



**DERMAL IRRITATION HAZARD ASSESSMENT OF INGREDIENTS IN WEN BY  
CHAZ DEAN PRODUCTS**



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## 1. INTRODUCTION

Cardno ChemRisk was asked by WEN By Chaz Dean (“WCD”) to conduct a comprehensive risk and safety assessment of the cosmetic product commonly known as WEN® by Chaz Dean Cleansing Conditioner (the “WEN Products”), and, specifically, whether the Products cause hair loss and/or any other adverse dermal event, which evaluation was triggered by complaints and allegations that the WEN Products caused hair loss in a small percentage of consumers. As part of that comprehensive risk and safety assessment, we performed an assessment of 31 ingredients in the three top selling versions of the WEN Products (Sweet Almond Mint, Lavender, and Pomegranate Cleansing Conditioners), which are also the three most complained about versions of the WEN Products in order to understand the dermal irritation potential of ingredients in them. WCD confirmed to us that the formulations for these three versions of the WEN Products, as manufactured by WCD, have not changed since entering the marketplace [REDACTED]

[REDACTED] These three versions of the WEN Products contain most of the ingredients used in all versions of the WEN Products.

## 2. METHODS

We first reviewed the formulation sheets for each of the three best selling varieties of the WEN Products (Lavender, Pomegranate, and Sweet Almond Mint) and the Material Safety Data Sheets (MSDS) for the listed components in each of the WEN Products to develop a complete list of chemicals, botanicals and fragrances present in these products (Table 1). There are a total 31 ingredients between the three varieties of the WEN Products (including Kathon CG as one ingredient and fragrance as one ingredient). Water (which the single largest ingredient in the WEN Products) was not included in this analysis.

Then, the dermal irritation potential of each identified ingredient was evaluated in a stepwise approach. The first step was to look at the safety determination by the Cosmetic Ingredient Review (CIR). The Cosmetic Ingredient Review (CIR), an independent industry trade association in the United States, evaluates the safety of cosmetic ingredients by assessing the chemistry, use, and toxicology in order to provide safety recommendations. Data on dermal irritation is included in each assessment and considered in the safety recommendations. We determined if each ingredient was within the CIR guidelines (Table 1). Next, we summarized the human irritation data reported by the CIR for each chemical to illustrate the irritation potential (Table 2). The human studies were included in Table 2 if the study description gave the percentage of the chemical in the tested material and reported irritation outcomes or the author’s determination of the irritancy potential. Thus, many sensitization studies were reported as long as irritation results were clearly discussed or conclusions on irritation were drawn. Sensitization studies were not included if irritation was not discussed.

If an ingredient had not been reviewed by the CIR, we conducted a literature review of the human and animal studies. Information on the chemical ingredients were collected and

incorporated from various databases and textbooks, many of which are created and maintained by regulatory agencies and all are the authoritative sources relied upon by the scientific community in determining human health risks from exposures to chemicals, cosmetic ingredients, food, and drugs. We searched the following databases for animal or human irritation studies on the ingredients in the Products:

- PubMed, Google Scholar
- Organisation for Economic and Co-operation and Development (OECD) Global Portal to Information on Chemical Substances (EChemPortal)
- US FDA
- Agency for Toxic Substances and Disease Registry (ATSDR)
- European Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH)
- We also looked at the current and historical use of each ingredient by searching the National Library of Medicine's Household Products Database and the EWG's Skin Deep Cosmetic Database.

In regard to the fragrance within the WEN Products, that is a mixture of 39 chemicals (Table 3). The first step was to look at the safety determination by the CIR and International Fragrance Association (IFRA). IFRA is a trade organization that with members that account for 90% of the global production of fragrances. One of the tenets of the organization is to rigorously assess the toxicity and allergenicity of fragrance ingredients. We determined if each ingredient was within the CIR and IFRA guidelines (Table 3). We also evaluated the Raw Materials Monographs put forward by the Research Institute for Fragrance Materials (RIFM). RIFM is a nonprofit with the stated purpose to gather and analyze scientific data, engage in testing and evaluation, distribute information, cooperate with official agencies and to encourage uniform safety standards related to the use of fragrance ingredients. The maximal reported ingredient concentrations were pulled from the monographs (Table 3). Next, we summarized the human and animal irritation data reported by RIFM for each of the 39 chemicals to illustrate their respective irritation potential (Table 4). If a fragrance constituent did not have irritation data reported in RIFM, a literature review of the human and animal studies was completed and discussed in the below text. Other sources for ingredient use were also relied on as identified in the below text.

