

# Scientific Literature Review

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## Hydrolyzed Source Proteins as Used in Cosmetics

**May 21, 2012**

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*All interested persons are provided 60 days from the above date to comment on this Scientific Literature Review and to identify additional published data that should be included or provide unpublished data which can be made public and included.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 All unpublished data submitted to CIR will be discussed in open meetings, will be available at the CIR office for review by any interested party and may be cited in a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. F. Alan Andersen.*

The 2012 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 F. Alan Andersen, Ph.D. This report was prepared by Christina Burnett, Scientific Analyst/Writer, and Bart Heldreth, Ph.D., Chemist CIR.

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## **INTRODUCTION**

This scientific literature review summarizes available data relevant to the safety of 55 hydrolyzed proteins and related salts from plant and animal sources as used in cosmetics. These ingredients function as skin and hair conditioning agents in personal care products. The list of ingredients in this report is found in Table 1.

Concurrent reviews of the safety of  $\alpha$ -amino acid ingredients and plant and animal derived amino acid ingredients as they are used in cosmetics are being performed by the Cosmetic Ingredient Review (CIR) Expert Panel. The Expert Panel previously has reviewed the safety of hydrolyzed collagen and hydrolyzed corn protein, and concluded that these ingredients are safe for use in cosmetic ingredients.<sup>1-3</sup>

## **CHEMISTRY**

The definitions of these ingredients are presented in Table 1.

The ingredients in this group are interrelated because they each are prepared from proteins by partial hydrolysis to yield cosmetically acceptable raw materials. The definitions exclude the complete hydrolysis products of proteins, the amino acids. These protein derivatives are prepared by subjecting animal or vegetable proteins to enzymatic (e.g., papain hydrolysis) or other chemical hydrolyses (e.g., acid or steam hydrolysis). The resulting polypeptide-, oligopeptide-, and peptide-containing products are used as conditioning agents in hair and skin products. Methods used to manufacture protein hydrolysates typically yield broad molecular weight distributions of peptides, 500-30,000 daltons (Da).<sup>4,5</sup> However, certain enzymes, such as papain, can routinely yield narrower distributions, 500-10,000 Da.<sup>4</sup> For example, if the average molecular weight of an amino acid is 135 Da, then, under the broader distribution figures, these ingredients are approximately 4 to 220 amino acids in length (and approximately 4 to 74 amino acids in length under the narrower distribution).<sup>6</sup> Molecular weights provided for some of the specific ingredients in this report are presented in Table 2, and histograms showing the approximate distribution of molecular weights for hydrolyzed hazelnut protein and hydrolyzed soy protein are shown in Figure 1.

### **Method of Manufacturing**

#### Hydrolyzed Amaranth Protein

A supplier has reported that hydrolyzed amaranth protein is produced by filtering a solution of finely ground amaranth powder in water and then reacting the resultant colloidal protein solution with acid for a prescribed period of time and temperature until the hydrolyzed protein solution is obtained.<sup>7</sup>

#### Hydrolyzed Collagen

As given in the CIR safety assessment and re-review of this ingredient, hydrolyzed collagen may be prepared by alkaline hydrolysis of bovine or fish collagen, followed by enzymatic hydrolysis to the desired molecular weight.<sup>2,3</sup>

#### Hydrolyzed Elastin

Hydrolyzed elastin has been reported to be prepared from the skin of codfish or from bovine neck tendons.<sup>8,9</sup> The fibrous tissue is washed and purified to remove soil and other residual materials and then dried. The dried elastin fibers are then hydrolyzed for several hours until the target molecular weight is reached. The final product is a solution, with the bovine source material being concentrated to a 30% active content.

#### Hydrolyzed Hazelnut Protein

A supplier has reported that hydrolyzed hazelnut protein is produced by enzymatic hydrolysis.<sup>10</sup>

#### Hydrolyzed Keratin

Hydrolyzed keratin may be prepared from sheep's wool.<sup>11</sup> The wool is first washed to remove soil and debris and then boiled to remove residual oils. Next, the wool is enzyme-hydrolyzed under mild conditions for 4-6 hours. When the target molecular weight is reached, the pH is adjusted to neutralize the enzyme. The resultant solution is a mixture for hydrolyzed keratin fractions with a molecular weight of ~ 1000 Da. The solution may be diluted to produce a 30% active material.

#### Hydrolyzed Milk Protein

A supplier has reported that hydrolyzed milk protein is produced from milk intended for human consumption.<sup>12</sup> The milk solids are separated and hydrolyzed with a protease for 2 hours. When the target

molecular weight is achieved, the enzyme is inactivated by heating the solution to 140°C for 30 minutes. The inactivation step is repeated if gelatin mixed with a sample loses viscosity, indicating the presence of active protease.

#### Hydrolyzed Corn and Hydrolyzed Soy Protein

The proteins of corn and soy may be combined and hydrolyzed with enzyme under mild conditions for several hours until the target molecular weight is achieved.<sup>13</sup> The resultant hydrolyzed proteins may then be concentrated.

#### Hydrolyzed Silk

Hydrolyzed silk has been reported to be prepared from the cocoon of the silkworm moth (*Bombyx mori*).<sup>14</sup> The silk thread is isolated from the cocoon and the fibers are cleaned and degummed. The individual silk fiber is then wound with other silk fibers to create one long thread. The threads are then combed to remove noils, which are short fibers considered to be by-products of the textile industry. The noils are used in the production of hydrolyzed silk proteins through carefully controlled hydrolysis. The resultant material is a 5% solution of a water soluble silk protein.

#### Hydrolyzed Serum Protein

Hydrolyzed serum protein can be derived from the enzymatic hydrolysis of defibrinated bovine blood plasma by food-grade microbial proteases and aided with heat denaturation.<sup>15</sup> The maximum degree of hydrolysis was 43% at an enzyme concentration of 110 LAPU/g protein after 15.5 h. The resultant substrate consists of small peptides (molecular masses were less than 6.5 kDa and most were less than 1.04 kDa at maximum hydrolysis) and free amino acids, which including lysine, leucine, arginine, serine, and phenylalanine.

#### Hydrolyzed Soy Protein

Soy hydrolysate may be dephosphorylated, deglycosylated and digested by a variety of endoproteases to generate oligopeptides.<sup>16</sup> A supplier has reported that hydrolyzed soy protein is produced from isolated soy proteins that are hydrolyzed with a protease enzyme for 2 hours.<sup>17</sup> The enzyme is inactivated by heat once the target molecular weight is achieved. The resultant solution may then be concentrated.

