**Supplementary Materials**

**Exposures in Nail Salons to Trace Elements in Nail Polish from Impurities or Pigment Ingredients – A Pilot Study**

**Nail Polish Finish Term Definitions**

* **Glitter**: refers to nail polish that contains glitter or tiny light-reflecting particles of sparkling material;
* **Shimmer**: refers to a shine that light seems to shake slightly and quickly;
* **Metallic**: refers to metallic shades like the ones resembling bronze, copper, gold, silver;
* **Pearl**: refers to a faint hint of color because of fine suspended shiny particles, and usually less pigmented than a shimmer and not as shiny as a metallic; and
* **Neon**: refers to a neon-like color that gives a glow.

Finish definitions were obtained from the description of the nail polishes studied or from nail product distribution websites. A finish may use pigments and other ingredients to impart color, texture, or other properties different to color.

**Toenail Sample Preparation**

Toenails were cleaned to remove any external contamination in sequential steps removing solution residue between steps, as follows: 1) 3 mL of acetone sonicated for 20-minutes, 2) 3 mL of 1% triton solution of deionized (DI) water sonicated for 20-minutes, 3) DI water sonicated for 20-minutes, repeated 5 times. Toenail clippings were left to dry in a hood a minimum of 8 days before analysis. Toenail clippings were then weighed in the laboratory before analysis. Clippings were digested in a microwave digester with a 9:1 solution of trace metal grade nitric acid and hydrochloric acid. The microwave heating program had a 15-minute ramp to 105ºC then held constant for 45 minutes. Then, 100 L of hydrogen peroxide was added to each sample, and the microwave digestion process was repeated. Finally, DI water was added to the solutions for a final acid percentage of 5%. Toenail sample preparation followed procedures by Punshon et al. (2016).

Table S1. Description of the 40 nail polishes selected by brand, color category, and finish

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID & Brand** | **Label\*** | **Coat/Color Category** | **Finish Name** | **Average Sample Weight**  **(mg)**‡ |
| 1-1 | 7-free | Base/No color | No | 246 |
| 2-1 |  | Red 1/Color | No | 187 |
| 3-1 |  | Pink 1/Color | No | 183 |
| 4-1 |  | Green 1/Color | No | 181 |
| 5-1 |  | Peach/Color | No | 253 |
| 6-1 |  | Teal/Color | Metallic glitter | 157 |
| 7-1 |  | Purple 1/Color | Metallic | 136 |
| 8-1 |  | Red 2/Color | Pearl | 156 |
| 9-1 |  | Green 2/Color | Shimmer | 204 |
| 10-1 |  | Red 3/Color | Shimmer | 258 |
| 11-2 | None | Top 1/No color | No | 206 |
| 12-2 |  | Red 4/Color | No | 159 |
| 13-2 |  | Purple 2/Color | No | 99.0 |
| 14-2 |  | Red 5/Color | No | 134 |
| 15-2 |  | Turquoise/Color | No | 179 |
| 16-2 |  | Pink 2/Color | Metallic | 125 |
| 17-2 |  | Pink 3/Color | Neon | 91.0 |
| 18-2 |  | Pink 4/Color | Glitter | 198 |
| 19-2 |  | Pink 5/Color | Shimmer | 164 |
| 20-2 |  | White 1/Color | Glitter | 719 |
| 21-3 | 3-free | Top 2/No color | No | 215 |
| 22-3 |  | Red 6/Color | No | 127 |
| 23-3 |  | Pink 6/Color | No | 129 |
| 24-3 |  | Pink 7/Color | No | 94 |
| 25-3 |  | Red 7/Color | No | 122 |
| 26-3 |  | Blue/Color | Pearl | 162 |
| 27-3 |  | Gold 1/Color | Glitter | 171 |
| 28-3 |  | Purple 3/Color | Metallic shimmer | 146 |
| 29-3 |  | Purple 4/Color | Pearl | 132 |
| 30-3 |  | Silver 1/Color | Glitter | 169 |
| 31-4 | 3-free | Top 3/No color | No | 209 |
| 32-4 |  | Red 8/Color | No | 200 |
| 33-4 |  | Red 9/Color | No | 171 |
| 34-4 |  | White 2/Color | No | 170 |
| 35-4 |  | Green 3/Color | No | 165 |
| 36-4 |  | Green 4/Color | Shimmer | 107 |
| 37-4 |  | Purple 5/Color | Glitter | 247 |
| 38-4 |  | Gold 2/Color | Glitter | 182 |
| 39-4 |  | Gold 3/Color | Metallic | 498 |
| 40-4 |  | Silver 2/Color | Mirror metallic | 111 |
| \* None of the nail polishes selected had labels that reported the exclusion of metals. | | | | |

‡Two independent replicate samples of nail polish were weighed wet, analyzed, and averaged.

