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CHEMICAL AWARENESS ON SHAMPOO PRESERVATIVES AND ADDITIVES

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ABSTRACT

Shampoos contain functional ingredients, including surfactants, fragrances, conditioning agents, colorants, and preservatives. Preservatives prevent microbial growth, maintain product quality, and reduce contamination during storage and use. However, methyliso thiazolinone and methylchloro isothiazolinone have been linked to allergic contact dermatitis in sensitized individuals. Consumers may also have concerns about parabens, despite difficulty distinguishing ingredient hazards, exposure-related risks, and marketing claims.A survey and shampoo-label reading exercise were conducted to assess consumer awareness of preservatives and other cosmetic additives. The study examined participants' ability to identify common preservatives, interpret ingredient labels, and understand the role of preservatives in product safety and stability. Consumer beliefs regarding preservative benefits and risks were also evaluated in relation to age, education, cosmetic-use frequency, prior skin reactions, and experience reading ingredient labels. The findings identified gaps in consumer knowledge and misunderstandings regarding preservative functions, safety information, and the relationship between chemical exposure and individual risk.

KEYWORDS: Cosmetic Products, Shampoo, Preservatives, Consumer Awareness, Ingredient Labels, Cosmetic Safety, Methylisothiazolinone, Methylchloroisothiazolinone, Parabens, Allergic Contact Dermatitis, Methyl Parabens, Sodium Benzoate, Additives Etc.

INTRODUCTION

Cosmetic products are used routinely for personal hygiene[1], appearance[2] and hair care[3], making their chemical composition a relevant consumer-health issue. Shampoos are a particularly important product category[4] because they are used frequently, applied directly to the scalp and hair, and contain multiple functional ingredients, including surfactants, fragrances, conditioning agents, colorants, and preservatives[5-10]. Preservatives are added primarily to inhibit microbial growth and maintain product stability and safety throughout storage and use. A recent survey of cosmetic formulations[11-20] found that preservatives were present in all examined rinse-off products, illustrating their central role in this category of cosmetics. (Poddębniak & Kalinowska-Lis, 2024)

Although preservatives contribute to microbiological protection[6], some can cause adverse cutaneous reactions in susceptible individuals. Allergic contact dermatitis is a well-recognized concern for selected cosmetic preservatives, particularly isothiazolinones such as methylisothiazolinone (MI) and methylchloroisothiazolinone (MCI). Reviews have linked widespread cosmetic use of MI and MCI/MI to increased sensitization and allergic contact dermatitis, while shampoos and other rinse-off hair-care products have been identified among relevant exposure sources. (Lidén & White, 2024)(Patch Testing for Contact Allergy, 2016) In a multicenter European audit conducted in 2022, 2.9% of patch-tested patients showed contact allergy to MI, and rinse-off cosmetics were associated with most reported MI-related elicitation events. (Schwensen et al., 2024)

The safety of cosmetic preservatives should nevertheless be interpreted in relation to both concentration and exposure conditions. Regulatory and scientific assessments distinguish between leave-on and rinse-off formulations because contact duration and residual exposure differ substantially. For example, the Cosmetic Ingredient Review Expert Panel concluded that MI may be used in rinse-off cosmetics at specified concentrations, whereas European scientific assessments have restricted its use more stringently because of sensitization concerns. (Burnett et al., 2019) This distinction is important for shampoos: although they are rinsed off, repeated use and direct scalp contact may still be relevant for people with pre-existing allergies, impaired skin barriers, or heightened sensitivity to particular ingredients. (Schwensen et al., 2024)(Burnett et al., 2019)

Other preservatives, including parabens, are frequently discussed in public discourse despite differing toxicological and sensitization profiles. Available evidence indicates that parabens have comparatively low rates of skin sensitization relative to several other preservative groups, although consumers may perceive “paraben-free” products as inherently safer. (Torfs

& Brackman, 2020) Such perceptions can influence purchasing decisions but may not reflect the evidence-based safety assessment of a specific ingredient, formulation, concentration, or pattern of use. Consequently, awareness should involve more than recognizing familiar chemical names; it should include an ability to interpret ingredient labels, distinguish between hazard and actual risk, and identify when professional advice is needed.

