

Tradename: AC WonderShroom

Code: 21029CHI

CAS #: 7732-18-5 & 223751-82-4 (or) 68917-13-5 & 84650-60-2 & N/A (or) 9057-02-7 & 56-81-5 & 1686112-36-6 (or) 68333-16-4 (or) 9015-54-7

Test Request Form #: 11681

Lot #: N240509A

Sponsor: *Active Concepts, LLC; 107 Technology Drive Lincolnton, NC 28092*

Study Director: *Daniel Shill*

Principal Investigator: *Kayla Goodson*

Test Performed:

EEG (electroencephalography) Brainwave Study

Introduction

The physical experience of applying cosmetics is multifaceted and influences how consumers perceive products, demonstrating the importance of quantifying the complex effects of product application. Cosmetic products are designed to provide the traditional physical beauty attributes and benefits in addition to various sensory effects and an overall feeling of well-being. Considering the physiological and psychological implications of product application are interdependent, enhancing the emotional response to cosmetic products can augment the consumer experience.

Accordingly, an EEG brainwave study was conducted to evaluate the immediate active thinking properties associated with the topical application of **AC WonderShroom**. Because the ingredient was designed to promote active thinking properties through enhanced Beta brainwave activity, Alpha, Gamma, Theta, and Delta frequencies were also measured to confirm that its effects remained specific to Beta waves and did not unintentionally influence other neurological states. Alpha GPC and Caffeine were also tested as comparative products.

Study Principle

A headband is placed on the forehead of participants and brainwaves are monitored as products are applied to the skin. The brainwaves associated with active thinking properties are isolated and analyzed to provide insight to the psychological state during product application.

Materials

- A. Equipment:** Muse 2 Headband and Application (IntraXon, Toronto, ON, Canada); Mind Monitor Application
- B. Products:** Base Lotion (Cetaphil® Moisturizing Cream for All Skin Types)
- C. Software:** Excel Analysis ToolPak (Microsoft)

Methods

20 volunteers between the ages of 24 and 50, who were known to be free of any skin pathologies with Fitzpatrick skin types I to IV, participated in this study (Table 1).

Table 1. The Fitzpatrick Classification of Skin Types Chart¹

Fitzpatrick Skin Type Descriptions*	
Skin Type	Description
I	Always burns, never tans
II	Burns easily, tans minimally
III	Burns moderately, tans to light brown
IV	Burns minimally, tans to moderate brown
V	Rarely burns, tans to dark
VI	Never burns, least sensitive to changes
*Adapted from The Surgeon General's Call to Action to Prevent Skin Cancer	

Prior to initiating the study protocol, participants were seated in a quiet room for 10 minutes with the Muse 2 Headband on to obtain Baseline brainwave activity. Four randomly assigned test sites were identified on the volar forearm of participants and the order of applying conditions was randomized for each participant. Following stable Baseline measurements, the principal investigator physically applied 0.2 g of one condition to the respective test site for 30 seconds. After applying the first condition, brainwaves were monitored for 60 seconds without physical contact from the principal investigator. Once stable recordings were achieved, the principal investigator applied 0.2 g of the second condition to the respective test site for 30 seconds. The skin test site conditions and treatments are described below (Table 2). The Base Lotion utilized in this study was Cetaphil® Moisturizing Cream for All Skin Types.

Table 2. Descriptions of the Conditions and Treatments for each Skin Test Site

Skin Test Site	Condition	Treatment / Test Article Application Description
1	Base Lotion	Base Lotion
2	3.0% Alpha GPC	3.0% Alpha GPC in Base Lotion
3	3.0% Caffeine	3.0% Caffeine in Base Lotion
4	2.0% AC WonderShroom	2.0% AC WonderShroom in Base Lotion

The Muse 2 Headband smart device has five EEG Brain Sensors detecting Gamma, Beta, Alpha, Theta, and Delta brainwave activity which indicate different psychological states (Table 3). The Muse 2 Application records these brainwaves and provides feedback regarding sensor placement and connectivity. Brainwave data was exported from the Muse 2 Application and uploaded to the Mind Monitor Application for individual brainwave analysis.