Table S2. Elements detected on wipe sampling of 100 cm2 nail salon surfaces in 3 of the 8 nail salons in the study (2017)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Direct contact** |  | **Elements Concentration**‡**, µg/100 cm2 sample** | | | | | | | | | | | | | | | |
| **Salon-**  **n** | **with nail polish** | **Wipe location** | **Al** | **Ba** | **Cr** | | **Cu** | | **Fe** | | **Pb** | | **Mg** | | **Sr** | | **Ti** | |
| **Surfaces in Direct Contact with Nail Polishes** | | | | | | | | | | | | | | | | | | |
| 1-1 | Yes | Manicure table | 42 | <MDL | <MDL | | <MDL | | <MDL | | <MDL | | 8.8 | | <MDL | | <MDL | |
| 1-2 | Yes | Stool/table for utensils/tools | 33 | <MDL | <MDL | | <MDL | | <MDL | | 0.90 | | 43 | | <MDL | | <MDL | |
| 1-3 | Yes | Pedicure area | 12 | <MDL | <MDL | | <MDL | | <MDL | | 0.10 | | 17 | | <MDL | | <MDL | |
| 1-4 | Yes | Different manicure table | 3.0 | 0.50 | 0.08 | | 0.2 | | 3.0 | | <MDL | | 7.0 | | 2.20 | | 0.40 | |
| 1-5 | Yes | Uncleaned acrylic table | <MDL | <MDL | 0.18 | | <MDL | | <MDL | | <MDL | | <MDL | | <MDL | | <MDL | |
| 2-6 | Yes | Manicure table | 15 | 0.70 | 1.2 | | 1.2 | | 18 | | 0.12 | | 22 | | 0.60 | | 0.30 | |
| 2-7 | Yes | Pedicure footrest | <MDL | <MDL | <MDL | | <MDL | | <MDL | | <MDL | | <MDL | | <MDL | | 0.30 | |
| 2-8 | Yes | Pedicure material table | 360 | 3.80 | 0.15 | | 2.5 | | 23 | | 0.15 | | 9.0 | | 0.30 | | <MDL | |
| 3-9 | Yes | Manicure tabletop (front of store) | <MDL | <MDL | <MDL | | <MDL | | 21 | | <MDL | | 4.0 | | <MDL | | <MDL | |
| 3-10 | Yes | Pedicure chair where feet are placed | <MDL | <MDL | <MDL | | <MDL | | <MDL | | <MDL | | <MDL | | <MDL | | <MDL | |
| 3-11 | Yes | Manicure tabletop | <MDL | <MDL | <MDL | | <MDL | | <MDL | | <MDL | | 3.0 | | <MDL | | <MDL | |
| 3-12 | Yes | On top of nail polish holder/tower | 52 | 26 | 7.6 | | 5.7 | | 184 | | 2.9 | | 860 | | 4.7 | | 2.5 | |
| 2-13 | Yes | Manicure table | 6.0 | 0.50 | 0.10 | | 0.10 | | 4.0 | | 0.090 | | 12 | | 0.40 | | 0.50 | |
| Median for all 13 samples | | | 6.0 | 0.21 | 0.040 | | 0.070 | | 1.4 | | <MDL | | 8.8 | | 0.21 | | 0.21 | |
| **Surfaces in No Direct Contact with Nail Polishes** | | | | | | | | | | | | | | | | | | |