Ingredient labels are a key source of information for consumers seeking to avoid substances that may be personally relevant, particularly individuals with diagnosed contact allergies. However, cosmetic ingredient lists can be difficult to locate, read, and understand. Experimental research has shown that simple changes to label design can improve consumers' ability to identify target ingredients on cosmetic labels. (Yazar et al., 2014) In addition, recent survey research suggests that public familiarity with cosmetic-safety concepts and surveillance systems remains limited, even among relatively educated participants. (Yazar et al., 2026) These findings indicate that the availability of ingredient information does not necessarily ensure that consumers can use it effectively.

Despite extensive dermatological and regulatory research on preservative safety, there is comparatively limited evidence on consumer's specific awareness of the chemicals and additives present in shampoos, particularly preservatives. Existing studies often address cosmetics broadly, focus on clinical allergy outcomes, or assess general attitudes toward product safety rather than examining whether consumers can recognize common shampoo preservatives, interpret ingredient labels, and connect those ingredients with appropriate safety considerations. This gap limits the development of targeted educational interventions and consumer-information strategies for routine hair-care products.

Therefore, this study aims to assess awareness of chemicals and additives in cosmetic products, with particular emphasis on preservatives used in shampoos.

Literature review

1. Lundov et al. (2011): Studied methylisothiazolinone (MI) and found that it can cause allergic contact dermatitis in sensitive individuals.
2. Deza and Giménez-Arnau (2017): Reviewed cosmetic preservatives and their role in skin allergies, highlighting the importance of preservative safety.
3. Herman et al. (2019): Examined isothiazolinone preservatives and discussed their association with allergic skin reactions and cosmetic regulations.
4. Shampoo allergy study (2020): Investigated shampoo-related dermatitis and identified preservatives, fragrances, and surfactants as possible causes.

5. MCI/MI safety assessment (1999): Reviewed preservative safety and emphasized the importance of concentration and exposure in determining allergic risks.
6. Reeder and Atwater (2019): Reviewed allergies to MI and related preservatives, highlighting the need for ingredient awareness among consumers.
7. Goossens and Aerts (2022): Reviewed formaldehyde-releasing preservatives and their possible role in allergic contact dermatitis. [OBJ]
8. Cherian et al. (2020): Assessed the safety of parabens in cosmetics and emphasised evaluating ingredients according to scientific evidence and conditions of use.
9. Lidén and colleagues (2022): Reviewed preservative exposure and skin sensitisation, highlighting the importance of chemical labelling and prevention of allergic reactions.
10. Halla et al. (2018): Reviewed cosmetic preservation methods and explained how preservatives protect products against microbial contamination and extend shelf life.

Materials

Materials used for this are :-

1. Five sample shampoos
2. Five measuring cylinders
3. Distilled water
4. Markers
5. Labels
6. Google survey form

METHODOLOGY

The study will use a survey method and label-reading technique to assess chemical awareness of shampoo preservatives. Data will be collected using a structured questionnaire to understand consumers' knowledge of preservatives, their functions, and possible side effects. Different shampoo samples will be collected from local shops and examined.

The ingredient labels of the selected shampoos will be studied to identify preservatives such as parabens, phenoxyethanol, and sodium benzoate. Foaming capacity will be test to assess the performance and presence of surfactants.Survey responses and label findings and foaming capacity test will be recorded in tables and analyzed using percentages to assess consumer awareness and compare preservatives listed in different shampoo brands.

A) Survey method

A questionnaire was distributed among selected respondents to assess their awareness of shampoo preservatives, their functions, possible side effects, and ingredient-label reading habits.

Survey interview questions

1. What is your age group?

☐ 18- 25 years

☐ 26 - 35 years

☐ 36 - 45 years

☐ 45 - 50 years

2. Which cosmetic/personal-care products do you use?

☐ Shampoo/hair products

☐ Face wash/cleanser

☐ Moisturiser/cream

☐ Sunscreen

☐ Makeup products

☐ Hair colour/dye

☐ Deodorant/perfume

☐ More than one of the above

3. Have you heard of additives being used in cosmetic products?

☐ Yes

☐ No

☐ Not sure

4. Do you know that parabens can be used as preservatives in some cosmetic products?

☐ Yes

☐ No

☐ Not sure

5. Do you believe that “paraben-free” means that the product contains no preservatives at all?

☐ Yes

☐ No

☐ Not sure

6. Do you think a “paraben-free” product is automatically safer than a product that contains parabens?

☐ Yes

☐ No

☐ Not sure

7. Have you used herbal or natural cosmetic products?

☐ Yes

☐ No

☐ Maybe

8. Do you believe herbal or natural cosmetic products are automatically safer than conventional cosmetic products?

☐ Yes

☐ No

☐ Maybe

9. Would you choose a cosmetic product mainly because it is labelled “additives-free” “preservative-free,” or “natural/herbal”?