### **Impurities**

#### Hydrolyzed Hazelnut Protein

A supplier has reported that hydrolyzed hazelnut protein has less than 20 ppm heavy metals and less than 2 ppm arsenic.<sup>10</sup>

### **USE**

#### **Cosmetic**

The hydrolyzed plant and animal proteins and related salts discussed in this safety assessment function primarily as hair conditioning agents and skin conditioning agents (miscellaneous) in cosmetic formulations.<sup>18</sup> Additional functions may include nail conditioning agents (calcium hydrolyzed collagen and hydrolyzed keratin), light stabilizers (hydrolyzed lupine protein), and film formers (hydrolyzed gadidae protein and hydrolyzed wheat protein).

Table 3 presents the current product-formulation data for hydrolyzed proteins. According to information supplied to the Food and Drug Administration (FDA) by industry as part of the Voluntary Cosmetic Registration Program (VCRP), hydrolyzed wheat protein has the most reported uses in cosmetic and personal care products, with a total of 1055; approximately half of those uses are in non-coloring hair products.<sup>19</sup> Hydrolyzed soy protein has the second greatest number of overall uses reported, with a total of 681; again, approximately half of those uses are in non-coloring hair products. At this time, the Personal Care Products Council is performing a use concentration survey.

#### **Non-Cosmetic**

The FDA has determined the use of peptones as direct food substances are generally recognized as safe (GRAS). These GRAS peptones are defined as “the variable mixture of polypeptides, oligopeptides, and amino acids that are produced by partial hydrolysis of casein, animal tissue, soy protein isolate, gelatin, defatted fatty tissue, egg albumin, or lactalbumin (whey protein) (21 CFR §184.1553).

Conversely, the FDA has prohibited use of cattle spinal cord in human food (21 CFR §189.5).

The FDA has defined the term “protein” to mean any  $\alpha$ -amino acid polymer with a specific defined sequence that is greater than 40 amino acids in size.<sup>20</sup> The FDA considers a “peptide” to be any polymer composed of 40 or fewer amino acids.

### **TOXICOKINETICS**

Biologically active peptides were derived from the soy protein, including glycinin.<sup>16</sup> These biological activities included angiotensin converting enzyme (ACE) inhibitory, anti-thrombotic, surface tension, and antioxidant properties.

### **TOXICOLOGICAL STUDIES**

Most of the hydrolyzed proteins in this assessment are found in the foods we consume daily, and the daily exposure from food use would result in a much larger systemic dose than that resulting from use in cosmetic products. These ingredients would be safe if absorbed into the body. Consequently, single dose toxicity, repeated dose toxicity, or other systemic toxicity studies are not addressed in this report.

The safety focus of use of these hydrolyzed proteins as cosmetic ingredients is on the potential for irritation and sensitization.

### **IRRITATION AND SENSITIZATION**

#### **Irritation**

##### ***Ocular – Non-Human***

###### **Hydrolyzed Amaranth Protein**

The ocular irritation potential of hydrolyzed amaranth protein was determined with an EpiOcular MTT Viability assay.<sup>21</sup> MatTek EpiOcular™ tissue samples were treated with the test material, as 20% dilutions, for 16, 64, and 256 minutes. Additional samples were treated with the positive control, 0.3% Triton X-100, for 15 and 45 minutes and the negative control, tissue culture water, for 16 minutes. Post-treatment, the viability of the samples were assessed using MTT uptake and conversion, and the absorbance of each sample was measured at 540 nm with a reference wavelength of 690 nm. Viability was expressed as a percent of control values, and the mean percent viability for each time point was used to calculate an ET<sub>50</sub> (time at which the tissue viability was reduce to 50% compared to control tissue). The test material had an ET<sub>50</sub> greater than 256 while the positive control had an ET<sub>50</sub> of 21.7. The authors of this study concluded that hydrolyzed amaranth protein was non-irritating.

###### **Hydrolyzed Hazelnut Protein**

In an ocular irritation study that was performed under Organisation for Economic Co-operation and Development (OECD) Guideline 405, pure hydrolyzed hazelnut protein product was reported to be a non-irritant.<sup>10</sup> No further details were provided.

###### **Hydrolyzed Soy Protein**

Pure hydrolyzed soy protein was a very slight irritant in an ocular irritation study performed under OECD Guideline 405.<sup>10</sup> No further details were provided.

##### ***Dermal – Non-Human***

###### **Hydrolyzed Amaranth Protein**

The dermal irritation potential of hydrolyzed amaranth protein was determined with an EpiDerm MTT Viability assay.<sup>22</sup> MatTek EpiDerm™ tissue samples were treated with the test material for 1, 4, and 24 hours. Additional samples were treated with the positive control, 1.0% Triton X-100, for 4 and 24 hours, and the negative control, tissue culture water, for 4 hours. Post-treatment, the viability of the samples were assessed using MTT uptake and conversion, and the absorbance of each sample was measured at 540 nm with a reference wavelength of 690 nm. Viability was expressed as a percent of control values, and the mean percent viability for each time point was used to calculate an ET<sub>50</sub> (time at which the tissue viability was reduce to 50% compared to control tissue). The test material had an ET<sub>50</sub> greater than 24 while the positive control had ET<sub>50</sub>s of 5.3 and 6.2 (tested in duplicate). The authors of this dermal irritation study concluded that hydrolyzed amaranth protein was non-irritating.

###### **Hydrolyzed Hazelnut Protein**

In a dermal irritation study that was performed under OECD Guideline 404, pure hydrolyzed hazelnut protein product was a non-irritant.<sup>10</sup> No further details were provided.

### Hydrolyzed Soy Protein

Pure hydrolyzed soy protein was not an irritant in a dermal irritation study performed under OECD Guideline 404.<sup>10</sup> No further details were provided.

### **Sensitization**

#### ***Dermal – Non-Human***

##### Hydrolyzed Hazelnut Protein

In a guinea pig dermal sensitization study performed according to OECD guideline 406, pure hydrolyzed hazelnut protein was non-sensitizing. No further details were provided.<sup>10</sup>

In another irritation and sensitization study using the Marzulli-Maibach method, hydrolyzed hazelnut protein diluted to 5% was non-irritating and non-sensitizing. No further details were provided.<sup>10</sup>

#### ***Dermal – Human***

##### Hydrolyzed Amaranth Protein

The sensitization potential of hydrolyzed amaranth protein was investigated in a human repeat insult patch test of 108 subjects.<sup>23</sup> The test sites were semi-occlusive and the test material was applied at the concentration that was received by the laboratory. No irritation or sensitization was observed.