| 1-1 | No | Surface between sink and trash hole | 27 | <MDL | <MDL | | <MDL | | <MDL | | <MDL | | 40 | | <MDL | | <MDL | |
| 1-2 | No | Desk with nail-art showcase, UV light | <MDL | <MDL | <MDL | | <MDL | | <MDL | | <MDL | | <MDL | | 0.50 | | <MDL | |
| 1-3 | No | High table with plants, middle of room | 7.0 | <MDL | <MDL | | 0.40 | | 7.0 | | <MDL | | 11 | | 1.2 | | 0.30 | |
| 2-4 | No | Sink | 4.0 | 0.40 | 0.060 | | 0.20 | | 7.0 | | 0.070 | | 7.0 | | 0.30 | | <MDL | |
| 2-5 | No | Front desk | 22 | 0.80 | 0.080 | | 0.80 | | 18 | | 1.06 | | 6.0 | | <MDL | | 0.70 | |
| 2-6 | No | UV tables | <MDL | <MDL | <MDL | | 0.30 | | 3.0 | | 0.060 | | 3.0 | | <MDL | | <MDL | |
| 2-7 | No | Waiting room table | <MDL | <MDL | <MDL | | <MDL | | 4.0 | | <MDL | | <MDL | | <MDL | | <MDL | |
| 3-8 | No | Entrance decorative table | 6.0 | <MDL | 0.070 | | <MDL | | 14 | | 0.15 | | 7.0 | | <MDL | | 0.40 | |
| 3-9 | No | Wall surface | 15 | 2.0 | 0.15 | | 0.50 | | 17 | | 0.20 | | 24 | | 0.3 | | <MDL | |
| 3-10 | No | Top of sinks | <MDL | <MDL | <MDL | | <MDL | | <MDL | | <MDL | | 7.0 | | <MDL | | <MDL | |
| 3-11 | No | Floor near manicure table | 3.0 | <MDL | <MDL | | <MDL | | 5.0 | | 0.060 | | 6.0 | | <MDL | | <MDL | |
| Median for all 11 samples | | | 4.0 | 0.21 | 0.040 | | 0.070 | | 5.0 | | 0.060 | | 7.0 | | 0.21 | | 0.21 | |
|  |  | MDL | 3.0 | 0.30 | 0.060 | | 0.10 | | 2.0 | | 0.050 | | 3.0 | | 0.30 | | 0.30 | |
|  |  | % > MDL | 63 | 33 | 42 | | 42 | | 58 | | 50 | | 79 | | 38 | | 33 | |
|  |  | BNL (2017) (non-production - production) | | | |  | |  | |  | | 4⎯27 | |  | |  | |  | |
|  |  | EPA (2019) (non-lead surfaces) | | | |  | |  | |  | | 92 | |  | |  | |  | |
| ‡Only elements that were above 30% > MDL detected are included; other elements measured but not reported include: Sb = Antimony, As = Arsenic, Be = Beryllium, Bi = Bismuth, Cd = Cadmium, Co = Cobalt, Au = Gold, In = Indium, Li = Lithium, Mn = Manganese, Mo = Molybdenum, Ni = Nickel, Se = Selenium, Ag = Silver, Tl = Thallium, Sn = Tin, V = Vanadium, Zn = Zinc. MDL = Minimum detection limit. Al = Aluminum, Ba = Barium, Cr = Chromium, Cu = Copper, Fe =Iron, Pb = Lead, M = Magnesium, Sr = Strontium, Ti = Titanium. BNL = US Brookhaven National Laboratory. EPA = US Environmental Protection Agency. | | | | | | | | | | | | | | | | | | | |