### **3. RESULTS**

#### **Overview**

Thirty-one ingredients present in the WEN Products were evaluated for their irritation potential (Table 1). Twenty-three ingredients had previously been evaluated by the CIR and had guidelines for the safe concentration in cosmetics. For each ingredient, the maximal reported concentration in the WEN Products, per formulation sheets, were compared to the CIR guidance concentrations. For 21 ingredients, the formulation of the WEN Products is within the CIR guidelines. For two ingredients (aloe barbadensis leaf juice and hydrolyzed wheat protein) there were additional restrictions beyond concentration. For aloe barbadensis leaf juice, the WEN

[REDACTED]

Products are within the allowable cosmetic concentration guidelines. For hydrolyzed wheat protein, the WEN Products are within the allowable cosmetic concentration guidelines but the guidelines also specifies that the molecular weight (MW) should be restricted. We are not aware of testing or documentation of the MW of the wheat protein.

The CIR reviewed animal and human irritation data as part of the safety determination. It should be noted that irritation was not always the driver in setting allowable levels. The human irritation/sensitization tests reported by the CIR are summarized in Table 2. This table illustrates the low irritation potential of each evaluated ingredient and of the WEN Products overall. The number and rigor of studies is variable between ingredients. For example, Kathon CG (MCI/MI), a known skin sensitizer, had 39 reported human studies that discussed irritation. Whereas, citric acid only had four human irritation studies reported.

### *Chemicals Evaluated by CIR*

- *Aloe Barbadensis (Aloe Vera) Leaf Juice*

The CIR evaluated aloe barbadensis (aloe vera) leaf juice and several species/extracts of aloes (CIR, 2007). In a human irritation study, aloe barbadensis leaf water was applied to the back of 10 female subjects and occluded for 48 hours (Table 2). There was very slight erythema (redness) in one subject and no other skin reactions. The CIR concluded that aloe barbadensis leaf extract is safe in cosmetic ingredients (if anthraquinone levels in the ingredients do not exceed 50 ppm) (CIR, 2007). Aloe-derived ingredients are used in a wide variety of cosmetic product types at concentrations of 0.001% to 20% (CIR, 2007). [REDACTED]

[REDACTED] Some cells in the aloe plant contain anthraquinones and there is an industry established limit for anthraquinones in aloe-derived materials for nonmedical uses of 50 ppm. The Cosmetic Ingredient Review Expert Panel concluded that anthraquinone levels in the several Aloe Barbadensis extracts are well understood and can conform to the industry-established level of 50 ppm. [REDACTED]

- *Amodimethicone*

The CIR evaluated amodimethicone, a siloxane polymer of dimethicone, along with other structurally related compounds (Nair, 2003). The CIR Expert Panel considered it unlikely that any of these polymers would be significantly absorbed into the skin due to their large molecular weight. In a human irritation study, a related compound, dimethicone, was applied to the forearm of 54 male subjects and occluded for 24 hours. No irritation was produced (Table 2). The CIR Expert Panel concluded that amodimethicone was safe as used in cosmetic products. The reported use concentration was up to 3% in hair conditioners (Nair, 2003). The CIR safe list notes that amodimethicone is safe up to 3%. [REDACTED]

- *Behentrimonium Methosulfate*

[REDACTED]

