More Than Just A Label: Shampoo & Its Adverse Effects: A Systematic Review

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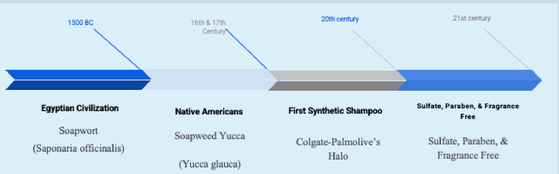
ABSTRACT

Do you read your shampoo label? Within recent years, consumers have raised a concern towards environmental health and awareness in regards to what they are using. However, not many people understand what each ingredient means or does. The current research's aim is to review, break down, and explain the frequent ingredients found in shampoo and their adverse effects. In order to do this, the data being collected is found by using the systematic review method in which articles were collected via databases that collect various chemical articles. The data available ranges from 1997 to 2020. From the available data, the results yield that consumers should be aware of and research what ingredients are being used on their hair and scalp.

Keywords: Shampoo, hair, scalp, cosmetics, fragrance, sulfates, parabens, hair loss, pH, allergies

INTRODUCTION

- Cosmetics, the industry of beautification: Tracing back more than 100,000 years, cosmetics have been used to treat the mind, body, and soul (Draelos, 2015).
- U.S. Food and Drug Administration (FDA): ensure the safety, efficacy, and security of products for human use.
- Federal Food, Drug, and Cosmetic Act (FD&C Act): federal law enacted by Congress.
    - Sec. 201(i): Cosmetics
    - Sec. 201 (g)(1): Drug
- Cosmetic Timeline: Soap/Shampoo



PURPOSE OF THE STUDY

The current research's aim is to review, break down, and explain the frequent ingredients found in shampoo and its adverse effects.

RESEARCH QUESTIONS

- What are the ingredients in shampoo, such as sulfates, parabens, and fragrance?
- Why are they important?

METHODS

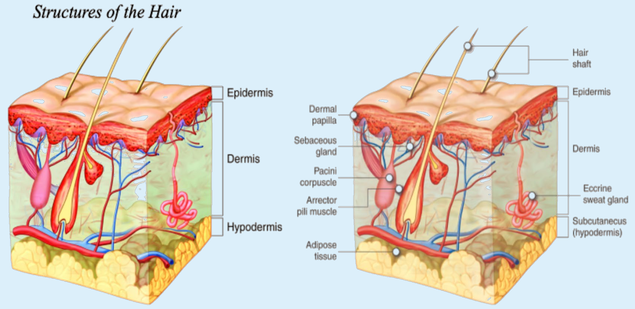
The data is collected by using the systematic review method in which articles were collected via databases that collect various chemical articles.

RESULTS & DISCUSSION

- Adverse Effects and Allergic Reactions
    - Dandruff
    - Contact Dermatitis
    - Hair Loss
        - Depression
- Sulfate, Paraben, and Fragrance-Free (Cline et al., 2018; Dias, 2015).
- DMDM hydantoin
- Emily Castillo v. Unilever United States, INC. 2020
- FDA regulations

Figure 1

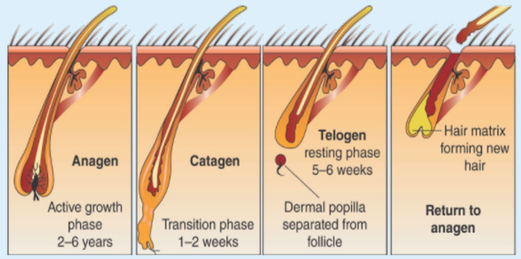
Structures of the Hair



Note. Adapted from Anatomy and Physiology I, Integumentary Levels of Organization. Authored by: Open Learning Initiative. Provided by: Carnegie Mellon University. Located at: https://oli.cmu.edu/jcourse/webui/syllabus/module.do?context=4348901580020ca6010f804da8b af7ba. Project: Anatomy & Physiology.

Figure 2

Hair Follicle Growth Cycle



Note. Adapted from Anatomy and Physiology I, Integumentary Levels of Organization. Authored by: Open Learning Initiative. Provided by: Carnegie Mellon University. Located at: https://oli.cmu.edu/jcourse/webui/syllabus/module.do?context=4348901580020ca6010f804da8b af7ba. Project: Anatomy & Physiology.

Table 1

Shampoo detergent characteristics

Surfactant Type	Chemical Class	Characteristics
Anionics	Lauryl sulfates, laureth sulfates, sarcosines, sulfosuccinates	Deep cleansing, may leave hair harsh
Cationics	Long-chain amino esters, ammonioesters	Poor cleansing, poor lather, impart softness and manageability
Nonionics	Polyoxyethylene fatty alcohols, polyoxyethylene sorbitol esters, alkanolamides	Mildest cleansing, impart manageability
Amphoterics	Betaines, sultaines, imidazolinium derivatives	Nonirritating to eyes, mild cleansing, impart manageability
Natural surfactants	Sarsaparilla, soapwort, soap bark, ivy, agave	Poor cleansing, excellent lather

Note. Table granted from *article titled: "Shampoos, conditioners, and camouflage techniques,* by Z. Draelos (2012).