☐ Yes

☐ No

☐ Maybe

10. Do you believe that herbal or natural cosmetic products can also contain preservatives and additives?

☐ Yes

☐ No

☐ Maybe

11. Do you think consumers need more scientific information about parabens, preservatives, and herbal cosmetic products?

☐ Yes

☐ No

☐ Maybe

12. Which cosmetic products according to you can contain parabens?

☐ Shampoo/ conditioners

☐ Face cream/ face powders

☐ Foundations/compact

☐ Herbal Kajal/eyeliners/mascara

☐ Lipstick/lip balm/lip tint

B) Test of foaming capacity of shampoo samples

Procedure

1. Take five clean measuring cylinders. Label them as A , B , C ,D ,E.
2. Weigh 2g sample shampoo each separately.
3. Add 40 ml of water to each sample cylinder mix well .
4. Shake each sample cylinder vigorously for 30 secs.
5. Observe the amount of foam produced by each sample in measuring cylinder.
6. Allow the cylinders to stand for 10 minutes and observe the stability of foam.

Observation

Samples of shampoo	**Observation**
Sample A	Produced moderate amount of foam.
Sample B	Produced good amount of foam
Sample C	Produced high amount of foam
Sample D	Produced high amount of foam
Sample E	Produced moderate amount of foam

Shampoo sample Observation



Image of shampoo samples foaming fig 1.1

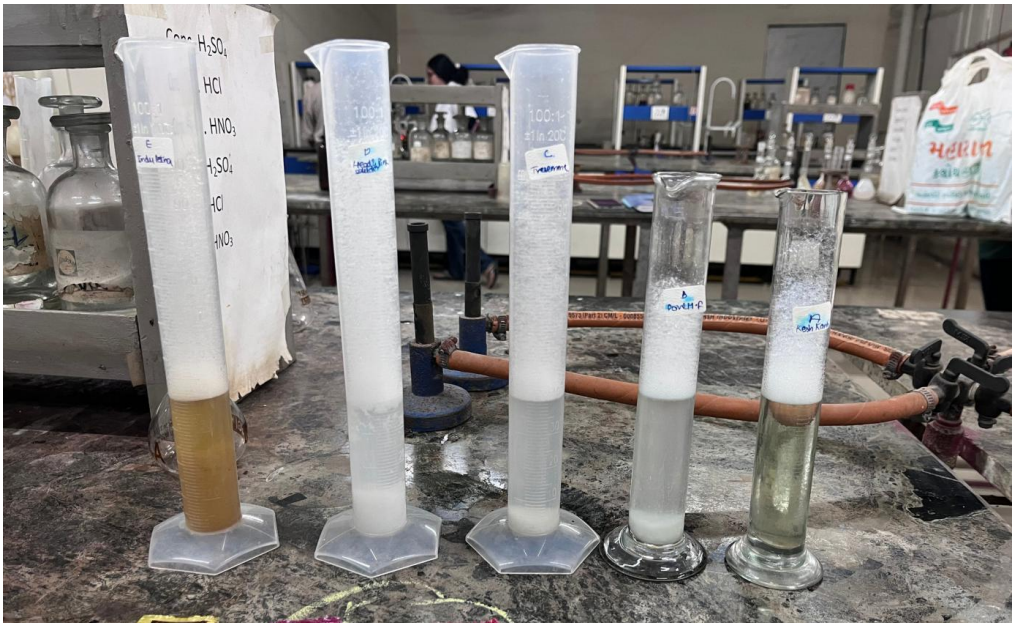


Image of shampoo samples after 10 minutes fig 1.2 moderate amount of foam.

C) label reading of samples

Procedure

1. Mark the samples of shampoos A ,B ,C ,D ,and E .
2. Read the labels at the back carefully and note it down.
3. Create observation table of given data.