##### Multiple Hydrolyzed Proteins

A study of sensitization to protein hydrolysates in hair care products was performed in 3 groups of patients.<sup>24</sup> The first group of patients, which was comprised of 11 hairdressers with hand dermatitis, submitted to scratch and prick tests with 22 trademarked protein hydrolysates, including hydrolyzed collagen, hydrolyzed elastin, hydrolyzed keratin, hydrolyzed milk protein, hydrolyzed wheat protein, hydrolyzed sweet almond protein, as well as quaternized hydrolyzed proteins. The second test group was comprised of 2160 consecutive adults with suspected allergic respiratory disease: they were subjected to skin prick tests with 1 to 3 of the protein hydrolysates. The third group of patients was comprised of 28 adults with atopic dermatitis and was also tested with 1 to 3 protein hydrolysates via a skin prick test.

Positive reactions were seen in a total of 12 patients (all female with atopic dermatitis) from 3 of the 22 protein hydrolysates. All 12 had reactions to hydroxypropyl trimonium hydrolyzed collagen. One of the 12 also had a reaction to hydroxypropyl trimonium hydrolyzed milk protein while 3 others had a reaction to one trademarked version of hydrolyzed collagen. No adverse reactions to hydrolyzed elastin, hydrolyzed keratin, hydrolyzed milk protein, hydrolyzed wheat protein, or hydrolyzed sweet almond protein were observed.<sup>24</sup>

### **Phototoxicity**

##### Hydrolyzed Hazelnut Protein

A phototoxicity study that used the 3T3 NRU method found that hydrolyzed hazelnut protein, diluted to protocol, was not phototoxic.<sup>10</sup> No further details were provided.

### **CASE STUDIES**

#### Hydrolyzed Keratin

A 22-year-old woman was reported to have a severe allergic reaction that included marked periorbital edema and swollen, sore, and itchy eyes and hands following use of a hair conditioner.<sup>25</sup> Prick testing elicited a strong positive (10 mm) wheal-and-flare response to the hair conditioner, which contained steartrimonim hydrolyzed animal protein. Further prick testing showed further reactions to the quaternary hydrolyzed protein as well as to shampoos and conditioners that contained gelatin keratin amino acids, hydrolyzed keratin, and/or hydrolyzed collagen. Patch tests using the European standard series and a series of 15 common bases of medicines and cosmetics were negative.

#### Hydrolyzed Wheat Protein

Three cases of wheat-dependent exercise-induced anaphylaxis (WDEIA) were reported in Japan.<sup>26</sup> The 3 female patients had used the same brand of soap that contained hydrolyzed wheat protein. Skin prick tests reveal positive reactions to 0.1% of the soap solution in physiological saline solution and to 100 µg/mL hydrolyzed wheat protein in physiological saline solution. Western blotting of the patients' sera IgE found serum positive reaction to the hydrolyzed wheat protein. The researchers concluded that the WDEIA was caused by cross reaction to wheat protein.

In another case study, a 42-year-old woman reported an intense burning sensation over her face, neck, and scalp several hours after applying a moisturizing cream that contained hydrolyzed wheat protein.<sup>27</sup> Patch testing with the diluted ingredients from the moisturizing cream resulted in a positive reaction (D2+, D4+) to 50% aq. hydrolyzed wheat protein. No reactions were observed from skin prick testing to standardized wheat extract or contact urticaria testing with hydrolyzed wheat protein.

Contact urticaria was reported in a 46-year-old woman.<sup>28</sup> The patient developed the symptoms 3 months prior to consulting her physician after applying an eyelid cream and a body moisturizer that contained hydrolyzed wheat proteins. Strong positive reactions were observed from the preserved food, wheat gluten that was in the food, the cosmetic creams, and hydrolyzed wheat protein. Further investigation revealed that the hydrolyzed wheat proteins in the cosmetic creams were from the same manufacturer as the gluten in the preserved food.

A 27-year-old woman was reported to have a pruritic, erythematous, urticarial rash that became increasingly more intense after subsequent use of a moisturizing body cream that contained hydrolyzed wheat protein.<sup>29</sup> Skin prick tests with common inhalant allergens, natural rubber latex, and cereal grains including wheat were negative. Also negative were the results of prick tests to a series of 21 protein allergens from plant and animal sources that included hen's egg, cow's milk, milk casein, almond, silk protein, aloe gel, papaya fruit, and hydrolyzed collagen. Total serum immunoglobulin (Ig)E was slightly elevated. The individual components of the body cream tested negative in an open application test, but a skin prick test was positive (8 mm) to hydrolyzed wheat protein. Further IgE testing found that specific binding occurred to wheat hydrolysate.

In another case study, a 64-year-old woman was reported to have itchy, erythematous, edematous lesions on the eyelids, face, and neck following use of a moisturizing cosmetic cream.<sup>30</sup> The patient was patch tested with the (GEIDC) standard and cosmetics series, the cosmetic cream, and the cream's individual ingredients. Positive reactions (++) were observed to nickel sulfate, the cosmetic cream (tested neat), and to an ingredient of the cream, hydrolyzed wheat protein (10% aq.). Open testing with hydrolyzed wheat protein (10% aq.) was negative at 30 min.

The sensitization of 9 female patients to hydrolyzed wheat protein were studied with skin reactivity and IgE testing.<sup>31</sup> The patients all experienced contact urticaria after using cosmetic products containing hydrolyzed wheat protein. Six of the patients had also experienced generalized urticaria or anaphylaxis to food containing hydrolyzed wheat protein, but all of the patients could tolerate traditional wheat products, bread, pastries, etc. All of the patients had low to moderate levels of IgE specific to wheat flour or gluten. Skin tests (open or prick) confirmed the sensitivity to hydrolyzed wheat protein and tolerance to unmodified wheat proteins. Immunoblotting analyses found that all of the patients reacted with almost all of the hydrolyzed wheat protein preparations tested, with most reactions occurring with large random peptide aggregates. Unlike the skin tests, IgE reactions were observed in the immunoblotting analyses with unmodified wheat proteins. Reactions in the immunoblotting analyses were observed always with salt soluble proteins, but varied with gluten proteins and were not observed with gliadins in patients without associated immediate reactions to food containing hydrolyzed wheat protein. The researchers noted that IgE reacted mostly with large aggregates, which suggests that hydrolysis of the proteins did not destroy pre-existing epitopes and may have created multi-epitopic entities, some with charged groups, that allows for bridging of IgE on mastocytes and basophiles and increased solubility and transport.

### **SUMMARY**

Hydrolyzed proteins derived from plant and animal sources function primarily as skin and hair conditioning agents in personal care products. These protein derivatives are prepared by subjecting animal or vegetable proteins to enzymatic or other chemical, partial hydrolyses.

Hydrolyzed wheat protein has the most reported uses in cosmetic and personal care products, with a total of 1055; approximately half of those uses are in non-coloring hair products. Hydrolyzed soy protein has the second greatest number of overall uses reported, with a total of 681; again, approximately half of those uses are in non-coloring hair products. At this time, the Personal Care Products Council is performing a use concentration survey.