Table 2

Top 10 Most Common Used Shampoos: Ingredients and available pH Level

Shampoo Brand	Shampoo Name	Ingredients	pH Level
Garnier Fructis	Sleek & Shine Shampoo	1101502 FS9 AQUA / WATER/EAU, SODIUM LAURETH SULFATE, COCO-BETAINE, SODIUM CHLORIDE, LAURETH-5 CARBOXYLIC ACID, COCAMIDE MIPA, AMODIMETHICONE, PARFUM/FRAGRANCE, SODIUM BENZOATE, HEXYLENE GLYCOL, POLYQUATERNIUM-7, PYRUS MALUS FRUIT EXTRACT/APPLE FRUIT EXTRACT, PEG-55 PROPYLENE GLYCOL OLEATE, PROPYLENE GLYCOL, SALICYLIC ACID, PEG-60 HYDROGENATED CASTOR OIL, NIACINAMIDE, PYRIDOXINE HCL, HEXYL CINNAMAL, CITRIC ACID, SACCHARUM OFFICINARUM EXTRACT/SUGAR CANE EXTRACT/EXTRAIT DE CANNE A SUCRE, BENZYL ALCOHOL, LINALOOL, AMYL CINNAMAL, ARGANIA SPINOSA KERNEL OIL, HYDROXYPROPYLTRIMONIUM LIMON PROTEIN, TOCOPHEROL, PHENOXYETHANOL, CITRUS LIMON PEEL EXTRACT/LIMON PEEL EXTRACT, LEUCONOSTOC/RADISH ROOT FERMENT FILTRATE, CAMELLIA SINENSIS LEAF EXTRACT, CI 19140/YELLOW 5, CI 14700/RED 4, SODIUM HYDROXIDE. F.I.L.# D19172?/1 US PATENTS: 7,514,091; 8,246,941; 8,470,754	5.0 - 7.0
Pantene	Pro-V Repair & Protect	WATER, SODIUM LAURETH SULFATE, COCAMIDOPROPYL BETAINE, SODIUM CITRATE, SODIUM XYLENESULFONATE, SODIUM LAURYL SULFATE, GLYCOL DISTEARATE, SODIUM CHLORIDE, STEARYL ALCOHOL, FRAGRANCE, DIMETHICONOL, CETYL ALCOHOL, DIMETHICONE, SODIUM BENZOATE, GUAR HYDROXYPROPYLTRIMONIUM CHLORIDE, CITRIC ACID, TEA-DODECYLBENZENESULFONATE, TETRASODIUM EDTA, TRIDECETH-10, TRISODIUM ETHYLENEDIAMINE DISUCCINATE, PANTHENOL, PANTHENYL ETHYL ETHER, METHYLCHLOROISOTHIAZOLINONE, YELLOW 5, METHYLISOTHIAZOLINONE, RED 33	4.5 - 6.5
Olaplex	No.4 Bond Maintenance Shampoo	WATER, SODIUM LAUROYL METHYL ISETHIONATE, COCAMIDOPROPYL HYDROXYSULTAINE, POTASSIUM COCOYL GLYCINATE, DISODIUM COCOYL GLUTAMATE, POTASSIUM COCOATE, SODIUM LAUROYL SARCOSINATE, GLYCERETH-26, DECYL GLUCOSIDE, FRAGRANCE, PHENOXYETHANOL, COCAMIDOPROPYLAMINE OXIDE, SODIUM COCOYL GLUTAMATE, GLYCOL DISTEARATE, DISODIUM LAURETH SULFOSUCCINATE, METHYL GLUCETH-20, ACRYLATES COPOLYMER, PEG-120 METHYL GLUCOSE DIOLEATE, AMODIMETHICONE, POLYQUATERNIUM-10, CITRIC ACID, ETHYLHEXYLGLYCERIN, SODIUM LAURYL SULFOACETATE, DIVINYLDIMETHICONE/DIMETHICONE COPOLYMER, CHLORPHENESIN, POLYQUATERNIUM-11, GUAR HYDROXYPROPYLTRIMONIUM CHLORIDE, C11-15 PARETH-7, TRISODIUM ETHYLENEDIAMINE DISUCCINATE, LAURETH-9, GLYCERIN, TRIDECETH-12, PANTHENOL, HYDROLYZED VEGETABLE PROTEIN PG-PROPYL SILANETRIOL, C12-13 PARETH-3, C12-13 PARETH-23, HELIANTHUS ANNUUS (SUNFLOWER) SEED OIL, TOCOPHEROL, PSEUDOZYMA EPICOLA CAMELLIA SINENSIS SEED OIL FERMENT EXTRACT FILTRATE, PSEUDOZYMA EPICOLA/ARGANIA SPINOSA KERNEL OIL FERMENT FILTRATE, PRUNUS