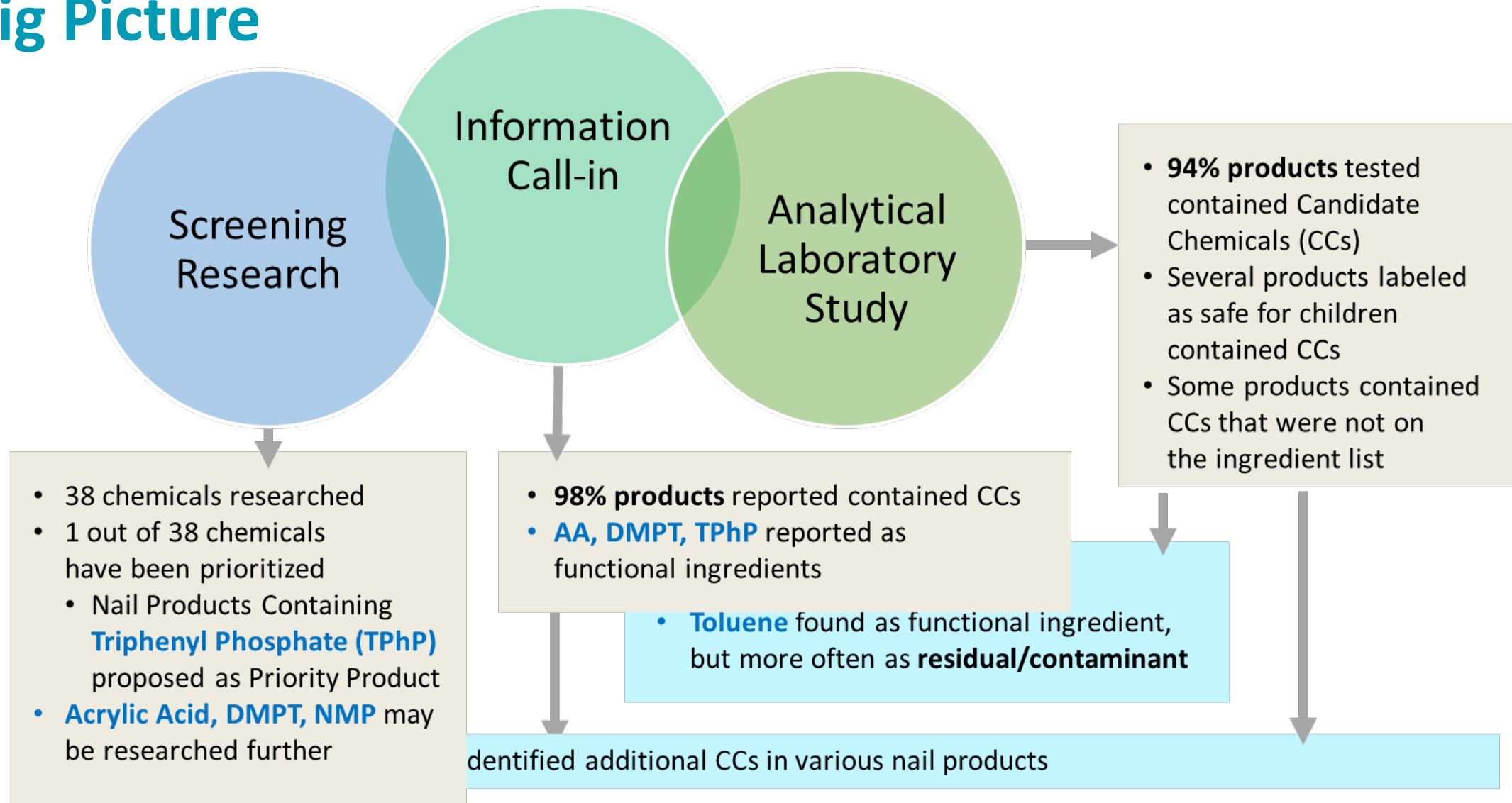
- Proposed Priority Products – Nail products containing
 - Toluene
 - Methyl methacrylate (MMA)
 - Triphenyl phosphate
- Additional Research Chemicals
 - DMPT
 - NMP
 - Acrylic acid



Methodology



Big Picture



Next Steps - Summary

- Comment period on the [Background Document](#)
 - Tuesday, August 16, 2022 at [CalSAFER](#)
- Complete rulemaking on toluene in nail products
- Initiate rulemaking for MMA in nail products
- Complete research profile on TPhP in nail products



Next Steps – Summary (cont.)

- Make prioritization decisions for nail products containing
 - N,N-Dimethyl-p-toluidine (DMPT)
 - N-Methyl-2-pyrrolidone (NMP)
 - Acrylic acid



Next Steps – Summary (cont.)

- Complete reports
 - Information call-in
 - Nail products lab study – report and journal article
- Evaluate information/data
 - Possibly identify additional proposed Priority Products




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 - Nail products lab study: Christine.Papagni@dtsc.ca.gov
- General questions: SaferConsumerProducts@dtsc.ca.gov
- Meeting requests: Heather.Kessler@dtsc.ca.gov
- Join our E-list to get updates: bit.ly/scpupdates
- Submit comments: calsafer.dtsc.ca.gov



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- Please ask only **one (1) question** at a time





Thanks for attending today's workshop!



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