The FDA has determined the use of peptones as direct food substances are GRAS, but has prohibited use of cattle spinal cord from use in human food.

Biologically active peptides may be derived from hydrolysis of soy protein.

Ocular irritation studies of hydrolyzed amaranth protein and hydrolyzed hazelnut protein found these ingredients to be non-irritating. Hydrolyzed soy protein was a very slight ocular irritant.

In dermal irritation studies, hydrolyzed amaranth protein, hydrolyzed hazelnut protein, and hydrolyzed soy protein were not irritants.

Hydrolyzed hazelnut protein was non-sensitizing in guinea pig dermal sensitization studies.

A HRIPT study of hydrolyzed amaranth protein observed no irritation or sensitization in any of the subjects. A study of sensitization in almost 2200 patients to protein hydrolysates in hair care products resulted in no

adverse reactions to hydrolyzed elastin, hydrolyzed keratin, hydrolyzed milk protein, hydrolyzed wheat protein, or hydrolyzed sweet almond protein.

Hydrolyzed hazelnut protein was not phototoxic in a study that used the 3T3 NRU method.

Several cases of allergic reactions were reported in women who had used personal care products that contained hydrolyzed wheat protein. One case study reported a positive reaction a hair conditioner that contained hydrolyzed keratin in a prick test.

#### **DATA NEEDS**

Data will be obtained from an industry survey of current uses and use concentrations as a function of cosmetic product type. Any available impurities data and safety test data specific to dermal exposures would be useful.



## TABLES AND FIGURES

**Table 1.** Definitions and functions of the ingredients in this safety assessment.<sup>18</sup>  
(The italicized text below represents additions made by CIR staff.)

Ingredient CAS No.	Definition	Function
Ammonium Hydrolyzed Collagen 68951-88-2	Ammonium Hydrolyzed Collagen is the ammonium salt of Hydrolyzed Collagen. <i>Wherein Hydrolyzed Collagen is defined as the hydrolysate of animal or fish collagen derived by acid, enzyme or other method of hydrolysis. Hydrolyzed Collagen is characterized by a significant level of hydroxyproline residues.</i>	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Calcium Hydrolyzed Collagen	Calcium Hydrolyzed Collagen is the calcium salt of Hydrolyzed Collagen. <i>Wherein Hydrolyzed Collagen is the partial hydrolysate of animal or fish collagen derived by acid, enzyme or other method of hydrolysis. Hydrolyzed Collagen is characterized by a significant level of hydroxyproline residues.</i>	Nail Conditioning Agent; Skin-Conditioning Agent - Misc
Hydrolyzed Actin 73049-73-7	Hydrolyzed Actin is the <i>partial</i> hydrolysate of actin derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Albumen 73049-73-7	Hydrolyzed Albumen is the <i>partial</i> hydrolysate of Albumen derived by acid, enzyme or other method of hydrolysis. <i>Wherein Albumen is defined as the dried whites of chicken eggs.</i>	Skin-Conditioning Agent - Misc.
Hydrolyzed Amaranth Protein	Hydrolyzed Amaranth Protein is the <i>partial</i> hydrolysate of amaranth protein derived by acid, enzyme or other method of hydrolysis.	Skin-Conditioning Agent - Misc.
Hydrolyzed Avocado Protein	Hydrolyzed Avocado Protein is the <i>partial</i> hydrolysate of avocado protein derived by acid, enzyme or other method of hydrolysis.	Skin-Conditioning Agent - Misc.
Hydrolyzed Barley Protein	Hydrolyzed Barley Protein is the <i>partial</i> hydrolysate of barley protein derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Brazil Nut Protein	Hydrolyzed Brazil Nut Protein is the <i>partial</i> hydrolysate of brazil nut protein derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Casein 65072-00-6 73049-73-7 [generic to peptides obtained by the hydrolysis of animal tissue proteins]	Hydrolyzed Casein is the <i>partial</i> hydrolysate of Casein derived by acid, enzyme or other method of hydrolysis. <i>Wherein, Casein is a mixture of phosphoproteins obtained from cow's milk.</i>	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Conalbumin	Hydrolyzed Conalbumin is the <i>partial</i> hydrolysate of conalbumin derived by acid, enzyme or other method of hydrolysis. <i>Wherein, conalbumin is an avian egg protein, also known as ovotransferrin.</i>	Skin-Conditioning Agent - Misc.
Hydrolyzed Conchiolin Protein 73049-73-7	Hydrolyzed Conchiolin Protein is the <i>partial</i> hydrolysate of conchiolin, a peptide covering the inorganic portion of the pearl shell, derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Cottonseed Protein	Hydrolyzed Cottonseed Protein is the <i>partial</i> hydrolysate of cottonseed protein derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Egg Protein 73049-73-7	Hydrolyzed Egg Protein is the <i>partial</i> hydrolysate of egg protein derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Elastin 73049-73-7 91080-18-1 100085-10-7	Hydrolyzed Elastin is the <i>partial</i> hydrolysate of elastin derived by acid, enzyme or other method of hydrolysis. <i>Wherein, Elastin is a fibrous protein found in the connective tissue of animals.</i>	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Extensin 73049-73-7	Hydrolyzed Extensin is the <i>partial</i> hydrolysate of extensin protein derived by acid, enzyme or other method of hydrolysis. <i>Wherein, extensins are defined as wall-located, basic, hydroxyproline rich structural glycoproteins with alternating hydrophilic and hydrophobic motifs.</i> <sup>32</sup>	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Fibroin	Hydrolyzed Fibroin is the <i>partial</i> hydrolysate of Fibroin derived by acid, enzyme or other method of hydrolysis. <i>Wherein, Fibroin is a protein filament produced by the silkworm, Bombyx mori which together with Sericin composes Silk.</i>	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Fibronectin 73049-73-7 100085-35-6	Hydrolyzed Fibronectin is the <i>partial</i> hydrolysate of Fibronectin derived by acid, enzyme or other method of hydrolysis. <i>Wherein, Fibronectin is a glycoprotein found in connective tissues, basement membranes, in plasma and other body fluids.</i>	Hair conditioning Agent; Skin-Conditioning Agent - Misc.

**Table 1.** Definitions and functions of the ingredients in this safety assessment.<sup>18</sup>  
(The italicized text below represents additions made by CIR staff.)

