Safety Assessment of Dialkyl Carbonates as Used in Cosmetics

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All interested persons are provided 60 days from the above date to comment on this safety assessment and to identify additional published data that should be included or provide unpublished data which can be made public and included. Information may be submitted without identifying the source or the trade name of the cosmetic product containing the ingredient. All unpublished data submitted to CIR will be discussed in open meetings, will be available at the CIR office for review by any interested party and may be cited in a peer-reviewed scientific journal. Please submit data, comments, or requests to the CIR Director, Dr. Lillian J. Gill

The 2016 Cosmetic Ingredient Review Expert Panel members are: Chair, Wilma F. Bergfeld, M.D., F.A.C.P.; Donald V. Belsito, M.D.; Ronald A. Hill, Ph.D.; Curtis D. Klaassen, Ph.D.; Daniel C. Liebler, Ph.D.; James G. Marks, Jr., M.D.; Ronald C. Shank, Ph.D.; Thomas J. Slaga, Ph.D.; and Paul W. Snyder, D.V.M., Ph.D. The CIR Director is Lillian J. Gill, D.P.A. This report was prepared by Wilbur Johnson, Jr., M.S., Senior Scientific Analyst and Bart Heldreth, Ph.D., Chemist.
INTRODUCTION

The safety of the following 6 dialkyl carbonates as used in cosmetics is reviewed in this safety assessment:

- Dicaprylyl Carbonate
- Bis-Propylheptyl Carbonate
- C14-15 Dialkyl Carbonate
- Diethylhexyl Carbonate
- Dimethyl Carbonate
- Dipropyl Carbonate

According to the *International Cosmetic Ingredient Dictionary and Handbook*, with the exception of dimethyl carbonate, which functions as a fragrance ingredient, propellant, or solvent, these ingredients function as skin conditioning agents in cosmetic products. In addition to the skin conditioning agent function, Dicaprylyl Carbonate is the only other ingredient that also functions as a solvent in cosmetic products.

It is possible that alcohols previously reviewed by the Cosmetic Ingredient Review (CIR) may be considered relevant (as starting materials and potential metabolites) to this safety assessment of Dialkyl Carbonates. For example, data on propanol, included in the CIR safety assessment on Methyl Acetate, may be useful in the safety assessment of Dipropyl Carbonate. Additionally, regarding Dimethyl Carbonate, CIR has evaluated the safety of Methyl Alcohol in cosmetic products, and concluded that this ingredient is safe as used to denature alcohol used in cosmetic products.

CHEMISTRY

Definition and General Characterization

The ingredients in this report are each structurally related as simple alkyl diesters of carbonic acid. Each ingredient comprises a carbonic acid residue, diesterified with alkyl alcohols, as short as methanol (C1) to as long as pentadecyl alcohol (C15). For example, Dipropyl Carbonate is the apparent diesterification product of propanol and carbonic acid (Figure 1). These ingredients vary from volatile liquids (Dimethyl carbonate can be used as a Propellant) to low temperature melting solids (the di-C15 component of C14-15 Dialkyl Carbonate melts at 39-41°C). The definitions of dialkyl carbonates are presented in Table 1.

![Dipropyl Carbonate](image)

**Figure 1**

Chemical and Physical Properties

Chemical and physical properties of two Dialkyl Carbonates, Dimethyl Carbonate and Dipropyl Carbonate are presented in Table 2.

Method of Manufacture

**Dimethyl Carbonate**

Dimethyl Carbonate is produced mostly by transesterification of methanol and propylene carbonate.
Composition/Impurities

**Dimethyl Carbonate**

The results of what has been described as a typical analysis of Dimethyl Carbonate were as follows: Dimethyl Carbonate (99.8 weight % minimum), water (0.1 weight % maximum), methanol (0.1 weight % maximum), chlorine (0.01 weight % maximum), aldehydes [as formaldehyde] (0.001 weight % maximum), and acids [as formic acid] (0.01 weight % maximum).6