The CIR evaluated behentrimonium methosulfate, a quarternary ammonium salt, along with other structurally related compounds (Becker et al., 2012). In human irritation studies, the related compound behentrimonium chloride was tested at 5% for 24 hours. The reported irritation was similar to control (Table 2). The related compound, cetrimonium chloride, was evaluated in concentrations of 0.125 to 25% for 1 to 48 hours (Table 2). The results ranged from no reactions to moderate reactions with most studies exhibiting no irritation or mild irritation. The CIR expert panel concluded that behentrimonium methosulfate was safe in the present practice of use and concentration in cosmetics when formulated to be non-irritating. The allowable concentration to be non-irritating was not defined but it was reported that cetrimonium chloride was not an irritant up to 1% and behentrimonium chloride up to 5%. The use concentrations for behentrimonium methosulfate reported in 2010 were 0.1-10% (Becker et al., 2012). [REDACTED]

- *Calendula Officinalis (Marigold) Flower Extract*

The CIR evaluated calendula officinalis flower extract and other calendula officinalis-derived ingredients (Andersen et al., 2010). In a human irritation studies, 1% extract was tested in patch tests for various durations (Andersen et al., 2010) (Table 2). Limited or no irritation was reported. The CIR expert panel concluded that calendula officinalis flower extract was safe for use in cosmetic in the practices of use and concentrations reported. The use concentrations for calendula officinalis flower extract were reported as 0.0001-6% in 2010 in various cosmetics (Andersen et al., 2010). [REDACTED]

- *Cetearyl Alcohol*

The CIR evaluated cetearyl alcohol and other long-chain aliphatic alcohols in 1988 and 2008 (CIR, 1988, 2008). In a human sensitization study, 25 subjects had a 3% cetearyl alcohol cream applied to the forearm and occluded for 48 h. After 24 hours on no treatment, patches were reapplied and the process was repeated five times. The product was considered non-irritating (CIR, 1988) (Table 2). The CIR expert panel concluded that cetearyl alcohol was safe as a cosmetic in the present practice of use (CIR, 1988, 2008). Use concentrations >0.1-25% were report in in 1982 and 0.002-15% in 2005 (CIR, 2008). Use concentrations in shampoos were 0.2-14% in 2005 (CIR, 2008). The CIR safe list notes the cetearyl alcohol is safe to up to 25%. [REDACTED]

- *Cetyl Alcohol*

The CIR evaluated cetyl alcohol and other long-chain aliphatic alcohols in 1988 and 2008 (CIR, 1988, 2008). In human irritation studies, 2-100% cetyl alcohol in various formulations were applied in patch tests or use tests. There was no irritation in most studies and mild irritation in some cumulative tests (Table 2). The CIR expert panel concluded that cetyl alcohol was safe as a cosmetic in the present practice of use (CIR, 1988, 2008). Use concentrations ≤0.1-50% were report in in 1982 and 0.000002-15% in 2005 (CIR, 2008). Use concentrations in shampoos were 0.08-4% in 2005 (CIR, 2008). The CIR safe list notes the cetyl alcohol is safe to up to 50%. [REDACTED]

- ***Chamomilla Recutita Flower/Leaf (Chamomile) Extract***

The CIR evaluated chamomilla recutita-derived ingredients (Johnson et al., 2016). In human irritation studies, on the flower extract or the extract in 0.00006 to 0.5% in patch test and cumulative irritation tests. No skin reactions were observed (Table 2). The CIR expert panel concluded that chamomilla recutita flower/leaf extract was safe as a cosmetic in the present practice of use and concentration (when formulated to be non-sensitizing). The reported use concentration for chamomilla recutita flower/leaf extract was 0.002-0.1% and 0.002-0.02% for a leave-in and rinse-off products, respectively. [REDACTED]

- ***Citric Acid***

The CIR evaluated citric acid and related compounds (Fiume et al., 2014). In a human irritation studies, 1-100% citric acid was applied for 20 minutes to 48 h. No irritation was observed (Table 2). The CIR expert panel concluded that citric acid was safe as a cosmetic in the present practice of use and concentration. The CIR safe list reports that citric acid concentrations up to 39% are safe (CIR). [REDACTED]