<b>Ingredient CAS No.</b>	<b>Definition</b>	<b>Function</b>
Hydrolyzed Gadidae Protein 73049-73-7	Hydrolyzed Gadidae Protein is the <i>partial</i> hydrolysate of the skin and flesh of the fish of the family, Gadidae, derived by acid, enzyme or other method of hydrolysis. <i>Wherein, the family Gadidae is a family of fish in the order Gadiformes, including cod, haddock, pollock, and hake.</i>	Film formers; Skin-Conditioning Agent - Emollient; Skin-Conditioning Agent - Misc.
Hydrolyzed Gelatin [68410-45-7]	Hydrolyzed Gelatin is the <i>partial</i> hydrolysate of Gelatin derived by acid, enzyme or other method of hydrolysis.	Skin-Conditioning Agent - Misc.
Hydrolyzed Hair Keratin 65997-21-9 73049-73-7	Hydrolyzed Hair Keratin is the <i>partial</i> hydrolysate of human hair keratin derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Hazelnut Protein	Hydrolyzed Hazelnut Protein is the <i>partial</i> hydrolysate of hazelnut protein derived by acid, enzyme, or other method of hydrolysis.	Skin-Conditioning Agent - Misc.
Hydrolyzed Hemoglobin 73049-73-7	Hydrolyzed Hemoglobin is the <i>partial</i> hydrolysate of hemoglobin obtained by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Hemp Seed Protein	Hydrolyzed Hemp Seed Protein is the <i>partial</i> hydrolysate of hemp seed protein derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Honey Protein	Hydrolyzed Honey Protein is the <i>partial</i> hydrolysate of honey protein derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Jojoba Protein 100684-35-3	Hydrolyzed Jojoba Protein is the <i>partial</i> hydrolysate of jojoba seed protein derived by acid, enzyme or other method of hydrolysis.	Hair conditioning Agent; Skin-Conditioning Agent - Emollient
Hydrolyzed Keratin 69430-36-0 73049-73-7	Hydrolyzed Keratin is the <i>partial</i> hydrolysate of keratin derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Nail Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Lactalbumin 68458-87-7 73049-73-7	Hydrolyzed Lactalbumin is the <i>partial</i> hydrolysate of milk albumins derived by acid, enzyme, or other method of hydrolysis.	Skin-Conditioning Agent - Misc.
Hydrolyzed Lupine Protein 73049-73-7	Hydrolyzed Lupine Protein is the <i>partial</i> hydrolysate of lupine protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Light Stabilizer; Skin-Conditioning Agent - Misc.
Hydrolyzed Maple Sycamore Protein 73049-73-7	Hydrolyzed Maple Sycamore Protein is the <i>partial</i> hydrolysate of the protein derived from the maple sycamore tree, <i>Acer pseudoplatanus</i> , obtained by acid, enzyme, or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Humectant; Skin-Conditioning Agent-Misc.
Hydrolyzed Milk Protein 92797-39-2	Hydrolyzed Milk Protein is the <i>partial</i> hydrolysate of milk protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Oat Protein 151661-87-9	Hydrolyzed Oat Protein is the <i>partial</i> hydrolysate of oat protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Pea Protein 222400-29-5 227024-36-4	Hydrolyzed Pea Protein is the <i>partial</i> hydrolysate of pea protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Emollient; Skin-Conditioning Agent-Misc.
Hydrolyzed Potato Protein 169590-59-4	Hydrolyzed Potato Protein is the <i>partial</i> hydrolysate of potato protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Reticulin 73049-73-7 99924-37-5	Hydrolyzed Reticulin is the <i>partial</i> hydrolysate of the reticulin portion of animal connective tissue derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Royal Jelly Protein	Hydrolyzed Royal Jelly Protein is the <i>partial</i> hydrolysate of the proteins obtained from Royal Jelly derived by acid, enzyme or other method of hydrolysis. <i>Wherein, Royal Jelly is the pharyngeal secretion of worker bees.</i>	Skin-Conditioning Agent - Misc.
Hydrolyzed Sericin 73049-73-7	Hydrolyzed Sericin is the <i>partial</i> hydrolysate of Sericin derived by acid, enzyme or other method of hydrolysis. <i>Wherein, Sericin is a protein isolated from the silk produced by the silk worm, <i>Bombyx mori</i>.</i>	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Serum Protein 73049-73-7	Hydrolyzed Serum Protein is the <i>partial</i> hydrolysate of Serum Protein derived by acid, enzyme or other method of hydrolysis. <i>Wherein, Serum Protein is the protein or protein fraction obtained from blood plasma.</i>	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Sesame Protein	Hydrolyzed Sesame Protein is the <i>partial</i> hydrolysate of sesame protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.

**Table 1.** Definitions and functions of the ingredients in this safety assessment.<sup>18</sup>

(The italicized text below represents additions made by CIR staff.)

<b>Ingredient CAS No.</b>	<b>Definition</b>	<b>Function</b>
Hydrolyzed Silk 73049-73-7 96690-41-4	Hydrolyzed Silk is the <i>partial</i> hydrolysate of silk protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Soy Protein 68607-88-5	Hydrolyzed Soy Protein is the <i>partial</i> hydrolysate of soy protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Soymilk Protein	Hydrolyzed Soymilk Protein is the <i>partial</i> hydrolysate of the proteins obtained from Soymilk derived by acid, enzyme or other method of hydrolysis.	Skin-Conditioning Agent - Misc.
Hydrolyzed Spinal Protein 73049-73-7	Hydrolyzed Spinal Protein is the <i>partial</i> hydrolysate of animal spinal cord protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Spongin	Hydrolyzed Spongin is the <i>partial</i> hydrolysate of spongin derived by acid, enzyme or other method of hydrolysis. <i>Wherein, spongin is a protein related to keratin that forms the skeletal structure of certain sponges.</i>	Skin-Conditioning Agent - Misc.
Hydrolyzed Sweet Almond Protein 100209-19-6	Hydrolyzed Sweet Almond Protein is the <i>partial</i> hydrolysate of sweet almond protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Vegetable Protein 73049-73-7 100209-45-8	Hydrolyzed Vegetable Protein is the <i>partial</i> hydrolysate of vegetable protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Wheat Gluten 100684-25-1	Hydrolyzed Wheat Gluten is the <i>partial</i> hydrolysate of Triticum Vulgare (Wheat) Gluten derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Wheat Protein 70084-87-6 100209-50-5 222400-28-4	Hydrolyzed Wheat Protein is the <i>partial</i> hydrolysate of wheat protein derived by acid, enzyme or other method of hydrolysis.	Film formers; Hair Conditioning Agent; Skin-Conditioning Agent - Misc.
Hydrolyzed Whey Protein	Hydrolyzed Whey Protein is the <i>partial</i> hydrolysate of Whey Protein derived by acid, enzyme or other method of hydrolysis.	Skin-Conditioning Agent - Misc.
Hydrolyzed Yeast Protein 100684-36-4 227025-31-2	Hydrolyzed Yeast Protein is the <i>partial</i> hydrolysate of yeast protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Yogurt Protein	Hydrolyzed Yogurt Protein is the <i>partial</i> hydrolysate of yogurt protein derived by acid, enzyme or other method of hydrolysis.	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Hydrolyzed Zein	Hydrolyzed Zein is the <i>partial</i> hydrolysate of Zein derived by acid, enzyme or other method of hydrolysis. <i>Wherein, Zein is an alcohol-soluble protein obtained from corn, Zea mays.</i>	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
MEA-Hydrolyzed Collagen	MEA-Hydrolyzed Collagen is the monoethanolamine salt of Hydrolyzed Collagen. <i>Wherein Hydrolyzed Collagen is defined as the partial hydrolysate of animal or fish collagen derived by acid, enzyme or other method of hydrolysis. Hydrolyzed Collagen is characterized by a significant level of hydroxyproline residues.</i>	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
MEA-Hydrolyzed Silk	MEA-Hydrolyzed Silk is the monoethanolamine salt of Hydrolyzed Silk. <i>Wherein Hydrolyzed Silk is defined as the partial hydrolysate of silk protein derived by acid, enzyme or other method of hydrolysis.</i>	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Sodium Hydrolyzed Casein	Sodium Hydrolyzed Casein is the sodium salt of Hydrolyzed Casein. <i>Wherein Hydrolyzed Collagen is defined as the partial hydrolysate of animal or fish collagen derived by acid, enzyme or other method of hydrolysis. Hydrolyzed Collagen is characterized by a significant level of hydroxyproline residues.</i>	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.
Zinc Hydrolyzed Collagen	Zinc Hydrolyzed Collagen is the zinc salt of Hydrolyzed Collagen. <i>Wherein Hydrolyzed Collagen is defined as the partial hydrolysate of animal or fish collagen derived by acid, enzyme or other method of hydrolysis. Hydrolyzed Collagen is characterized by a significant level of hydroxyproline residues.</i>	Hair Conditioning Agent; Skin-Conditioning Agent-Misc.