Table 3. Brainwave Activity Detected by the Muse 2 Headband

Brainwave	Psychological State
Gamma	Heightened perception, problem solving tasks
Beta	Awake, thinking, alert consciousness
Alpha	Physically and mentally relaxed
Theta	Light Sleep, dreams
Delta	Deep sleep, loss of bodily awareness

The absolute Beta brainwave activity recorded during the 30-second application period was utilized for analysis, with an increase in Beta brainwave activity indicating enhanced active thinking properties during application. Absolute Alpha, Gamma, Theta, and Delta brainwave activity were also evaluated to determine whether the observed changes in Beta activity occurred independently or were accompanied by alterations in other brainwave frequencies. This analysis helped confirm whether the active thinking response was specific to Beta brainwave enhancement rather than part of a generalized change in overall brainwave activity. Data was analyzed using a one-way ANOVA with statistical significance accepted at $p \leq 0.05$. Data is displayed relative to Baseline brainwave activity according to the following equation:

$$\text{Brainwave Activity} = \frac{\text{Brainwaves}_{\text{Condition}}}{\text{Brainwaves}_{\text{Baseline}}}$$

Percent change in absolute brainwave activity calculated for each test site relative to Baseline values, using the following equation:

$$\text{Percent Change (\%)} = \frac{\text{Brainwave Activity}_{\text{Condition}} - \text{Brainwave Activity}_{\text{Baseline}}}{\text{Brainwave Activity}_{\text{Baseline}}} \times 100$$

Results

The data obtained from this study met criteria for a valid study as the Base Lotion performed as anticipated. Application of 2.0% **AC WonderShroom** demonstrated effective immediate active thinking properties by increasing Beta brainwave activity compared to the Base Lotion.