Table S3. Creatinine-corrected elements examined in pre- and post-shift urine samples from nail salon technicians (n = 9) in the Greater Boston Area (2016-2017)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Pre-shift urine concentrations (µg/g) (n=9)** | | | | |  | **Post-shift urine concentrations (µg/g) (n=9)** | | | | |  | **Pre and Post Average** | **Pre vs post-shift\*** |
|  | **MDL**  **(µg/g)** | **% >MDL** | **GM** | **GSD** | **Median** | **Range** |  | **% >**  **MDL** | **GM** | **GSD** | **Median** | **Range** |  | **Median (Range)** | **p value\*** |
| Sb | 0.0305 | 100 | 0.657 | 2.52 | 0.59 | 0.13⎯2.4 |  | 100 | 0.361 | 2.26 | 0.30 | 0.13⎯1.3 |  | 0.48 (0.16⎯1.9) | 0.173 |
| Ba | 0.0833 | 100 | 1.78 | 2.36 | 1.44 | 0.59⎯8.8 |  | 100 | 2.22 | 1.73 | 2.08 | 0.78⎯5.2 |  | 1.8 (1.2⎯5.6) | 0.515 |
| Be | 0.0222 | 0 | NA | NA | <MDL | NA |  | 0 | NA | NA | <MDL | NA |  | <MDL | NA |
| Cd | 0.0500 | 89 | 0.601 | 2.45 | 0.52 | <MDL⎯2.2 |  | 67 | 0.291 | 2.82 | 0.19 | <MDL⎯1.2 |  | 0.36 (0.17⎯1.6) | 0.008 |
| Cs | 0.120 | 100 | 8.61 | 1.58 | 10.10 | 4.1⎯15.9 |  | 100 | 8.32 | 1.55 | 7.63 | 4.8⎯18 |  | 9.4 (4.4⎯13) | 0.767 |
| Co | 0.0319 | 100 | 0.6 | 2.28 | 0.45 | 0.2⎯3.0 |  | 100 | 0.628 | 2 | 0.64 | 0.27⎯2.8 |  | 0.55 (0.24⎯2.9) | 0.859 |
| Pb | 0.0417 | 100 | 0.631 | 2.02 | 0.83 | 0.21⎯1.4 |  | 100 | 0.655 | 2.04 | 0.51 | 0.32⎯2.3 |  | 0.67 (0.26⎯1.9) | 0.859 |
| Mn | 0.181 | 33 | NA | NA | 0.20 | <MDL⎯0.69 |  | 33 | NA | NA | 0.44 | <MDL⎯1.4 |  | 0.29 (<MDL⎯0.82) | 0.086 |
| Mo | 1.11 | 100 | 40.4 | 1.76 | 55.98 | 16⎯83 |  | 100 | 25.1 | 2.17 | 6.70 | 6.7⎯109 |  | 38 (17⎯67) | 0.173 |
| Pt | 0.0139 | 67 | 0.0213 | 2.31 | 0.03 | <MDL⎯0.066 |  | 44 | 0.0279 | 1.87 | 0.03 | <MDL⎯0.081 |  | 0.03 (<MDL⎯0.07) | 0.594 |
| Sr | 3.25 | 100 | 191 | 2.77 | 174.20 | 34⎯1489 |  | 100 | 230 | 1.8 | 262.22 | 84⎯545 |  | 203 (59⎯1017) | 0.441 |
| Tl | 0.0250 | 100 | 0.377 | 1.94 | 0.36 | 0.098⎯0.78 |  | 100 | 0.324 | 1.82 | 0.30 | 0.12⎯0.74 |  | 0.30 (0.11⎯0.76) | 0.314 |
| Sn | 0.125 | 89 | 0.501 | 2.95 | 0.48 | <MDL⎯4.4 |  | 78 | 0.533 | 1.87 | 0.49 | <MDL⎯2.2 |  | 0.41 (0.17⎯3.3) | 0.594 |
| W | 0.0250 | 78 | <MDL | 1.95 | 0.10 | <MDL⎯0.17 |  | 33 | <MDL | 1.78 | <MDL | <MDL⎯0.21 |  | 0.08 (<MDL⎯0.19) | 0.767 |
| U | 0.00278 | 78 | 0.00542 | 1.62 | 0.00 | <MDL⎯0.011 |  | 80 | 0.00705 | 1.35 | 0.01 | <MDL⎯0.011 |  | 0.0059 (<MDL⎯0.01) | 0.173 |
| Sb = Antimony, Ba = Barium, Be = Beryllium, Cd = Cadmium, Cs = Cesium, Co = Cobalt, Pb = Lead, Mn = Manganese, Mo = Molybdenum, Pt = Platinum, Sr = Strontium, Tl = Thallium, Sn = Tin, W = Tungsten, U =Uranium. MDL = Minimum detection limit. NA = Not calculated: proportion of results below limit of detection was too high to provide a valid result. \*Statistical difference determined using Wilcoxon Signed Ranks Test. | | | | | | | | | | | | | | | |