**USE**

**Cosmetic**

The safety of the Dialkyl Carbonates included in this safety assessment is evaluated based on data received from the U.S. Food and Drug Administration (FDA) and the cosmetics industry on the expected use of these ingredients in cosmetics. Use frequencies of individual ingredients in cosmetics are collected from manufacturers and reported by cosmetic product category in FDA’s Voluntary Cosmetic Registration Program (VCRP) database. Use concentration data are submitted by the cosmetics industry in response to surveys, conducted by the Personal Care Products Council (Council), of maximum reported use concentrations by product category. Collectively, the use frequency and use concentration data indicate that 3 of the 6 ingredients in this safety assessment are currently being used in cosmetic products (See Table 3). Based on these data, the following ingredients are not being used in cosmetics: Bis-Propylheptyl Carbonate, Dimethyl Carbonate, and Dipropyl Carbonate.

According to 2016 VCRP data, the greatest reported use frequency is for Dicaprylyl Carbonate (384 formulations, mostly leave-on products) (Table 3).7 The results of a concentration of use survey conducted in 2015 indicate that Dicaprylyl Carbonate has the highest maximum concentration of use; it is used at concentrations up to 34.5% in leave-on products (eye shadow) (Table3).8

Cosmetic products containing Dialkyl Carbonates may be applied to the skin and hair or, incidentally, may come in contact with the eyes (e.g., Dicaprylyl Carbonate at maximum use concentrations up to 34.5% in eye area cosmetics) and mucous membranes (e.g., Dicaprylyl Carbonate at maximum use concentrations up to 2.7% in other personal cleanliness products). Additionally, Dicaprylyl Carbonate is being used in products that may result in incidental ingestion; however, use concentration data relating to this type of exposure were not received. Products containing these ingredients may be applied as frequently as several times per day and may come in contact with the skin or hair for variable periods following application. Daily or occasional use may extend over many years.

Dicaprylyl Carbonate is used in aerosol suntan products at maximum use concentrations up to 1.5% and in tonics, dressings and other hair grooming aids, which could possibly be sprayed, at concentrations up to 6%. In practice, 95% to 99% of the droplets/particles released from cosmetic sprays have aerodynamic equivalent diameters >10 µm, with propellant sprays yielding a greater fraction of droplets/particles below 10 µm, compared with pump sprays.9,10,11,12 Therefore, most droplets/particles incidentally inhaled from cosmetic sprays would be deposited in the nasopharyngeal and bronchial regions and would not be respirable (i.e., they would not enter the lungs) to any appreciable amount.9,10 Diethylhexyl Carbonate is being used in moisturizing skin care products, which could possibly be in powder form, at maximum use concentrations up to 2.5%. Conservative estimates of inhalation exposures to respirable particles during the use of loose powder cosmetic products are no more than about 1 µg/kg/day.13,14,15

**Noncosmetic**

The Dialkyl Carbonates reviewed in this safety assessment do not appear on FDA’s list of direct food additives or indirect food additives. However, the following carbonate salts (included in this assessment) are listed and classified as generally recognized as safe direct food additives: Magnesium Carbonate, Ammonium Bicarbonate, Ammonium Carbonate, Calcium Carbonate, Potassium Bicarbonate, and Potassium Carbonate.16

**Dialkyl Carbonates**

Dialkyl Carbonates are widely used as raw materials for the manufacture of agrochemicals, pharmaceuticals, and antioxidants, and as potential solvents for coating, adhesives and electrolytes in lithium ion batteries.5
Dimethyl Carbonate

Dimethyl Carbonate is a methylating agent in organic synthesis.\textsuperscript{17,18,19,20,21,22,23,24}

TOXICOKINETICS

Data on the toxicokinetics of Dialkyl Carbonates were not found in the published literature, and unpublished data were not provided.

TOXICOLOGY

Data on the toxicity of Dimethyl Carbonate and Diethylhexyl Carbonate have been identified in registration dossiers that are accessible at the European Chemical Agency’s website.\textsuperscript{25} These data will be added to the draft report on Dialkyl Carbonates prior to its review by the CIR Expert Panel.