ARMENIACA (APRICOT) KERNEL OIL, QUATERNIUM-95, PROPANEDIOL, HELIANTHUS ANNUUS (SUNFLOWER) SEED EXTRACT, PEG-8, BIS-AMINOPROPYL DIGLYCOL DIMALEATE, IUTERPE OLERACEA FRUIT EXTRACT, ROSMARINUS OFFICINALIS (ROSEMARY) LEAF EXTRACT, PUNICA GRANATUM EXTRACT, ORIGANUM VULGARE LEAF EXTRACT, MUSA SAPIENTUM (BANANA) FRUIT EXTRACT, MORINDA CITRIFOLIA FRUIT EXTRACT, SODIUM HYALURONATE, PEG-8/SMDI COPOLYMER, ARCTIUM LAPPA ROOT EXTRACT, SODIUM POLYACRYLATE, PALMITOYL MYRISTYL SERINATE, CITRAL, HEXYL CINNAMAL, LIMONENE, BIOTIN, PENTAERYTHRITYL TETRA-DI-T-BUTYL HYDROXYHYDROCINNAMATE , POTASSIUM SORBATE, DISODIUM EDTA, ACETIC ACID, PENTASODIUM TRIPHOSPHATE, BENZOIC ACID, TETRASODIUM EDTA	6.0 - 6.5
Maui Moisture	Revive & Hydrate + Shea Butter	ALOE BARBADENSIS LEAF VERA, WATER (AQUA), SODIUM C14-16 OLEFIN SULFHONATE, COCAMIDOPROPYL BETAINE, GLYCOL DISTEARATE, PPG-2 HYDROXYETHYL COCO/ISOSTEARAMIDE, COCOS NUCIFERA (COCONUT) WATER, BUTYROSPERMUM PARKII (SHEA) BUTTER, COCOS NUCIFERA (COCONUT) OIL, MACADAMIA TERNIFOLIA SEED OIL, POLYQUATERNIUM-6, POLYQUATERNIUM-10, SODIUM COCOYL ISETHIONATE, COCAMIDOPROPYL HYDROXYSULTAINE, PEG-120 METHYL GLUCOSE DIOLEATE, GUAR HYDROXYPROPYLTRIMONIUM CHLORIDE, METHYL GLUCETH-10, TAPIOCA STARCH, SODIUM CHLORIDE, PROPYLENE GLYCOL, DIAZOLIDINYL UREA, IODOPROPOYNYL BUTYLCARBAMATE, FRAGRANCE (PARFUM).	5.0 - 7.0
Head Shoulders	2 in 1 Shampoo: Smooth & Silky	WATER, SODIUM LAURETH SULFATE, SODIUM LAURYL SULFATE, DIMETHICONE, COCAMIDE MEA, ZINC CARBONATE, GLYCOL DISTEARATE, SODIUM XYLENESULFONATE, FRAGRANCE, CETYL ALCOHOL, GUAR HYDROXYPROPYLTRIMONIUM CHLORIDE, MAGNESIUM SULFATE, SODIUM CHLORIDE, SODIUM BENZOATE, MAGNESIUM CARBONATE HYDROXIDE, BENZYL ALCOHOL, METHYLCHLOROISOTHIAZOLINONE, METHYLISOTHIAZOLINONE.	6.5 - 8.6
Dove	Intensive Repair Shampoo	WATER (AQUA), SODIUM LAURETH SULFATE, GLYCOL DISTEARATE, COCAMIDOPROPYL BETAINE, SODIUM CHLORIDE, FRAGRANCE (PARFUM), GLYCERIN, DIMETHICONE, GLUCONOLACTONE, PPG-9, DIMETHICONOL, ACRYLATES/BEHENETH-25 METHACRYLATE COPOLYMER, STYRENE/ACRYLATES COPOLYMER, CITRIC ACID, GUAR HYDROXYPROPYLTRIMONIUM CHLORIDE, SODIUM SULFATE, ADIPIC ACID, TREHALOSE, TETRASODIUM EDTA, AMODIMETHICONE, DMDM HYDANTOIN, PEG-45M, TEA-DODECYLBENZENESULFONATE, COCAMIDE MEA, PEG-9M, CETRIMONIUM CHLORIDE, METHYLCHLOROISOTHIAZOLINONE, METHYLISOTHIAZOLINONE, MICA (CI 77019), TITANIUM DIOXIDE (CI 77891).	4.0 - 5.0
Aussie	Miracle Curls Shampoo	WATER, SODIUM LAUROYL SULFATE, SODIUM LAURETH SULFATE, COCAMIDOPROPYL BETAINE, GLYCOL DISTEARATE, DIMETHICONE, SIMMONDSIA CHINENSIS (JOJOBA) SEED OIL, COCOS NUCIFERA (COCONUT) OIL, FRAGRANCE, SODIUM CITRATE, COCAMIDE MEA, SODIUM XYLENESULFONATE, CITRIC ACID, SODIUM BENZOATE, SODIUM CHLORIDE, TETRASODIUM EDTA, GUAR HYDROXYPROPYLTRIMONIUM CHLORIDE, METHYLCHLOROISOTHIAZOLINONE, METHYLISOTHIAZOLINONE, YELLOW 5, RED 33	5.3 - 6.7