Shampoo Sample	**Preservatives**	**Surfactants**	**Stabiliser**
Sample A - herbal shampoo	Sodium benzoate, Diazolidnyl urea.	Sodium lauryl ether sulphate (SLES), Cocamide MEA	Not verified
Sample B – Anti - dandruff shampoo	Sodium benzoate, benzyl alcohol (variant-dependent)	Sodium laureth sulfate, cocamidopropyl betaine	Glycol distearate, sodium chloride
Sample C Smoothing shampoo	DMDM hydantoin (variant-dependent)	Sodium laureth sulfate, cocamidopropyl betaine	Carbomer, glycol distearate
Sample D - Hair fall treatment shampoo	Sodium benzoate (variant-dependent)	Sodium laureth sulfate, cocamidopropyl betaine	Glycol distearate, sodium chloride
Sample E - Herbal shampoo	Not verified	Exact surfactants not verified	Not verified

The labels of shampoo products are taken from respective manufacturing companies sites references are given below.



Image of sample shampoos fig 1.3

Observation

Critical Knowledge Gap: 58.3% of Paraben-Aware Consumers Equate "Paraben-Free" with Zero PreservativesA fundamental paradox exists in consumer awareness regarding preservatives in cosmetic products: * High surface-level awareness exists, with 73.5% (25 of 34) knowing parabens act as preservatives and 64.7% (22 of 34) having heard of chemical additives.

- Among the **24** respondents who know parabens are preservatives, **58.3%** (**14 respondents**) incorrectly believe that "paraben-free" means the product contains **no preservatives at all**, while **16.7%** (**4 respondents**) are unsure.
- Overall, **58.8%** (**20 of 34**) believe "paraben-free" products are automatically safer, demonstrating how marketing terminology creates a false perception of chemical elimination rather than chemical substitution.
- The survey revealed that **58.3%** of respondents believed that “paraben-free” shampoos are completely free from preservatives. This indicates a lack of awareness about other preservatives that may be present in these products, such as phenoxyethanol, sodium benzoate, and potassium sorbate. The finding highlights the need to improve consumer awareness about shampoo ingredient labels and cosmetic preservatives.

Natural/Herbal Paradox : 55.6% Who Assume Herbal Products Are Safer Admit They Contain AdditivesConsumer reliance on natural branding conceals internal cognitive contradictions: * 68.8% (22 of 32) of respondents actively use herbal or natural cosmetic products, and 58.1% (18 of 31) believe herbal products are automatically safer than conventional alternatives.

- Among the **18** respondents who hold the belief that herbal cosmetics are automatically safer, **55.6%** (**10 respondents**) simultaneously acknowledge that herbal/natural products can also contain preservatives and additives.
- Meanwhile, **33.3%** (**6 of 18**) believe natural products contain zero preservatives or additives, and **31.3%** (**10 of 32**) overall falsely assume natural products are entirely additive-free.-----

🏷️ **Label-Driven Purchasing: 83.3% of Label-Influenced Buyers Rely on Safety AssumptionsMarketing claims heavily dictate purchasing intent despite widespread consumer uncertainty: * 37.5% (12 of 32) explicitly choose products mainly due to "additives-free", "preservative-free", or "natural/herbal" labels, while 43.8% (14 of 32) state they "maybe" do so.**

- Among the **12** respondents who make purchasing decisions directly based on these labels, **83.3%** (**10 respondents**) believe natural/herbal cosmetics are automatically safer.
- Furthermore, **39.4%** (**13 of 33**) identify "Shampoo/conditioners" as the primary product containing parabens, followed by "Herbal Kajal/eyeliners/mascara" (**15.2%**, **5 of 33**) and "Lipstick/lip balm/lip tint" (**15.2%**, **5 of 33**).-----

📚 **Demand for Scientific Information: 100% Demand Among Older DemographicsConsumer confusion creates a distinct opportunity for educational engagement across age tiers: * 74.2% (23 of 31) of all respondents state that consumers need more scientific information about parabens, preservatives, and herbal cosmetics.**