- ***Cucumis Sativus (Cucumber) Fruit Extract***

The CIR evaluated cucumis sativus-derived ingredients (Fiume, 2012). In human irritation studies with up to 2.5% cucumis sativus in use or patch tests did not show signs of irritation (Table 2). When 5% cucumis sativus was used, some discomfort was reported but no clinical signs of irritation were observed (Table 2). The CIR expert panel concluded that cucumis sativus fruit extract is safe in cosmetic formulations in the present practices of use and concentration. The reported use concentration for cucumis sativus fruit extract was 0.00005-1% and 0.0000001-0.4% for a leave-in and rinse off product, respectively. The CIR safe list notes that cucumis sativus fruit extract is safe to up to 1%. [REDACTED]

- ***Glycerin***

The CIR evaluated glycerin in 2014 (Becker, 2014). In one human irritation study, 420 subjects had a 50% glycerin patch test for 20-24 hours and glycerin was considered not irritating (Becker, 2014) (Table 2). In another study, 33 subjects had 25% glycerin applied in a 24 hour semi-occlusive patch and was considered not irritating (Becker, 2014). The CIR expert panel concluded that glycerin is safe in cosmetics in the present practice of use and concentration. The reported use concentrations was 0.0001-79% and 0.0007-99.4% for a leave-in and rinse off product, respectively. [REDACTED]

- ***Guar Hydroxypropyltrimonium Chloride***

The CIR evaluated guar hydroxypropyltrimonium chloride and related legume polysaccharides in 2015 (Johnson et al., 2015). The large size of the polysaccharides make skin penetration unlikely. There were no human studies on guar hydroxypropyltrimonium chloride. There was a human sensitization study on the related compound hydroxypropyl guar where no reactions were

observed after a 24 hours occlusive exposure at 2% (Table 2). The CIR expert review panel concluded that guar hydroxypropyltrimonium chloride was safe in the present practice of use and concentration. The use concentrations were reported to be up to 2% in leave on and rinse off products. The CIR safe lists notes that guar hydroxypropyltrimonium chloride is safe up to 2%.

- ***Hydrolyzed Soy Protein***

The CIR evaluated hydrolyzed soy protein and related soy proteins and peptides in 2015 (Burnett and Heldreth, 2015). In one human irritation study, 50 subjects received 20% hydrolyzed soy protein for an occluded 24 hour exposure, repeated in nine applications over three weeks. The substance was considered non-irritating (Table 2). In another human study, 20 female subjects received 25% hydrolyzed soy protein occluded for 24 hours and the substance was not considered a dermal irritant (Table 2). The CIR expert panel concluded that hydrolyzed soy protein is safe in the present practice of use and concentration. The maximum concentration of hydrolyzed soy protein was 3.5% and 0.63% in leave-on and rinse-off products, respectively.

- ***Hydrolyzed Wheat Protein***

The CIR evaluate hydrolyzed wheat protein in 2014 (Burnett and Heldreth, 2014). In one human irritation study, 42 subjects had 25% hydrolyzed wheat protein applied in a 48 hour occluded patch test. The substance was determined to be non-irritating (Table 2). In a human sensitization study, 52 subjects had a 25% solution occluded as part of a human repeat insult patch test (HRIPT) used to determine allergenicity. No dermal irritation was observed (Table 2). The CIR expert panel concluded that hydrolyzed wheat protein is safe for use in cosmetics where formulated to restrict peptides to a weight-average MW of 3500 Da or less. The hydrolyzed wheat protein that is formulated in WEN has an unknown weight-average. The reported concentration of use for hydrolyzed wheat protein is 0.00006-1% and 0.00002-1.7% in leave-in and rinse-off products, respectively.

- ***Kathon (Methylchloroisothiazolinone/Methylisothiazolinone)***

The CIR evaluated methylchloroisothiazolinone in a 3:1 ratio with methylisothiazolinone (a commercial mixture called Kathon) in 1992, 2010, and 2014 (Burnett and Boyer, 2014; Burnett et al., 2010; CIR, 1992). There were multiple human studies on irritation and sensitization with variable results (Table 2). In general, studies with concentrations of MI/MCI less than 100 ppm exhibited minimal or no irritation (Table 2). Based on sensitization, the CIR expert panel concluded that MCI/MI were safe in cosmetics at 15 ppm for rinse-off products and 7.5 ppm for leave-on products.