TRESemmé	Moisture Rich Shampoo	WATER/AQUA, SODIUM LAURETH SULFATE, COCAMIDOPROPYL BETAINE, SODIUM CHLORIDE, GLYCERIN, PERFUME/PARFUM, DIMETHICONOL, GLYCOL DISTEARATE, CARBOMER, MICA, GUAR HYDROXYPROPYLTRIMONIUM CHLORIDE, SODIUM HYDROXIDE, CITRIC ACID, TEA-DODECYLBENZENESULFONATE, TRIETHANOLAMINE, TEA-SULFATE, DMDM HYDANTOIN, DISODIUM EDTA, PEG-45M, SODIUM BENZOATE, MAGNESIUM NITRATE, TOCOPHEROL ACETATE, METHYLCHLOROISOTHIAZOLINONE, SILICA, MAGNESIUM CHLORIDE, METHYLISOTHIAZOLINONE, BENZYL ALCOHOL, BUTYLPHENYL METHYLPROPIONAL, CITRONELLOL, GERANIOL, HEXYL CINNAMAL, LIMONENE, LINALOOL, CI 77891.	6.0 - 6.5
Herbal Essences	Detox & Replenish Charcoal Shampoo	WATER, SODIUM LAUROYL SULFATE, SODIUM LAURETH SULFATE, COCAMIDOPROPYL BETAINE, CITRIC ACID, SODIUM CITRATE, SODIUM XYLENESULFONATE, FRAGRANCE, COCAMIDE MEA, SODIUM CHLORIDE, SODIUM BENZOATE, TETRASODIUM EDTA, PEG-60 ALMOND GLYCERIDES, GUAR HYDROXYPROPYLTRIMONIUM CHLORIDE, LINOLEAMIDOPROPYL PG-DIMONIUM CHLORIDE PHOSPHATE, TRIHYDROXYSTEARIN, HISTIDINE, CHARCOAL POWDER, ALOE BARBADENSIS LEAF JUICE, METHYLCHLOROISOTHIAZOLINONE, METHYLISOTHIAZOLINONE, ECKLONIA RADIATA EXTRACT.	5.0 - 6.5
Organix	Shampoo with Coconut Milk	WATER (AQUA), SODIUM C14-16 OLEFIN SULFONATE, COCAMIDOPROPYL HYDROXYSULTAINE, SODIUM COCOYL ISETHIONATE, PPG-2 HYDROXYETHYL COCO/ISOSTEARAMIDE, COCOS NUCIFERA (COCONUT) OIL, HYDROLYZED MILK PROTEIN, ALBUMEN, PANTHENOL, DIMETHICONE, AMODIMETHICONE, GLYCOL STEARATE, PEG-120 METHYL GLUCOSE DIOLEATE, GUAR HYDROXYPROPYLTRIMONIUM CHLORIDE, POLYQUATERNIUM-6, POLYQUATERNIUM-10, LAURETH-4, LAURETH-23, COCAMIDOPROPYL BETAINE, CETRIMONIUM CHLORIDE, TRIDECETH-12, TETRASODIUM EDTA, SODIUM CHLORIDE, FRAGRANCE (PARFUM), CITRIC ACID, DIAZOLIDINYL UREA, IODOPROPYNYL BUTYLCARBAMATE.	5.0 – 6.0

Note. Ingredients highlighted in red represent preservatives that release formaldehyde. pH values were retrieved from MSDS provided by the shampoo company. Also, Safety Data Sheets (SDS) is not required under local legislation. The information from the SDS is being provided as a courtesy to help assist in the safe handling and proper use of the product.

CONCLUSION

- Consumers should be aware of and research what they are putting on their hair and scalp.
- Companies need to:
    - Include pH levels (5-7)
    - Include all ingredients with %
    - Listen to consumers

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