**Table 2.** Physical and chemical properties.

<b>Property</b>	<b>Value</b>	<b>Reference</b>
<b><i>Hydrolyzed Amaranth Protein</i></b>		
Molecular Weight daltons	~1500	7
<b><i>Hydrolyzed Elastin</i></b>		
Molecular Weight daltons	~1000-4000	33
<b><i>Hydrolyzed Hazelnut Protein</i></b>		
Molecular Weight daltons	510-1000 (mode value)	10
<b><i>Hydrolyzed Keratin</i></b>		
Molecular Weight daltons	~1000	33
<b><i>Hydrolyzed Milk Protein</i></b>		
Molecular Weight daltons	~1000	33
<b><i>Hydrolyzed Soy Protein</i></b>		
Molecular Weight daltons	~1000; 490-1030 (mode value)	10,33
<b><i>Hydrolyzed Corn and Soy Protein</i></b>		
Molecular Weight daltons	~1000	33
<b><i>Hydrolyzed Silk</i></b>		
Molecular Weight daltons	~1000	33

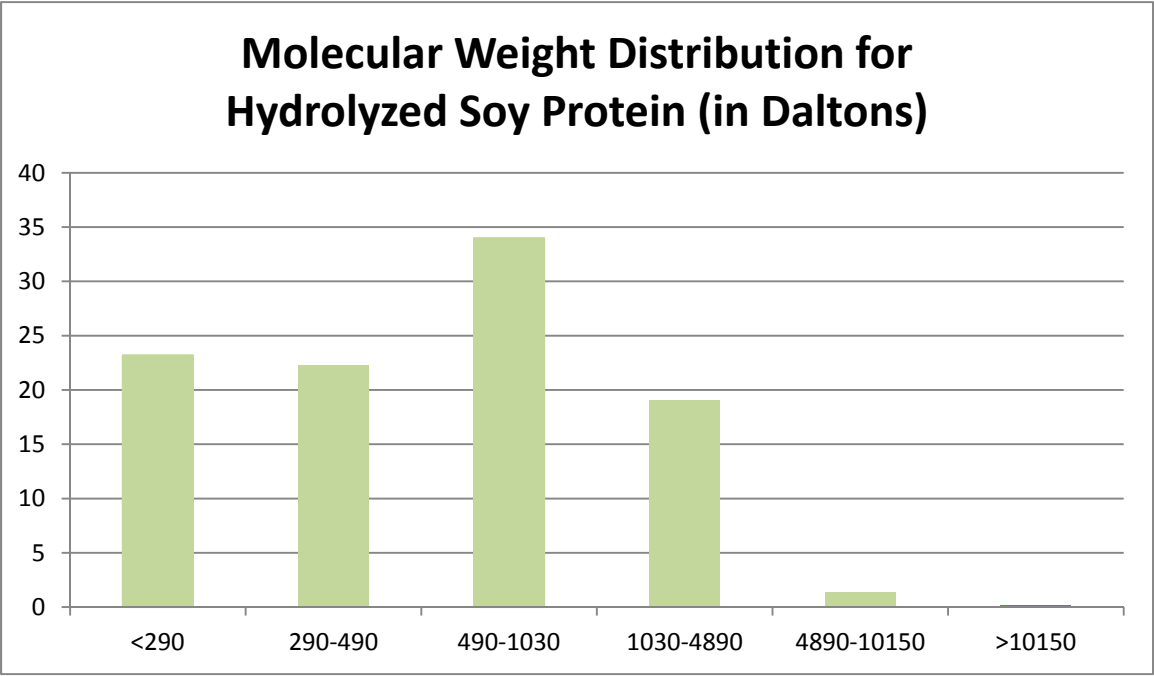
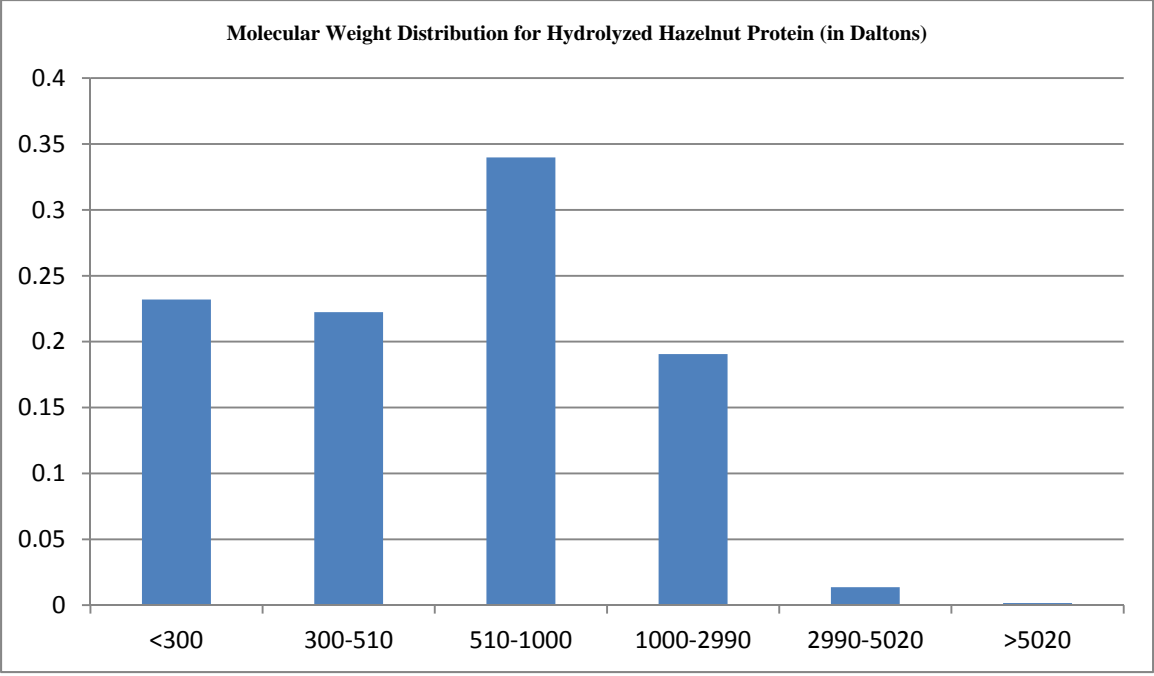