Acute Toxicity

Dermal

**Dimethyl Carbonate**

An acute dermal LD\textsubscript{50} of > 2.5 g/kg was reported for Dimethyl Carbonate in a study involving cavies (number and strain not stated).\textsuperscript{23} Study details were not included. An acute dermal LD\textsubscript{50} of 2.5 g/kg was reported for Dimethyl Carbonate in a study involving rats.\textsuperscript{26} Study details also were not included.

**Dipropyl Carbonate**

In a study involving rats (number and strain not stated), an acute dermal LD\textsubscript{50} of 0.98 g/kg was reported for Dipropyl Carbonate (> 95%).\textsuperscript{5,27} Study details were not included.

Oral

**Dimethyl Carbonate**

In an acute oral toxicity study involving rats (number and strain not stated), an LD\textsubscript{50} of 13.8 g/kg was reported for Dimethyl Carbonate.\textsuperscript{23,26} Study details were not included. According to other acute oral toxicity studies, the acute oral LD\textsubscript{50} value for Dimethyl Carbonate in rats and mice (number of animals and strains not stated) is between 6.4 g/kg and 12.8 g/kg. The exposure-related signs reported in these studies included weakness, ataxia with gasping, and unconsciousness. Additional study details were not included.

**Dipropyl Carbonate**

The acute oral toxicity of Dipropyl Carbonate (> 95%) was evaluated in a study involving mice (number and strain not stated).\textsuperscript{27} An LD\textsubscript{50} of 0.3 g/kg was reported. Study details were not included.

In a study involving rabbits (number and strain not stated), an acute oral LD\textsubscript{50} of 3.2 g/kg was reported for Dipropyl Carbonate (> 95%).\textsuperscript{27} Study details were not included.

Inhalation

**Dimethyl Carbonate**

In a study involving rats (number and strain not stated), an acute inhalation LC\textsubscript{50} of 0.14 g/l was reported for Dimethyl Carbonate after an exposure period of 4 h.\textsuperscript{23,26} Study details were not included. The results of another study (number of animals and strain not stated) indicated that exposure to Dimethyl Carbonate at a concentration of 8000 ppm for 2 h (4-h equivalence: 20.8 mg/l) caused gasping, loss of coordination, and death (in 2h) due to pulmonary edema.\textsuperscript{28}
Repeated Dose Toxicity

Following a 28-day dermal exposure period (using a murine model), Dimethyl Carbonate caused a significant decrease in thymus weight at concentrations of ≥ 75%. Effects on body weight or hematological parameters were not observed. Additional study results are included in the sections on Immunotoxicity and on Skin Irritation and Sensitization. Details relating to the test protocol will be included after the full text of this publication has been received.

Immunotoxicity

Dimethyl Carbonate

The immunotoxicity of Dimethyl Carbonate was evaluated using female BALB/c and B₆C₃F₁ mice in a series of studies. In the hypersensitivity study, groups of 5 BALB/c mice were treated topically with acetone vehicle, increasing concentrations of Dimethyl Carbonate, or positive control [(30% α-hexylcinnamaldehyde (v/v; sensitization positive control) and 0.3% dinitrofluorobenzene (v/v; irritancy positive control)]. Topical applications were made to the dorsal surface of each ear once per day for 3 consecutive days.

In the immune phenotyping and hematology study, groups of 5 B₆C₃F₁ mice were exposed topically to acetone or increasing concentrations of Dimethyl Carbonate (up to 100%; volume = 50 µl). Topical applications were made to shaved skin of the back once per day for 28 consecutive days.

For an analysis of the IgM response to sheep red blood cells, B₆C₃F₁ mice (n = 6) were exposed topically to acetone or increasing concentrations of Dimethyl Carbonate (up to 100%; volume = 50 µl). Applications were made to shaved skin of the back for 28 consecutive days. Cyclophosphamide (20 mg/kg in isotonic saline) served as the positive control, and was injected intraperitoneally.

Following a 28-day dermal exposure period, Dimethyl Carbonate caused a significant decrease in thymus weight at concentrations of ≥ 75%. Effects on the following parameters were not found: body weight, hematological parameters (erythrocytes, leukocytes, and their differentials), or immune cell phenotyping (B-cells, T-cells, and T-cell subsets). The IgM antibody response to sheep red blood cells was reduced significantly in the spleen, but not in the serum. These results indicate that dermal exposure to Dimethyl Carbonate induced immune suppression in mice.