- ***Panthenol (Pro-Vitamin B5)***

The CIR evaluated panthenol and related compound in 1987, 2006 and 2017 (CIR, 2006; Johnson and Swanson, 1987; Scott, 2017). The 2017 report is not yet final. In human irritation

[REDACTED]

studies, 0.5% panthenol was applied in various formulations for 24 or 48 hours. All studies found panthenol to be non-irritating or mildly irritating (Table 2). In 1987, the CIR expert review panel concluded that panthenol was safe as used in cosmetic and use data reported formulations with 25% (Johnson and Swanson, 1987). The CIR safe list reports that panthenol is safe in cosmetics up to 25%. In 2017, the expert panel again concluded that panthenol was safe as used. The reported concentration of use for panthenol in 2016 was 0.0001-5.3% and 0.000045-5% in leave-in and rinse-off products, respectively (Scott, 2017). [REDACTED]

- *PEG-60 Almond Glycerides*

The CIR evaluated PEG-60 almond glycerides with other PEGylated alkyl glycerides in 2014 (Fiume and Heldreth, 2015). In a human irritation study, subjects were exposed to 20% PEG-60 almond glycerides and it was reported to be non-irritating (Table 2). The CIR expert panel concluded that PEG-60 almond glyceride was safe in cosmetics in the present practice of use and concentration when formulated to be non-irritating. The maximum use concentrations were reported as 3.2% and 6.5% in leave-on and rinse-off products, respectively. [REDACTED]

- *Persea Gratissima (Avocado) Oil*

The CIR evaluated persea gratissima (avocado) oil and other plant derived fatty acid oils in 1980, 2003 and 2011 (Burnett and Fiume, 2011; CIR, 1980, 2003). In human irritation studies, 0.2% to 100% avocado oil was applied in patch tests. Some mild redness was observed in a few patients. Persea gratissima (avocado) oil was not considered an irritant (Burnett and Fiume, 2011) (Table 2). The CIR expert panel concluded that persea gratissima oil was safe as used in cosmetics in the present practice of use and concentration. Persea gratissima (avocado) oil was reported to have a maximum use concentration of 98% and 15% in leave-on and rinse-off products, respectively, in 2010. The CIR safe list noted that persea gratissima oil was safe up to 98%. [REDACTED]

- *Polysorbate-60*

The CIR evaluated polysorbate-60 and other polysorbates in 1984 and 2015 (Becker, 2015; CIR, 1984). In human irritation studies, 0.6 to 100% polysorbate-60 was applied in patch and use tests (CIR, 1984). Under some conditions, minimal irritation was observed in some subjects (Table 2). In multiple studies, no irritation was observed (Table 2). In the 2015 review, the CIR expert panel concluded that polysorbate-60 was safe as a cosmetic ingredients when formulated to be non-irritating. Polysorbate-60 was reported to have a maximum use concentration of 4% and 6% in leave-on and rinse-off products, respectively, in 2014 [REDACTED]

- *Prunus Amygdalus Dulcis (Sweet Almond) Oil*

[REDACTED]

The CIR evaluated prunus amygdalus dulcis oil and other plant-derived fatty acid oils in 1983, 2005, and 2011 (Burnett and Fiume, 2011). In human irritation studies, 7 to 46% prunus amygdalus dulcis oil was tested in patch and use tests (Burnett and Fiume, 2011). In some studies a few subjects had mild reactions but the oil was generally considered to be non-irritating (Table 2). The CIR expert review panel concluded that prunus amygdalus dulcis oil is safe in the present practice of use and concentration. The oil was reported to have a maximum use concentration of 77 and 43% in leave-on and rinse-off products, respectively, in 2010. The CIR safe list notes that prunus amygdalus dulcis oil is safe up to 77%. [REDACTED]