Table S4. Element concentrations in toenail clipping samples from nail salon technicians (n = 20) in the Greater Boston Area (2016-2017)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Toenail clipping concentration (g/g)** | | | | | |
|  | **MDL** | **%>MDL** | **GM** | **GSD** | **Median** | **Range** |
| Al‡ | 1.4 | 100 | 8.79 | 2.21 | 9.10 | 2.62⎯21.0 |
| Sb | 0.0040 | 100 | 0.0320 | 2.09 | 0.0350 | 0.00630⎯0.110 |
| As | 0.0040 | 100 | 0.136 | 1.59 | 0.133 | 0.0570⎯0.470 |
| Cd | 0.0020 | 95 | 0.00690 | 2.70 | 0.00670 | <MDL⎯0.0900 |
| Cr | 0.020 | 100 | 0.425 | 4.79 | 0.377 | 0.0640⎯21.0 |
| Co | 0.0020 | 100 | 0.0110 | 2.87 | 0.00710 | 0.00350⎯0.0890 |
| Cu | 0.020 | 100 | 3.82 | 1.30 | 3.49 | 2.76⎯7.00 |
| Fe | 1.4 | 100 | 33.5 | 2.53 | 38.8 | 8.41⎯179 |
| Pb | 0.0040 | 100 | 0.157 | 2.27 | 0.134 | 0.052⎯1.10 |
| Mn | 0.010 | 100 | 0.267 | 3.29 | 0.217 | 0.050⎯4.10 |
| Hg | 0.0080 | 100 | 0.650 | 2.94 | 0.901 | 0.0272⎯2.50 |
| Mo‡ | 0.0040 | 100 | 0.0110 | 2.59 | 0.00843 | 0.00526⎯0.14 |
| Ni | 0.020 | 100 | 0.417 | 6.00 | 0.301 | 0.0520⎯113 |
| Se | 0.0080 | 100 | 0.763 | 1.20 | 0.754 | 0.590⎯1.10 |
| Sn | 0.0040 | 100 | 0.207 | 3.14 | 0.161 | 0.036⎯3.30 |
| V‡ | 0.0040 | 100 | 0.0140 | 1.85 | 0.0159 | 0.00570⎯0.0370 |
| Zn | 0.20 | 100 | 88.6 | 1.19 | 89.1 | 63.3⎯122 |
| ‡Only 10 out of the 20 samples had data reported for these analytes because of differences in laboratory reporting between batches of samples. Al = Aluminum, Sb = Antimony, As = Arsenic, Cd = Cadmium, Cr = Chromium, Co = Cobalt, Cu = Copper, Fe = Iron, Pb = Lead, Mn = Manganese, Hg = Mercury, Mo = Molybdenum, Ni = Nickel, Se = Selenium, Sn = Tin, V = Vanadium, Zn = Zinc. MDL = Minimum detection limit. | | | | | | |
|  | | | | | | |