- Demand for scientific clarity scales directly with age: **63.2%** (**12 of 19**) among 18–25 year-olds, **87.5%** (**7 of 8**) among 26–35 year-olds, and **100.0%** (**4 of 4**) among 45–50 year-olds.
- The overall respondent base is concentrated in younger demographics, with **64.7%** (**22 of 34**) aged 18–25, **23.5%** (**8 of 34**) aged 26–35, and **11.8%** (**4 of 34**) aged 45–50.-----

💡 **Strategic Action Items * Launch consumer education workshops clarifying that "paraben-free" does not equal "preservative-free," addressing the 58.3% knowledge gap.**

- Provide clear ingredient transparency on natural products to educate the **55.6%** who buy herbal products expecting complete absence of chemical preservatives.
- Target older age demographics (26–50 years) with scientific breakdowns, as **87.5%–100.0%** of these groups actively demand empirical product information.

- Develop visual infographics differentiating alternative preservatives from harmful additives to build true consumer confidence rather than relying on non-regulated label claims.-----

📊 **Chart InsightsThe chart visualizes the relationship between consumer knowledge of parabens as preservatives and their misunderstanding of "paraben-free" labeling. It highlights that even among respondents who know parabens are preservatives, the vast majority (14 out of 24) still mistakenly believe that "paraben-free" guarantees a product contains no preservatives whatsoever.**

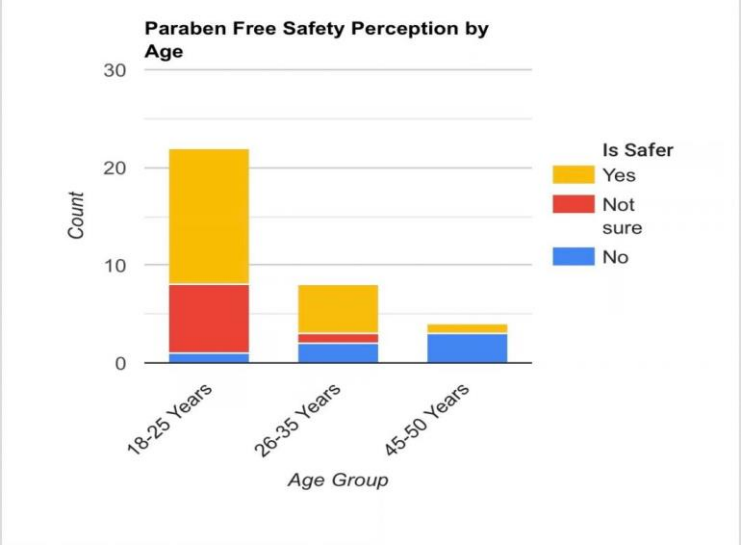


Chart on paraben free perception on population fig 2.1.