- ***Rosmarinus Officinalis (Rosemary) Leaf Extract***

The CIR evaluated rosmarinus officinalis (rosemary) leaf extract and other rosmarinus officinalis-derived ingredients in 2014. In human studies, the rosmarinus leaf was extracted in multiple ways and the extracts were applied in 0.2 to 100% in patch tests (Table 2). In many studies no reactions were observed but in some studies the extract was considered a weak irritant. The CIR expert panel concluded that rosmarinus officinalis (rosemary) extract was safe in the present practice of use and concentration when formulated to be non-sensitizing (Fiume, 2014). The extract was reported to have a maximum use concentration of 10% and 3% in leave-on and rinse-off products, respectively. [REDACTED]

- ***Stearamidopropyl Dimethylamine***

The CIR evaluated stearamidopropyl dimethylamine and other fatty acid amidopropyl dimethylamines in 2014 (Fiume, 2014). In human studies, 0.045 to 1% were applied in semi occlusive and occlusive patch tests (Fiume, 2014). Limited or no dermal reactions were reported. The CIR expert panel concluded that stearamidopropyl dimethylamine is safe when formulated to be non-sensitizing (Fiume, 2014). The reported maximum use concentration was 3 and 5% in leave-on and rinse-off products, respectively. [REDACTED]

- ***Tetrasodium EDTA***

The CIR evaluated tetrasodium EDTA and other EDTA salts in 2002 (Lanigan and Yamarik, 2002). In human irritation studies, EDTA salts did not exhibit irritation (Lanigan and Yamarik, 2002). The CIR expert panel concluded that tetrasodium EDTA was safe in cosmetic formulations. The reported maximum use concentration of tetrasodium EDTA was 1.3% in shampoos. The CIR safe list notes that tetrasodium EDTA is safe up to 1%. [REDACTED]

- ***Triticum Vulgare (Wheat) Starch***

The CIR evaluated triticum vulgare (wheat) starch and other polysaccharide gum in 1980, 2003, and 2015 (Johnson, 2015). In a human patch test, wheat starch was found to be non-irritating (Table 2). The CIR expert panel concluded that triticum vulgare (wheat) starch was safe in the

present practice of use and concentration (Johnson, 2015). The reported maximum use concentration was 6 and 3.6% in leave-on and rinse-off products, respectively.

### **Chemicals Without CIR Guidance**

- ***Dicetyldimonium chloride***

There was no information available on the irritation potential of dicetyldimonium chloride. It is found in approximately 200 personal care products in the National Library of Medicine's Household Products Database and the EWG's Skin Deep Cosmetic Database including 135 conditioners; 2 moisturizer, cream, lotion, and body oil products; and 7 shampoos. This appears to be a common ingredient but the concentration in other products is unavailable.

- ***Hamamelis Virginiana (Witch Hazel)***

The CIR evaluated hamamelis virginiana-derived ingredients in 2017 and determined that there was insufficient data to make a determination on safety (CIR, 2017). Additional dermal irritation data was requested by the CIR. In one human study of hamamelis virginiana ointment (concentration not identified) on 231 subjects, there were only two adverse events (erythema, burning sensation). The irritation potential wasn't discussed but the ointment was considered well tolerated (CIR, 2017). The maximum reported concentration for leave-on and rinse-off products for hamamelis virginiana extract was 86% and 5%, respectively.

Although it is difficult to evaluate the irritation potential, the concentration of the ingredient in Wen is aligned with the current practice of concentration and use in cosmetics.

- ***Lavandula Angustifolia (Lavender) Flower Extract***

There was no information available on the irritation potential of lavandula angustifolia flower extract. Lavender extracts are used in over 2,300 personal care products in the National Library of Medicine's Household Products Database and the EWG's Skin Deep Cosmetic Database. Specifically, lavender extracts are found in approximately 721 moisturizer, cream, lotion, and body oil products; 534 body wash, face wash, and exfoliant products, 171 shampoos; 180 miscellaneous skin products which includes but is not limited to facial serums, facial masks, and massage oils; and 117 conditioners. This appears to be a common ingredient but the concentration in other products is unavailable.