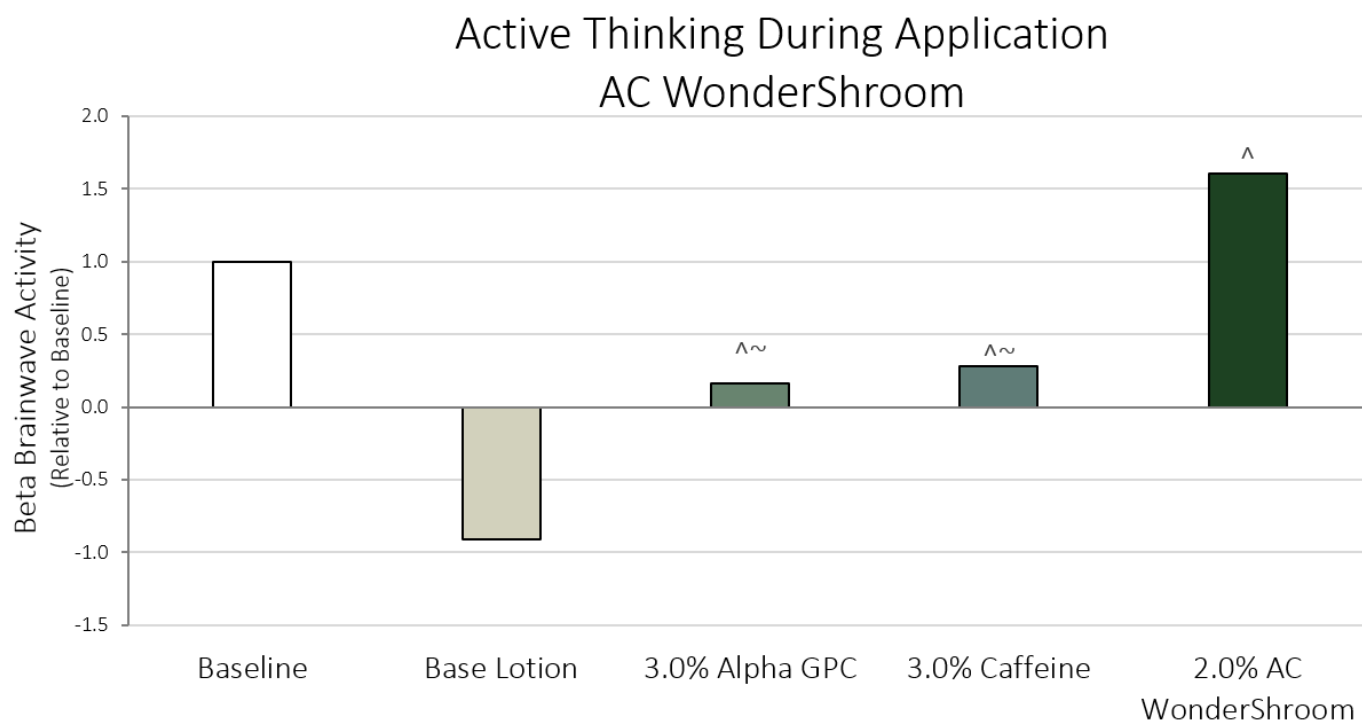


Figure 1. Beta Brainwave Activity During Product Application Relative to Baseline. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion. ~ indicates significance ($p \leq 0.05$) compared to 2.0% **AC WonderShroom**.

Table 4. Results from T-test Analyses of Beta Brainwave Activity During Application compared to Base Lotion. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

	Base Lotion vs 3.0% Alpha GPC	Base Lotion vs 3.0% Caffeine	Base Lotion vs 2.0% AC WonderShroom
P-value	0.017^	0.030^	0.001^