REPRODUCTIVE AND DEVELOPMENTAL TOXICITY

Dimethyl Carbonate

In a reproductive and developmental toxicity study, mice (number and strain not stated) were exposed to Dimethyl Carbonate, by inhalation, at concentrations ranging from 300 ppm to 3000 ppm. During the organogenesis period, both maternal body weight gain and food consumption were reduced following exposure to 3000 ppm; post-implantation loss due to increased resorptions and an increased number of stunted fetuses was also observed. Furthermore, at 3000 ppm, the total incidences of fetal malformations were significantly increased, and included cleft palate, microtia, and multiple skull bone malformations. The effects on reproduction and fetal development, especially the increased incidences of fetal malformations, were observed at a dose level at which general toxicity, such as decreased body weight gain in parental animals, was manifested. Additional study details were not included.

GENOTOXICITY

Dimethyl Carbonate

Reportedly, Dimethyl Carbonate is not genotoxic. Details relating to the test system and protocol were not included.

CARCINOGENICITY

Carcinogenicity data on Dialkyl Carbonates were not found in the published literature, and unpublished data were not provided.
IRRITATION AND SENSITZATION
Skin Irritation and Sensitization

Dimethyl Carbonate

Reportedly, Dimethyl Carbonate has negligible skin irritation potential. Study details were not included.

A combined local lymph node and irritancy assay was used to determine the irritation and sensitization potential of Dimethyl Carbonate at concentrations ranging from 50% to 100%. Acetone served as the vehicle control. Dimethyl Carbonate was not found to be an irritant or sensitizer in the local lymph node assay when tested at concentrations ranging from 50% to 100%. Increases in lymphocyte proliferation were not identified in this assay.

Ocular Irritation

Dimethyl Carbonate

In an in vitro assay (corneas – animal source not stated), dimethyl carbonate (solid) was classified as a severe irritant. Corneal opacity was not reported, but mean corneal swelling increased from a value of 16.6 at 1 h to 39.4 at 4 h. Slight pitting of the corneal epithelium was also observed. Additional study details were not included.

Dipropyl Carbonate

Dipropyl Carbonate (> 95%, 100 mg) was instilled into the eyes of rabbits (number and strain not stated). At 24 h, moderate ocular irritation was reported.

SUMMARY

The safety of the following 6 Dialkyl Carbonates as used in cosmetics is reviewed in this safety assessment: Dicaprylyl Carbonate, Bis-Propylheptyl Carbonate, C14-15 Dialkyl Carbonate, Diethylhexyl Carbonate, Dimethyl Carbonate, and Dipropyl Carbonate. These ingredients function mostly as skin conditioning agents in cosmetic products.

The results of what has been described as a typical analysis of Dimethyl Carbonate were as follows: Dimethyl Carbonate (99.8 weight % minimum), water (0.1 weight % maximum), methanol (0.1 weight % maximum), chlorine (0.01 weight % maximum), aldehydes [as formaldehyde] (0.001 weight % maximum), and acids [as formic acid] (0.01 weight % maximum).

Collectively, information supplied to FDA by industry as part of the VCRP and a survey of ingredient use concentrations conducted by the Council indicate that the following simple carbonate salts are being used in cosmetic products: Dicaprylyl Carbonate, C14-15 Dialkyl Carbonate, and Diethylhexyl Carbonate. The highest use frequency is reported for Dicaprylyl Carbonate (384 uses). The Council survey data also indicate that Dialkyl Carbonates are being used in cosmetics at maximum ingredient use concentrations up to 34.5% (i.e., Dicaprylyl Carbonate in leave-on products [eye shadow]).

The following LD₅₀ values have been reported for Dialkyl Carbonates in acute oral toxicity studies: 13.8 g/kg (Dimethyl Carbonate, rats), 0.3 g/kg (Dipropyl Carbonate, mice), and 3.2 g/kg (Dipropyl Carbonate, rabbits). According to other acute oral toxicity studies, the acute oral LD₅₀ value for Dimethyl Carbonate in rats and mice is between 6.4 g/kg and 12.8 g/kg.