- ***Lavandula Angustifolia (Lavender) Oil***

Lavandula angustifolia oil appears to have a low irritation potential. In a human study, 16% lavender oil in a 48 hour closed patch test produced no irritation (Opdyke, 1976). In animal studies, 100% lavender oil on mice and swine was not irritating (Opdyke, 1976). Lavender oil (100%) after 24 hours of occlusion was slightly irritating for rabbits (Opdyke, 1976). The

[REDACTED]

National Library of Medicine's Household Product Database report lavender oil in multiple household products in concentrations up to 10% and up to 2% in hand wash, deodorant and soap. In 1976, the concentration of lavender oil in soap (usual: 0.03%, max 0.3%), detergent (usual 0.003, max 0.03%), creams/lotions (usual 0.015%, max 0.1%) and perfume (usual 0.3%, 1-2%) was reported (Opdyke, 1976). [REDACTED]

- ***Menthol***

Menthol appears to have a moderate irritation potential under some conditions. In rabbit irritation studies, menthol isomers were tested at 100%, 50%, 25%, 5% and 1%. The undiluted isomers were irritating to the skin but the 1% dilution of isomers was not irritating (OECD, 2003). Menthols are considered moderately irritating to the skin (OECD, 2003).

Menthol is used in approximately 750 personal care products in the National Library of Medicine's Household Products Database and the EWG's Skin Deep Cosmetic Database including 110 body wash, face wash, and exfoliant products; 94 conditioners; 36 foundation, powder, beauty balm, and concealer; 39 moisturizer, cream, lotion, and body oil products; and 114 shampoos. However, the concentration in dermal cosmetic products was not reported (some oral hygiene products have reported menthol concentrations).

- ***Prunus Serotima (Wild Cherry) Fruit Extract***

There was no information available on the irritation potential of prunus serotina (wild cherry) fruit extract. Many other plant derived fatty acid oils have been determined to be safe in the present practices of use (Burnett and Fiume, 2011). Prunus Serotina (wild cherry) fruit extract was found in seven hair styling products, four shampoos, three conditioners, and one body wash, face wash, and exfoliant products in the National Library of Medicine's Household Products Database and the EWG's Skin Deep Cosmetic Database. However, the concentration in dermal cosmetic products was not reported.

- ***Punica Granatum (Pomegranate) Extract***

There was no information available on the irritation potential of punica granatum (pomegranate) extract. Pomegranate extract is used in approximately 800 personal care products in the National Library of Medicine's Household Products Database and the EWG's Skin Deep Cosmetic Database including approximately 202 lip products; 198 moisturizer, cream, lotion, and body oil products; 19 conditioners; 22 shampoos; 70 foundation, powder, beauty balm, and concealer products; and 65 body wash, face wash, and exfoliant products. However, the concentration in dermal cosmetic products was not reported.

### **Fragrance**

The fragrance within the Products is a mixture of 39 chemical constituents (Table 3). Two of the fragrance materials had been evaluated by the CIR. [REDACTED] CIR guidance indicates it is safe up to 1% and the maximum concentration in WEN is 0.01% (Table 3). The CIR guidance

[REDACTED]

for [REDACTED] indicates that the ingredient should not contain more than 15 ppm [REDACTED] and [REDACTED]. Eleven fragrance ingredients had recommended restrictions by IFRA in shampoos and conditioners (category 9). The maximum concentration in the Products was within this guidance for all eleven fragrance materials (Table 3).

Thirty-six fragrance constituents had RIFM raw materials monographs. Thirty-five fragrance constituents had animal or human irritation data reported by RIFM (Table 4). Generally, the ingredients ranged from not irritating to moderately irritating under the conditions of the study. In a study on p-tert-butylidihydrocin, rabbits exhibited slight to severe effects after a 24 hour occluded patch (Table 4). Due to the exaggerated nature of testing and the mild results, the ingredients all appear to have an acceptable irritation potential.

The maximum concentrations in the WEN Products were compared to historical maximum concentrations reported by the RIFM. The WEN Products are within these concentrations for all 36 fragrance constituents. Although the maximal historical concentrations are not necessarily considered safe concentrations, rather, they are a marker of what has been used in the past. Further, most of the fragrances ingredients have been used commercially for a long time which is antidotal evidence of safety (Table 4).

