ANALYSIS AND CHARACTERIZATION OF STICK SUNSCREENS AVAILABLE IN THE BRAZILIAN MARKET

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Introduction

Solar radiation, particularly ultraviolet (UV), presents significant risks to skin health, including deoxyribonucleic acid (DNA) damage and premature aging [1]. Excessive UV exposure is linked to skin cancer, which accounts for 30% of malignant tumors in Brazil [2]. Sunscreens play a crucial role in UV protection by absorbing and reflecting UV rays [3]. Stick sunscreens are popular for their convenience, but improper application can reduce their effectiveness. This study analyzed stick sunscreens available in the Brazilian market, highlighting trends, evaluating optimal usage in terms of application and occlusive capacity, and providing recommendations for effective protection.

Material and Methods

The *Google Trends* platform was used to analyze the search patterns for the term "sunscreen" in Brazil over the past five years (April 2019 to April 2024). Searches for "stick sunscreen," "cream sunscreen," and "gel sunscreen" were also analyzed. To identify stick sunscreens sold in Brazil, a search was conducted on ANVISA's website on March 12, 2024, using the keyword "sunscreen". Products with active registrations, excluding lip sunscreens, were reviewed.

Nine samples were selected for analysis and coded as follows: A1- "Solar Expertise Supreme Protect 4 Sun Protect Factor (SPF) 70" (emulsified lotion, SPF 70); A2- "Protetor solar nivea sun protect & hidrata SPF 50" (emulsion, SPF 50); A3 - "Protetor solar SPF 60 bastão sallve" (solid, SPF 60); A4- "Ollie bastão multifuncional incolor SPF 95" (stick, SPF 95); A5- "Latika sun stick protetor solar SPF 50" (stick, SPF 50); A6- "Protetor solar facial bastão SPF 50 firmeza & antissinais needs" (stick, SPF 50); A7- "Pink stick SPF 90 FPUVA70 Pink cheeks" (stick, SPF 70); A8- "Sunsafe kids speedo" (stick, SPF 60); A9- "Mustela stick protetor solar" (stick, 50), they were selected based on online trends (A4 and A6) and convenience (A1 to A3, A5, A7 to A9).

The study aimed to estimate the amount of product transferred by stick sunscreens, using adapted methodologies from Novick et al. (2015) [4] and Zibetti et al. (2016) [5]. The stick sunscreen samples were applied on paper, and the number of passes required to dispense 50 mg (equivalent to 2 mg/cm²) was recorded. Each sample was analyzed in triplicate. Additionally, the occlusion factor for formulations (seven sticks, one lotion, and one emulsion) was measured using methodologies adapted from Oliveira et al. (2023) [6] and Teixeira et al. (2019) [7]. These methods assessed water loss from a filter paper system over 24-48 hours at 32°C ± 2°C, with statistical analysis performed at a 5% significance level.

Results and Discussion

The analysis of the search profile revealed a significant increase in interest in the term "sunscreen." Notably, the term "sunscreen stick" even surpassed searches for "sunscreen cream" and "sunscreen gel" during the same period. A survey conducted on the "ANVISA consulta" website returned 2,854 products, of which 1,643 had active registrations and 1,211 were inactive. The most commonly registered

pharmaceutical form under the "sunscreen" category in the market was lotion (29.0%), followed by emulsion (19.7%), cream (14.1%), and emulsified lotion (7.4%). Sunscreen sticks (6.4%) and solids (0.9%) represented a smaller market share.

The average number of applications required to achieve a coverage of 2 mg/cm² for the products, in ascending order, were as follows: A3 (4 applications), A8 and A4 (6 applications), A7 (9 applications), A6 (10 applications), A5 (15 applications), and A9 (29 applications).

The occlusive factor measures a formulation's ability to create a barrier on the skin's surface. The average occlusive factor values recorded for the samples over 24 hours and 48 hours, respectively, were as follows:A1 22.97% ± 0.008 and 29.73% ± 0.012. A2 17.09% ± 0.001 and 22.73% ± 0.028. A3 30.82% ± 0.020 and 32.33% ± 0.029. A4 22.37% ± 0.016 and 28.57% ± 0.028. A5 35.63% ± 0.021 and 37.20% ± 0.011. A6 37.73%± 0.021 and 37.83% ± 0.021. A7 20.49% ± 0.020 and 17.86% ± 0.024. A8 23.68% ± 0.021 and 20.81% ± 0.026. A9 31.06% ± 0.020 and 27.64% ± 0.034. The results ranged from 17.09% (A2) to 37.83% (A6), with no statistically significant difference ($p > 0.05$) between the 24-hour and 48-hour measurements for any of the samples.

Conclusion

The analysis of search profiles for stick sunscreens clearly indicates a growing interest in this product, reflecting increased awareness of sun protection in Brazil. However, determining the number of applications necessary to achieve the ideal amount of stick sunscreen, as recommended by the American Academy of Dermatology Association [8] shows that this parameter may not effectively guide consumers, as there is significant variation depending on the brand. The thickness of sunscreen application is crucial for its efficacy. Factors such vehicle viscosity and application conditions influence this thickness. Applying less than 2 mg/cm² results in reduced UV protection [4]. The results also revealed that stick sunscreens exhibited higher occlusivity compared to other pharmaceutical forms evaluated. Products with high occlusivity enhance hydration, but sunscreens should ideally have a low occlusive factor to prevent the absorption of UV filters and potential toxic effects. Raising public awareness about proper application techniques is essential to ensure the effectiveness of these products and help reduce damage caused by sun exposure.

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