Figure 1. Molecular weight distribution of hydrolyzed proteins.<sup>10</sup>

**Table 3a.** Frequency and concentration of use according to duration and type of exposure.<sup>19</sup>

	<b>Hydrolyzed Actin</b>		<b>Hydrolyzed Amaranth Protein</b>		<b>Hydrolyzed Barley Protein</b>	
	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>
<b>Totals*</b>	<b>9</b>	NR	<b>1</b>	NR	<b>17</b>	NR
<i>Leave-On</i>	9	NR	NR	NR	7	NR
<i>Rinse Off</i>	NR	NR	1	NR	10	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Eye Area	4	NR	NR	NR	NR	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Sprays	NR	NR	NR	NR	1	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	5	NR	NR	NR	NR	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	2	NR	1	NR	17	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

	<b>Hydrolyzed Brazil Nut Protein</b>		<b>Hydrolyzed Conchiolin Protein</b>		<b>Hydrolyzed Cottonseed Protein</b>	
	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>
<b>Totals*</b>	<b>10</b>	NR	<b>73</b>	NR	<b>32</b>	NR
<i>Leave-On</i>	5	NR	64	NR	27	NR
<i>Rinse Off</i>	5	NR	9	NR	5	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Eye Area	NR	NR	8	NR	NR	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	NR	NR	11	NR
Incidental Inhalation-Powder	NR	NR	3	NR	NR	NR
Dermal Contact	NR	NR	59	NR	32	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	10	NR	10	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	4	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	3	NR
Baby Products	NR	NR	NR	NR	NR	NR

	<b>Hydrolyzed Elastin</b>		<b>Hydrolyzed Extensin</b>		<b>Hydrolyzed Fibroin</b>	
	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>
<b>Totals*</b>	<b>176</b>	NR	<b>30</b>	NR	<b>1</b>	NR
<i>Leave-On</i>	143	NR	25	NR	1	NR
<i>Rinse Off</i>	33	NR	5	NR	NR	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Eye Area	7	NR	2	NR	NR	NR
Incidental Ingestion	1	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	4	NR	NR	NR	NR	NR
Incidental Inhalation-Powder	2	NR	NR	NR	NR	NR
Dermal Contact	154	NR	27	NR	1	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	21	NR	3	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	6	NR	NR	NR	NR	NR
Baby Products	4	NR	NR	NR	NR	NR

\* Because each ingredient may be used in cosmetics with multiple exposure types, the sum of all exposure types may not equal the sum of total uses.

NR = none reported

**Table 3a.** Frequency and concentration of use according to duration and type of exposure.<sup>19</sup>

	<b>Hydrolyzed Fibronectin</b>		<b>Hydrolyzed Gadidae Protein</b>		<b>Hydrolyzed Hair Keratin</b>	
	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>
<b>Totals*</b>	<b>10</b>	NR	<b>4</b>	NR	<b>32</b>	NR
<i>Leave-On</i>	9	NR	3	NR	3	NR
<i>Rinse Off</i>	1	NR	1	NR	29	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Eye Area	1	NR	1	NR	NR	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Sprays	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	10	NR	4	NR	NR	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	32	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

	<b>Hydrolyzed Hazelnut Protein</b>		<b>Hydrolyzed Jojoba Protein</b>		<b>Hydrolyzed Keratin</b>	
	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>
<b>Totals*</b>	<b>24</b>	NR	<b>35</b>	NR	<b>399</b>	NR
<i>Leave-On</i>	23	NR	15	NR	181	NR
<i>Rinse Off</i>	1	NR	20	NR	217	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	1	NR
Eye Area	4	NR	1	NR	27	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	NR	NR	17	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	24	NR	9	NR	56	NR
Deodorant (underarm)	NR	NR	NR	NR	1	NR
Hair - Non-Coloring	NR	NR	25	NR	281	NR
Hair-Coloring	NR	NR	NR	NR	33	NR
Nail	NR	NR	NR	NR	6	NR
Mucous Membrane	NR	NR	1	NR	20	NR
Baby Products	NR	NR	NR	NR	NR	NR

	<b>Hydrolyzed Lupine Protein</b>		<b>Hydrolyzed Milk Protein</b>		<b>Hydrolyzed Oat Protein</b>	
	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>
<b>Totals*</b>	<b>79</b>	NR	<b>123</b>	NR	<b>78</b>	NR
<i>Leave-On</i>	73	NR	71	NR	31	NR
<i>Rinse Off</i>	6	NR	45	NR	47	NR
<i>Diluted for (Bath) Use</i>	NR	NR	7	NR	NR	NR
Eye Area	11	NR	2	NR	1	NR
Incidental Ingestion	NR	NR	3	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	5	NR	2	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	72	NR	96	NR	32	NR
Deodorant (underarm)	NR	NR	2	NR	NR	NR
Hair - Non-Coloring	5	NR	24	NR	42	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	4	NR
Mucous Membrane	NR	NR	30	NR	20	NR
Baby Products	NR	NR	NR	NR	NR	NR