Table S5. Demographic and employment characteristics of nail technician participants (n = 20) in the Greater Boston Area (2016 – 2017)

|  |  |  |  |
| --- | --- | --- | --- |
| **Participant Characteristics** |  | **N** | **Median (Range)** |
| Current age (years) |  |  | 42 (21 – 64) |
| Country of origin  (primary language spoken) |  |  |  |
| USA (English) |  | 5 |  |
| Vietnam (Vietnamese) |  | 14 |  |
| Taiwan (Chinese) |  | 1 |  |
| Occupational title |  |  |  |
| Nail technician |  | 15 |  |
| Nail salon owner |  | 4 |  |
| Nail salon manager |  | 1 |  |
| Employment history |  |  |  |
| Full-time in nail salon (years) |  |  | 5 (<1 – 23) |
| Part-time in nail Salon (years) |  |  | 5 (<1 – 33) |
| Hours worked |  |  |  |
| Per week |  |  | 40 (20 – 60) |
| Day of sampling |  |  | 8 (6 – 11) |

N = Number of participants.

Table S6. Element concentrations in 40 nail polishes grouped by finish and color

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Nail Polish Concentration (mg/g)**‡ | | | | | | | | | | | | | |
| **Group** |  | **Al** | **Ba** | **Bi** | **Cu** | **Fe** | **Pb** | **Li** | **Mg** | **Mn** | **Ni** | **Sr** | **Sn** | **Ti** | **Zn** |
| Finish | Min | 9.00 | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL | 3.00 | 0.0900 | <MDL | <MDL | 0.140 | <MDL | <MDL |
| (n=19) | Max | 11,500 | 2,840 | 1.96 | 31.2 | 3,270 | 0.400 | 84.2 | 2,375 | 9.26 | 0.670 | 32.4 | 5.18 | 67.95 | 13.4 |
|  | Median | 288 | 2.43 | 0.101 | 0.200 | 52.1 | 0.209 | 18.7 | 549 | 1.29 | 0.145 | 3.36 | **2.79\*** | 14.3 | 1.46 |
|  | GM | 402 | 6.92 | 0.109 | 0.471 | 51.2 | 0.192 | 1.95 | 149 | 0.900 | 0.145 | 1.61 | 1.63 | 5.37 | 1.99 |
| No Finish | Min | <MDL | 0.130 | <MDL | <MDL | <MDL | <MDL | <MDL | 1.00 | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL |
| (n=21) | Max | 4,870 | 11,250 | 6,355 | 1.97 | 2,780 | 0.310 | 31.25 | 921 | 5.28 | 0.600 | 99.2 | 5.42 | 144 | 8.67 |
|  | Median | 223 | 79.5 | 0.0672 | 0.153 | 49.0 | 0.210 | 9.39 | 375 | 0.900 | 0.170 | 2.78 | **0.0859** | 24.2 | 1.58 |
|  | GM | 160 | 54.8 | 0.2681 | 0.174 | 72.3 | 0.174 | 1.54 | 120 | 0.779 | 0.165 | 3.22 | 0.219 | 11.4 | 1.30 |
| Color | Min | 9.00 | 0.100 | <MDL | <MDL | <MDL | <MDL | <MDL | 3.00 | 0.0900 | <MDL | <MDL | 0.0600 | <MDL | <MDL |
| (n=36) | Max | 11,500 | 11,250 | 6,355 | 31.2 | 3,270 | 0.400 | 84.2 | 2,375 | 9.26 | 0.670 | 99.2 | 5.18 | 144 | 13.4 |
|  | Median | **288\*** | **13.1\*** | 0.0848 | **0.182\*** | **52.1\*** | **0.211\*** | **18.1\*** | **538\*** | **1.06\*** | **0.166\*** | **3.67\*** | 1.35 | **23.0\*** | **1.70\*** |
|  | GM | 391 | 30.9 | 0.195 | 0.334 | 85.6 | 0.203 | 2.64 | 183 | 1.01 | 0.171 | 3.26 | 0.738 | 11.1 | 2.06 |
| No Color | Min | <MDL | 0.13 | <MDL | <MDL | <MDL | <MDL | <MDL | 1.00 | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL |
| (n=4) | Max | 136 | 1.06 | 0.200 | 0.160 | 57.4 | 0.230 | 0.05 | 445 | 1.38 | 0.140 | 1.47 | 5.42 | 2.62 | 0.710 |
|  | Median | **<MDL** | **0.263** | 0.0516 | **0.0811** | **<MDL** | **0.0650** | **<MDL** | **3.95** | **0.116** | **0.0656** | **<MDL** | 0.0354 | **0.177** | **<MDL** |
|  | GM | 5.23 | 0.305 | 0.0641 | 0.0705 | 2.81 | 0.0720 | <MDL | 7.72 | 0.156 | 0.0636 | 0.0898 | 0.0882 | 0.347 | <MDL |
| Red | Min | 50.0 | 106 | <MDL | 0.110 | 29.3 | 0.160 | <MDL | 25.0 | 0.62 | 0.0600 | 2.40 | 0.0600 | 0.25 | 0.550 |
| (n=9) | Max | 9,230 | 11,250 | 10.1 | 0.250 | 2,780 | 0.270 | 22.4 | 658 | 5.28 | 0.600 | 99.15 | 4.90 | 43.1 | 8.67 |
|  | Median | 204 | **2,310\*** | 0.112 | 0.149 | 41.1 | 0.202 | 15.8 | 473 | 0.880 | 0.220 | **17.7\*** | 0.115 | 7.81 | 2.05 |
|  | GM | 262 | 2,054 | 0.187 | 0.169 | 90.6 | 0.207 | 2.25 | 214 | 1.06 | 0.195 | 21.04 | 0.352 | 7.16 | 2.74 |
| No Red | Min | <MDL | 0.100 | <MDL | <MDL | <MDL | <MDL | <MDL | 1.00 | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL |
| (n=31) | Max | 11,500 | 2,840 | 6,355 | 31.2 | 3,270 | 0.400 | 84.2 | 2,375 | 9.26 | 0.670 | 32.4 | 5.42 | 144 | 13.4 |
|  | Median | 289 | **1.72** | 0.0802 | 0.175 | 53.1 | 0.211 | 8.65 | 445 | 1.08 | 0.161 | **2.34** | 1.75 | 22.2 | 1.33 |
|  | GM | 252 | 5.04 | 0.171 | 0.333 | 54.2 | 0.176 | 1.60 | 116 | 0.780 | 0.145 | 1.193 | 0.696 | 8.03 | 1.38 |