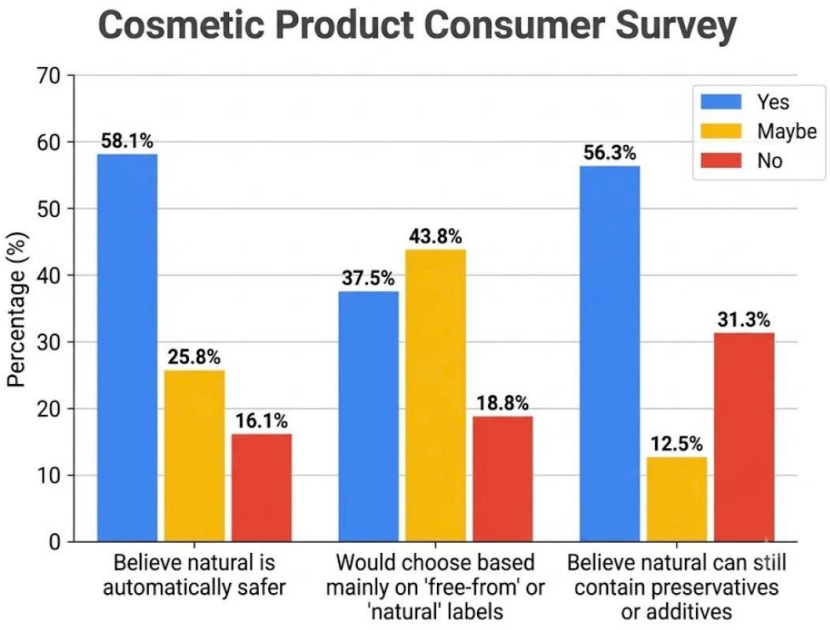
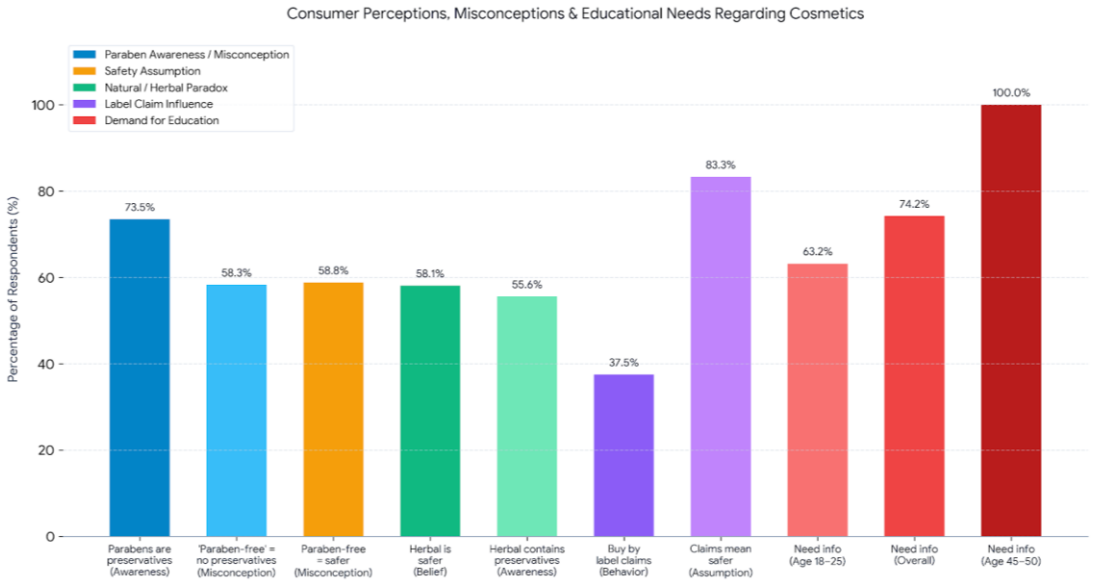


Chart on population's opinion on herbal products fig 2.2

RESULTS AND DISCUSSION

- High awareness, low understanding: Although 73.5% recognized parabens as preservatives, 58.3% of paraben-aware respondents believed paraben-free means no preservatives are present.
- Safety misconception: Overall, 58.8% considered paraben-free products automatically safer.
- Natural-product paradox: While 58.1% believed herbal products are safer, 55.6% of this group also recognized that herbal products may contain preservatives and additives.
- Labels influence purchasing: 37.5% selected products based on "natural," "herbal," or "preservative-free" claims; among them, 83.3% assumed natural/herbal products were safer.
- Need for education: 74.2% wanted more scientific information on parabens, preservatives, and herbal cosmetics; this rose from 63.2% among 18–25-year-olds to 100% among 45–50-year-olds.



CONCLUSION

- The findings reveal a substantial gap between consumer awareness and accurate understanding of preservatives in cosmetic products. Although many respondents recognized that parabens function as preservatives, a majority incorrectly interpreted "paraben-free" as meaning completely preservative-free and assumed that such products are automatically safer. Similar misconceptions were observed for natural and herbal cosmetics, which were widely perceived as safer despite the fact that such products may also contain chemicals, preservatives, and other additives.

- Product labels such as “natural,” “herbal,” and “preservative-free” strongly influenced purchasing decisions, indicating that marketing claims often shape consumer perceptions more than scientific knowledge of cosmetic formulations. In response to these findings, the ingredient label developed for shampoo products may serve as a practical educational tool by clearly communicating the presence and function of ingredients, including preservatives and other chemical components. Such labeling can help consumers recognize that the term “herbal” does not necessarily mean chemical-free or preservative-free.
- Future education campaigns should provide clear, evidence-based explanations of the purpose and safety of cosmetic ingredients, the meaning of commonly used product labels, and the distinction between natural, herbal, and chemical-free claims. Campaigns could incorporate simplified ingredient labels, product-label guides, social-media materials, pharmacist-led counseling, and community awareness programs. These initiatives should specifically address the misconception that “paraben-free,” “natural,” or “herbal” products are inherently safer, encouraging consumers to make informed choices based on ingredient information rather than marketing claims alone.