In acute dermal toxicity studies, the following LD₅₀ values have been reported for Dialkyl Carbonates: 2.5 g/kg (Dimethyl Carbonate, rats), > 2.5 g/kg (Dimethyl Carbonate, cavies), and 0.98 g/kg (Dipropyl Carbonate, rats).

In a study involving rats, an acute inhalation LC₅₀ of 0.14 g/l was reported for Dimethyl Carbonate after an exposure period of 4 h.

Following a 28-day dermal exposure period (using a murine model), Dimethyl Carbonate caused a significant decrease in thymus weight at concentrations of ≥ 75%. Effects on body weight or hematological parameters were not observed.
Using a murine model, dermal exposure to Dimethyl Carbonate induced immune suppression at concentrations of ≥ 75%.

Dimethyl Carbonate was a reproductive and developmental toxicant in mice exposed (inhalation exposure) to a concentration of 3000 ppm. The increased incidences of fetal malformations were observed at a dose level at which general toxicity (i.e., decreased body weight gain) was observed in parental animals.

Reportedly, Dimethyl Carbonate is not a genotoxic compound. However, data supporting this finding have not been identified in the published literature.

Dipropyl Carbonate was classified as a moderate ocular irritant in rabbits. In an in vitro assay (corneas – animal source not stated), Dimethyl Carbonate (solid) was classified as a severe irritant. Reportedly, Dimethyl Carbonate has negligible skin irritation potential. Furthermore, using a murine model, Dimethyl Carbonate was classified as a non-irritant. In the local lymph node assay, Dimethyl Carbonate was not found to be a sensitizer when tested at concentrations ranging from 50% to 100%. Increases in lymphocyte proliferation were not identified in this assay.

Data relating to the toxicokinetics or carcinogenicity of the Dialkyl Carbonates that are used in cosmetic products were not found in the published literature.

### TABLES

**Table 1. Definitions, structures, and functions of the ingredients in this safety assessment.**

<table>
<thead>
<tr>
<th>Ingredient CAS No.</th>
<th>Definition &amp; Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimethyl Carbonate 616-38-6</td>
<td>Dimethyl Carbonate is the organic compound that conforms to the formula:</td>
<td>Fragrance Ingredients; Propellants; Solvents</td>
</tr>
<tr>
<td>Dipropyl Carbonate 623-96-1</td>
<td>Dipropyl Carbonate is the organic compound that conforms to the formula:</td>
<td>Skin-Conditioning Agents - Miscellaneous</td>
</tr>
<tr>
<td>Dicaprylyl Carbonate 1680-31-5</td>
<td>Dicaprylyl Carbonate is the diester of carbonic acid and caprylyl alcohol. It conforms to the formula:</td>
<td>Skin-Conditioning Agents - Emollient; Solvents</td>
</tr>
<tr>
<td>C14-15 Dialkyl Carbonate [153821-35-3 Di-C14 145197-00-8 Di-C15]</td>
<td>C14-15 Dialkyl Carbonate is the organic compound that conforms generally to the formula:</td>
<td>Skin-Conditioning Agents - Emollient</td>
</tr>
<tr>
<td>Diethylhexyl Carbonate 14858-73-2</td>
<td>Diethylhexyl Carbonate is the organic compound that conforms to the formula:</td>
<td>Skin-Conditioning Agents - Emollient</td>
</tr>
</tbody>
</table>
Table 1. Definitions, structures, and functions of the ingredients in this safety assessment.