‡Only elements that were above 60% > MDL detected are included: Al = Aluminum, Ba = Barium, Bi = Bismuth, Cu = Copper, Fe = Iron, Pb = Lead, Li = Lithium, Mg = Magnesium, Mn = Manganese, Ni = Nickel, Sr = Strontium,

Sn = Tin, Ti = Titanium, Zn = Zinc. Other elements measured but not reported include: Sb = Antimony, As = Arsenic, Be = Beryllium, Cd = Cadmium, Cr = Chromium, Co = Cobalt, Au = Gold, In = Indium, Mo = Molybdenum,

Se = Selenium, Ag = Silver, Tl = Thallium, V = Vanadium. MDL = Minimum detection limit. GM = Geometric mean. \*Statistical difference (p<0.05) determined using Mann-Whitney U Test.

Table S7. Spearman's rho correlations among elements measured in 40 nail polishes

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Li | Mg | Al | Ti | Cr | Mn | Fe | Ni | Cu | Zn | Sr | Sn | Ba | Pb | Bi |
| Li | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mg | 0.965\*\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Al | 0.098 | 0.137 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| Ti | 0.391\* | 0.433\*\* | 0.320\* | 1 |  |  |  |  |  |  |  |  |  |  |  |
| Cr | 0.283 | 0.324\* | 0.086 | 0.306 | 1 |  |  |  |  |  |  |  |  |  |  |
| Mn | 0.582\*\* | 0.652\*\* | 0.495\*\* | 0.507\*\* | 0.285 | 1 |  |  |  |  |  |  |  |  |  |
| Fe | 0.547\*\* | 0.593\*\* | 0.416\*\* | 0.583\*\* | 0.235 | 0.832\*\* | 1 |  |  |  |  |  |  |  |  |
| Ni | 0.469\*\* | 0.509\*\* | 0.243 | 0.420\*\* | 0.622\*\* | 0.435\*\* | 0.439\*\* | 1 |  |  |  |  |  |  |  |
| Cu | 0.151 | 0.148 | 0.391\* | -0.016 | 0.308 | 0.054 | -0.046 | 0.359\* | 1 |  |  |  |  |  |  |
| Zn | 0.185 | 0.153 | 0.251 | -0.066 | 0.29 | 0.012 | 0.037 | 0.354\* | 0.661\*\* | 1 |  |  |  |  |  |
| Sr | 0.507\*\* | 0.566\*\* | 0.155 | 0.259 | 0.232 | 0.375\* | 0.386\* | 0.498\*\* | 0.131 | 0.495\*\* | 1 |  |  |  |  |
| Sn | -0.255 | -0.11 | 0.380\* | 0.097 | -0.03 | 0.320\* | 0.123 | 0.035 | 0.083 | -0.039 | -0.016 | 1 |  |  |  |
| Ba | 0.132 | 0.181 | 0.191 | 0.213 | 0.023 | 0.176 | 0.278 | 0.256 | 0.056 | 0.455\*\* | 0.803\*\* | 0.007 | 1 |  |  |
| Pb | 0.033 | 0.071 | 0.405\*\* | 0.277 | -0.157 | 0.277 | 0.385\* | 0.018 | 0.166 | 0.203 | 0.213 | 0.168 | 0.428\*\* | 1 |  |
| Bi | 0.235 | 0.212 | 0.072 | 0.105 | 0.103 | 0.282 | 0.386\* | 0.196 | -0.033 | 0.027 | 0.125 | 0.018 | 0.209 | 0.223 | 1 |

\*\*Correlation is significant at the 0.01 level (2-tailed). \*Correlation is significant at the 0.05 level (2-tailed). Only elements that were above 60% > MDL detected

are included: Li = Lithium, Mg = Magnesium, Al = Aluminum, Ti = Titanium, Cr = Chromium, Mn = Manganese, Fe = Iron, Ni = Nickel, Cu = Copper, Zn = Zinc,

Sr = Strontium, Sn = Tin, Ba = Barium, Pb = Lead, Bi = Bismuth.

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