There were four chemicals without irritation data in the RIFM raw materials monographs: [REDACTED]

[REDACTED] The irritation potential and use of these chemicals is outlined below.

- [REDACTED]

We were unable to determine the irritation potential of this fragrance ingredient or its present use in cosmetics. [REDACTED]

[REDACTED] is an established skin sensitizer (Hagvall et al., 2013; Scheman et al., 2014). In fragrance testing, a 1% solution was applied in a 48 hour patch test. [REDACTED] was reported to produce an irritant reaction in 4 out of 1072 patients (0.37%). In a human study, 27 patients had 48 hour patch test with 2.5% to 25% [REDACTED]. The irritancy reactions were scored and the cumulative scores for [REDACTED] were low (Hagvall et al., 2013). In another study, 25 subjects were exposed to undiluted [REDACTED] for 4 hours and two subjects reacted (York et al., 1996). The authors compared the reaction with [REDACTED] to SDS and lactic acid and concluded that [REDACTED] should not be classified as a skin irritant (York et al., 1996). The skin deep database indicates that [REDACTED] is present in 1190 products including 91 conditioners and 86 shampoos (Skin Deep database). The irritant potential of [REDACTED] is low and it appears to have been used in many cosmetics. [REDACTED]

- [REDACTED]

[REDACTED]

During human sensitization studies, 20% [REDACTED] in petrolatum, 0.75% in ethanol, and 20% in ethanol exposed for 24 or 48 hours did not result in irritation reactions (Api et al., 2007). In a rabbit LD<sub>50</sub> study, undiluted material was occluded for 24 hours and slight to well-define erythema and edema were observed (Api et al., 2007). Further, the skin deep database indicates that this ingredient is present in 4 recent products including 1 conditioner and 1 shampoo (Skin Deep database). The irritation potential of this fragrance constituent appears low; however, it is not frequently reported in cosmetic products.

[REDACTED]

- [REDACTED]

We were unable to determine the irritation potential of this fragrance ingredient. The skin deep database indicates that this ingredient is present in 4 recent products including 1 conditioner and 1 shampoo (Skin Deep database).

[REDACTED]

#### 4. CONCLUSIONS

This report explores the irritation potential of the ingredients in the WEN Products. Similar to all cosmetic products, there are ingredients that, under exaggerated conditions, can be irritating to human skin. Indeed, even water is toxic at a certain level.

Thirty-one ingredients across the three best selling versions of the WEN Products were considered. Twenty-three ingredients had been evaluated by the CIR and have safety guidelines. The ingredient concentrations in the WEN Products were all within the CIR guidance. There are two ingredients where additional data is needed to determine if they are within the CIR guidance. Eight ingredients do not have guidance through the CIR. There is no indications that any of these eight ingredients have a significant irritation potential; however, there are data gaps. For ingredients with human studies, the results ranged from not irritating to moderately irritation. Overall, the irritation potentials were low. Further, most of the ingredients are used in other cosmetic products.

The fragrance ingredient in the WEN Products was further characterized as containing 39 chemical constituents. Twelve fragrance constituents had concentration guidelines by the CIR or IFRA which they met. Additional data were needed to determine if one the fragrance constituents met the guidelines. For thirty-five fragrance constituents the irritation potential was illustrated with studies in the RIFM raw material monographs and summarized in Table 4. Generally, the ingredients ranged from not irritating to moderately irritating under the conditions of the study.

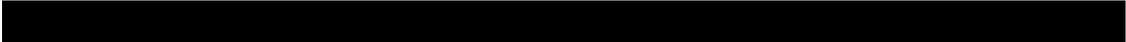
Based on this analysis, the risk of skin irritation after use of the WEN Products would be similar to other cosmetic products. Several data gaps were identified including a lack of irritation data on four ingredients and two fragrance constituents. Therefore, additional irritation testing of the WEN Products was commissioned. However, even with that gap, based on this analysis, overall, the irritation potential of the ingredients in the WEN Products appear to be low and similar to that of other on-market personal care and cosmetic products.

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