<table>
<thead>
<tr>
<th>Ingredient CAS No.</th>
<th>Definition &amp; Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bis-Propylheptyl Carbonate [1238449-42-7]</td>
<td>Bis-Propylheptyl Carbonate is the organic compound that conforms to the formula:</td>
<td>Skin-Conditioning Agents - Emollient</td>
</tr>
</tbody>
</table>

Table 2. Properties of Dialkyl Carbonates

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Background Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimethyl Carbonate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Form/Odor</td>
<td>Smells like methanol.</td>
<td>Short-chain symmetrical Dialkyl Carbonates are colorless, transparent liquids with a pleasant odor.</td>
</tr>
<tr>
<td>Viscosity</td>
<td>0.625 cP @ 20°C</td>
<td></td>
</tr>
<tr>
<td>Molecular Mass</td>
<td>90.08</td>
<td></td>
</tr>
<tr>
<td>Solubility</td>
<td>139 g/l in water, 13.9 g/100 g</td>
<td>The solubility of Dialkyl Carbonates in different media depends on the length of the carbon chain. Most are soluble in water and dissolve easily in polar organic solvents, such as ethanol. Dimethyl Carbonate is miscible with ethanol, ethers, esters, and ketones.</td>
</tr>
<tr>
<td>Melting Point</td>
<td>4.6°C</td>
<td></td>
</tr>
<tr>
<td>Boiling Point</td>
<td>90.3 °C</td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>1.069 g/cm³, 1.07 g/cm³</td>
<td></td>
</tr>
<tr>
<td>Reactivity</td>
<td></td>
<td>Dimethyl Carbonate has 3 reactive centers that can interact with nucleophiles: the carbonyl and 2 methyl groups. The carbonyl group is the harder electrophile (due to its polarized positive charge and sp² hybridization), and the 2 methyl groups represent softer electrophiles (due to their sp³ orbital and their saturated carbon atom, which has a weaker positive charge). Dimethyl Carbonate behaves as a methylaing agent toward substrates with acidic hydrogens.</td>
</tr>
</tbody>
</table>

| **Dipropyl Carbonate** | | |
| Form       | Yellow liquid. | |
| Molecular Mass | 146.19 | |
| Solubility | 4.1 g/l in water | |
| Melting Point | -41°C | |
| Boiling Point | 168.2°C, 167°C to 168°C | |
| Density   | 0.944 g/cm³, 0.944 g/cm³ at 25°C | |
Table 3. Current Frequency and Concentration of Use According to Duration and Type of Exposure.\textsuperscript{7,8}

<table>
<thead>
<tr>
<th>Exposure Type</th>
<th>Dicapryl Carbonate</th>
<th>C14-15 Dialkyl Carbonate</th>
<th>Diethylhexyl Carbonate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of Uses</td>
<td>Conc. (%)</td>
<td># of Uses</td>
</tr>
<tr>
<td>Totals/Conc. Range</td>
<td>384</td>
<td>0.3-34.5</td>
<td>NR</td>
</tr>
<tr>
<td><strong>Duration of Use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave-On</td>
<td>334</td>
<td>0.3-34.5</td>
<td>NR</td>
</tr>
<tr>
<td>Rinse off</td>
<td>48</td>
<td>0.3-4</td>
<td>NR</td>
</tr>
<tr>
<td>Diluted for (bath) Use</td>
<td>2</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td><strong>Exposure Type</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye Area</td>
<td>13</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Incidental Ingestion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incidental Inhalation - Sprays</td>
<td>10*</td>
<td>1.5; 2.6*</td>
<td>NR</td>
</tr>
<tr>
<td>Incidental Inhalation - Powders</td>
<td>2</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Dermal Contact</td>
<td>351</td>
<td>0.34-34.5</td>
<td>NR</td>
</tr>
<tr>
<td>Deodorant (underarm)</td>
<td>6</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Hair - Non-Coloring</td>
<td>18</td>
<td>0.3-2.9</td>
<td>NR</td>
</tr>
<tr>
<td>Hair-Coloring</td>
<td>2</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Nail</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Mucous Membrane</td>
<td>19</td>
<td>2.7</td>
<td>NR</td>
</tr>
<tr>
<td>Baby Products</td>
<td>1</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

NR = Not Reported; Totals = Rinse-off + Leave-on Product Uses.

*It is possible that these products may be sprays, but it is not specified whether the reported uses are sprays.

** It is possible that these products may be powders, but it is not specified whether the reported uses are powders.

Note: Because each ingredient may be used in cosmetics with multiple exposure types, the sum of all exposure type uses may not equal the sum total uses.
References