REFERENCES

1. Burnett, C. L., et al. (2019). Amended safety assessment of methylisothiazolinone as used in cosmetics. *International Journal of Toxicology, 38*(1_suppl), 70S–84S. https://doi.org/10.1177/1091581819838792
2. Dréno, B., Zuberbier, T., Gelmetti, C., Gontijo, G., & Marinovich, M. (2019). Safety review of phenoxyethanol when used as a preservative in cosmetics. *Journal of the European Academy of Dermatology and Venereology, 33*(Suppl. 7), 15–24. https://doi.org/10.1111/jdv.15944
3. Cherian, P., et al. (2020). Amended safety assessment of parabens as used in cosmetics. *International Journal of Toxicology, 39*(1_suppl), 5S–97S. https://doi.org/10.1177/1091581820925001
4. Nowak, K., Ratajczak-Wrona, W., Górska, M., & Jabłońska, E. (2021). Controversy around parabens: Alternative strategies for preservative use in cosmetics and personal care products. *Environmental Research, 198*, 110488. https://doi.org/10.1016/j.envres.2020.110488
5. *Skin safety and health prevention: An overview of chemicals in cosmetic products.* (2019). This study examines cosmetic ingredients and preservative information obtained from product labels. Read the article

6. Burnett, C. L., et al. (2010). Final report of the safety assessment of methylisothiazolinone. *International Journal of Toxicology, 29*(4_suppl). https://doi.org/10.1177/1091581810374651
7. *A survey of preservatives used in cosmetic products.* (2024). *Applied Sciences, 14*(4), 1581. https://www.mdpi.com/2076-3417/14/4/1581
8. *Prevalence of preservatives across all product types in the Contact Allergen Management Program.* (2017). This study examined preservative occurrence in cosmetic and personal care products. Read the article
9. European Commission, Scientific Committee on Consumer Safety. (2016). *Opinion on Phenoxyethanol (SCCS/1575/16).* European Commission.
10. Scientific Committee on Consumer Safety. (2018). *Opinion on Methylisothiazolinone (MI) (P94)—Submission II: In rinse-off products only.* European Commission.
11. U.S. Food and Drug Administration (FDA). Cosmetic Ingredients.
12. https://www.fda.gov/cosmetics/cosmetic-products-ingredients/cosmetic-ingredients
13. U.S. Food and Drug Administration (FDA). Parabens in Cosmetics.
14. https://www.fda.gov/cosmetics/productsingredients/ingredients/ucm128042.htm
15. U.S. Food and Drug Administration (FDA). Cosmetics Labeling Guide.
16. https://www.fda.gov/cosmetics/cosmetics-labeling-regulations/cosmetics-labeling-guide
17. MedlinePlus. Cosmetics.
18. https://medlineplus.gov/cosmetics.html
19. ASEAN Cosmetic Directive. Annex VI: List of Preservatives Allowed for Use in Cosmetic Products.
20. https://esubmission.fda.gov.mm/user-guides/cosmetic-guides/TechnicalGuide/ANNEXES%20OF%20THE%20ASEAN%20COSMETIC%20DIRECTIVE_update.pdf

Miscellaneous

1. Sodium benzoate :- May cause mild skin or scalp irritation in sensitive individuals.
2. Benzyl alcohol :- May cause skin irritation or allergic reactions.
3. DMDM hydantoin :- May cause allergic skin reactions in sensitive individuals.
4. Methylchloroisothiazolinone (MCI) :- May cause itching, redness, skin irritation or allergic contact dermatitis.
5. Methylisothiazolinone (MI):- May cause skin rashes, itching or allergic reactions.
6. Phenoxyethanol :- May cause skin or eye irritation.

7. Methylparaben :- May cause mild skin irritation or, rarely, allergic reactions.
8. Propylparaben:- May cause skin irritation or allergic reactions in sensitive individuals.
9. Potassium sorbate :- May cause mild skin or eye infection.

Note :- *These are possible side effects, not effects that occur in everyone. The table does not confirm that all these preservatives are present in your shampoo samples.*