**Table 3a.** Frequency and concentration of use according to duration and type of exposure.<sup>19</sup>

	Hydrolyzed Pea Protein		Hydrolyzed Potato Protein		Hydrolyzed Sericin	
	# of Uses	Conc. of Use	# of Uses	Conc. of Use	# of Uses	Conc. of Use
<b>Totals*</b>	<b>2</b>	NR	<b>15</b>	NR	<b>2</b>	NR
<i>Leave-On</i>	2	NR	15	NR	2	NR
<i>Rinse Off</i>	NR	NR	NR	NR	NR	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Eye Area	NR	NR	NR	NR	1	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Sprays	NR	NR	2	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	2	NR	15	NR	1	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	1	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

	Hydrolyzed Silk		Hydrolyzed Soy Protein		Hydrolyzed Soymilk Protein	
	# of Uses	Conc. of Use	# of Uses	Conc. of Use	# of Uses	Conc. of Use
<b>Totals*</b>	<b>577</b>	NR	<b>681</b>	NR	<b>7</b>	NR
<i>Leave-On</i>	283	NR	419	NR	3	NR
<i>Rinse Off</i>	289	NR	262	NR	4	NR
<i>Diluted for (Bath) Use</i>	5	NR	NR	NR	NR	NR
Eye Area	33	NR	46	NR	NR	NR
Incidental Ingestion	6	NR	1	NR	NR	NR
Incidental Inhalation-Spray	33	NR	13	NR	NR	NR
Incidental Inhalation-Powder	8	NR	2	NR	NR	NR
Dermal Contact	291	NR	283	NR	2	NR
Deodorant (underarm)	1	NR	1	NR	NR	NR
Hair - Non-Coloring	251	NR	314	NR	5	NR
Hair-Coloring	14	NR	32	NR	NR	NR
Nail	1	NR	32	NR	NR	NR
Mucous Membrane	82	NR	9	NR	NR	NR
Baby Products	6	NR	NR	NR	NR	NR

	Hydrolyzed Sweet Almond Protein		Hydrolyzed Vegetable Protein		Hydrolyzed Wheat Gluten	
	# of Uses	Conc. of Use	# of Uses	Conc. of Use	# of Uses	Conc. of Use
<b>Totals*</b>	<b>77</b>	NR	<b>153</b>	NR	<b>49</b>	NR
<i>Leave-On</i>	42	NR	55	NR	12	NR
<i>Rinse Off</i>	35	NR	98	NR	34	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	3	NR
Eye Area	6	NR	4	NR	1	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	1	NR	5	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	2	NR	1	NR
Dermal Contact	38	NR	50	NR	29	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	35	NR	49	NR	19	NR
Hair-Coloring	1	NR	54	NR	1	NR
Nail	NR	NR	NR	NR	NR	NR
Mucous Membrane	2	NR	2	NR	18	NR
Baby Products	NR	NR	NR	NR	3	NR

\* Because each ingredient may be used in cosmetics with multiple exposure types, the sum of all exposure types may not equal the sum of total uses.

NR = none reported



**Table 3a.** Frequency and concentration of use according to duration and type of exposure.<sup>19</sup>

	<b>Hydrolyzed Wheat Protein</b>		<b>Hydrolyzed Yeast Protein</b>		<b>Hydrolyzed Yogurt Protein</b>	
	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>
<b>Totals*</b>	<b>1055</b>	NR	<b>57</b>	NR	<b>8</b>	NR
<i>Leave-On</i>	524	NR	39	NR	NR	NR
<i>Rinse Off</i>	524	NR	18	NR	8	NR
<i>Diluted for (Bath) Use</i>	7	NR	NR	NR	NR	NR
Eye Area	66	NR	5	NR	NR	NR
Incidental Ingestion	12	NR	NR	NR	NR	NR
Incidental Inhalation-Sprays	19	NR	1	NR	NR	NR
Incidental Inhalation-Powder	6	NR	NR	NR	NR	NR
Dermal Contact	377	NR	40	NR	8	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	533	NR	17	NR	NR	NR
Hair-Coloring	80	NR	NR	NR	NR	NR
Nail	28	NR	NR	NR	NR	NR
Mucous Membrane	96	NR	NR	NR	8	NR
Baby Products	2	NR	NR	NR	NR	NR

	<b>Ammonium Hydrolyzed Animal Protein<sup>a</sup></b>		<b>Hydrolyzed Animal Protein<sup>a</sup></b>		<b>Hydrolyzed Fish Protein<sup>a</sup></b>	
	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>	<i># of Uses</i>	<i>Conc. of Use</i>
<b>Totals*</b>	<b>1</b>	NR	<b>143</b>	NR	<b>1</b>	NR
<i>Leave-On</i>	1	NR	72	NR	1	NR
<i>Rinse Off</i>	NR	NR	71	NR	NR	NR
<i>Diluted for (Bath) Use</i>	NR	NR	NR	NR	NR	NR
Eye Area	NR	NR	4	NR	1	NR
Incidental Ingestion	NR	NR	NR	NR	NR	NR
Incidental Inhalation-Spray	NR	NR	1	NR	NR	NR
Incidental Inhalation-Powder	NR	NR	NR	NR	NR	NR
Dermal Contact	NR	NR	57	NR	1	NR
Deodorant (underarm)	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	1	NR	85	NR	NR	NR
Hair-Coloring	NR	NR	NR	NR	NR	NR
Nail	NR	NR	1	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR

\* Because each ingredient may be used in cosmetics with multiple exposure types, the sum of all exposure types may not equal the sum of total uses.

NR = none reported

<sup>a</sup> Not an INCI ingredient. Listed in the FDA VCRP.

**Table 3b.** Ingredients not reported to be in use.

Ammonium Hydrolyzed Collagen  
Calcium Hydrolyzed Collagen  
Hydrolyzed Albumen  
Hydrolyzed Avocado Protein  
Hydrolyzed Casein  
Hydrolyzed Conalbumin  
Hydrolyzed Egg Protein  
Hydrolyzed Gelatin  
Hydrolyzed Hemoglobin  
Hydrolyzed Hemp Seed Protein  
Hydrolyzed Honey Protein  
Hydrolyzed Lactalbumin  
Hydrolyzed Maple Sycamore Protein

Hydrolyzed Reticulin  
Hydrolyzed Royal Jelly Protein  
Hydrolyzed Serum Protein  
Hydrolyzed Sesame Protein  
Hydrolyzed Spinal Protein  
Hydrolyzed Spongins  
Hydrolyzed Whey Protein  
Hydrolyzed Zein  
MEA-Hydrolyzed Collagen  
MEA-Hydrolyzed Silk  
Sodium Hydrolyzed Casein  
Zinc Hydrolyzed Collagen

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