Relaxation During Application AC WonderShroom

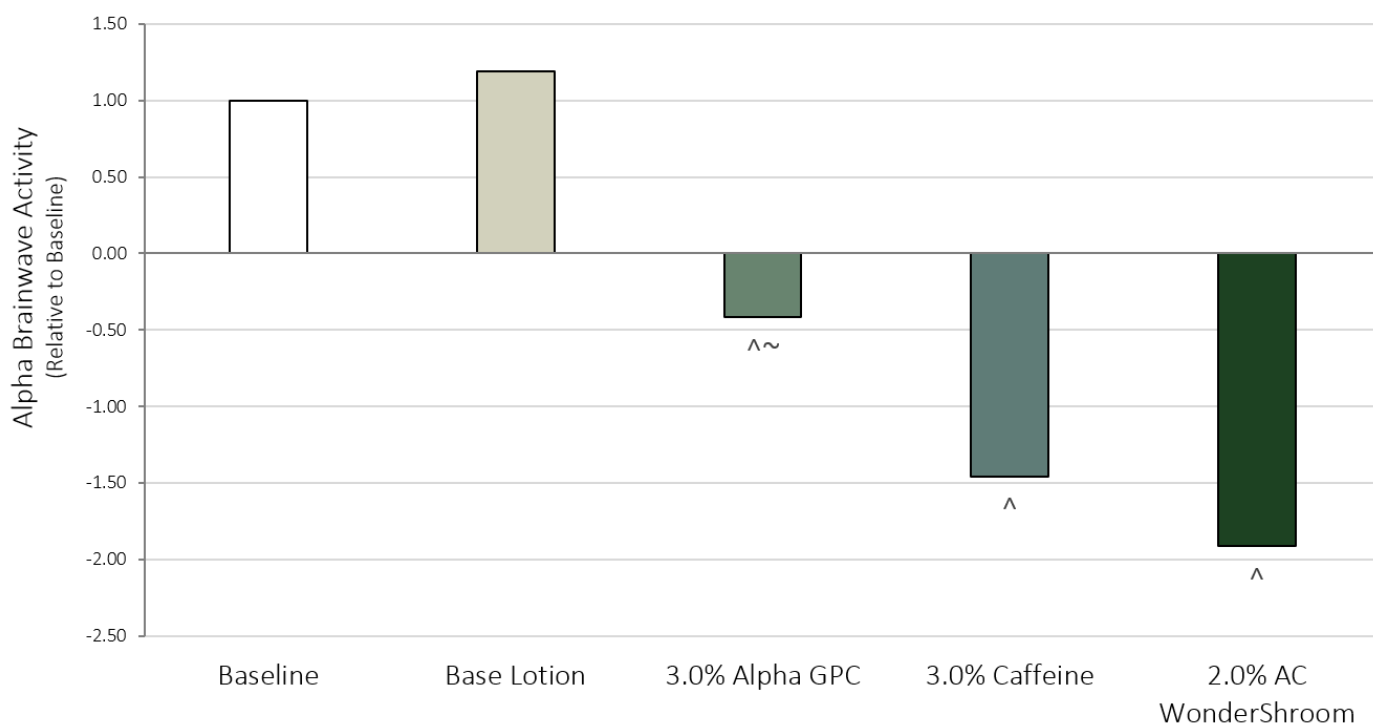


Figure 2. Alpha Brainwave Activity During Product Application Relative to Baseline. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion. ~ indicates significance ($p \leq 0.05$) compared to 2.0% AC WonderShroom.

Table 5. One-way ANOVA Results of Alpha Brainwave Activity During Application. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

	Base Lotion vs 3.0% Alpha GPC	Base Lotion vs 3.0% Caffeine	Base Lotion vs 2.0% AC WonderShroom
P-value	0.021^	0.001^	< 0.001^

Heightened Perception During Application AC WonderShroom

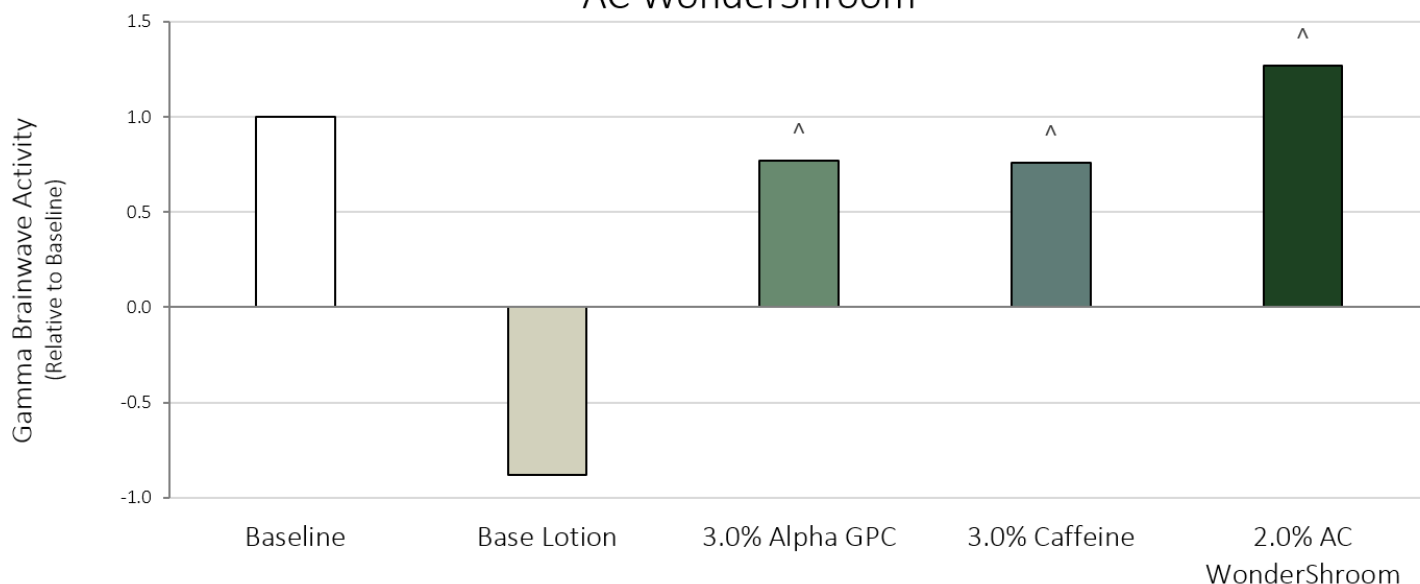


Figure 3. Gamma Brainwave Activity During Product Application Relative to Baseline. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

Table 6. One-way ANOVA Results of Gamma Brainwave Activity During Application. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

	Base Lotion vs 3.0% Alpha GPC	Base Lotion vs 3.0% Caffeine	Base Lotion vs 2.0% AC WonderShroom
P-value	0.015^	0.019^	0.005^

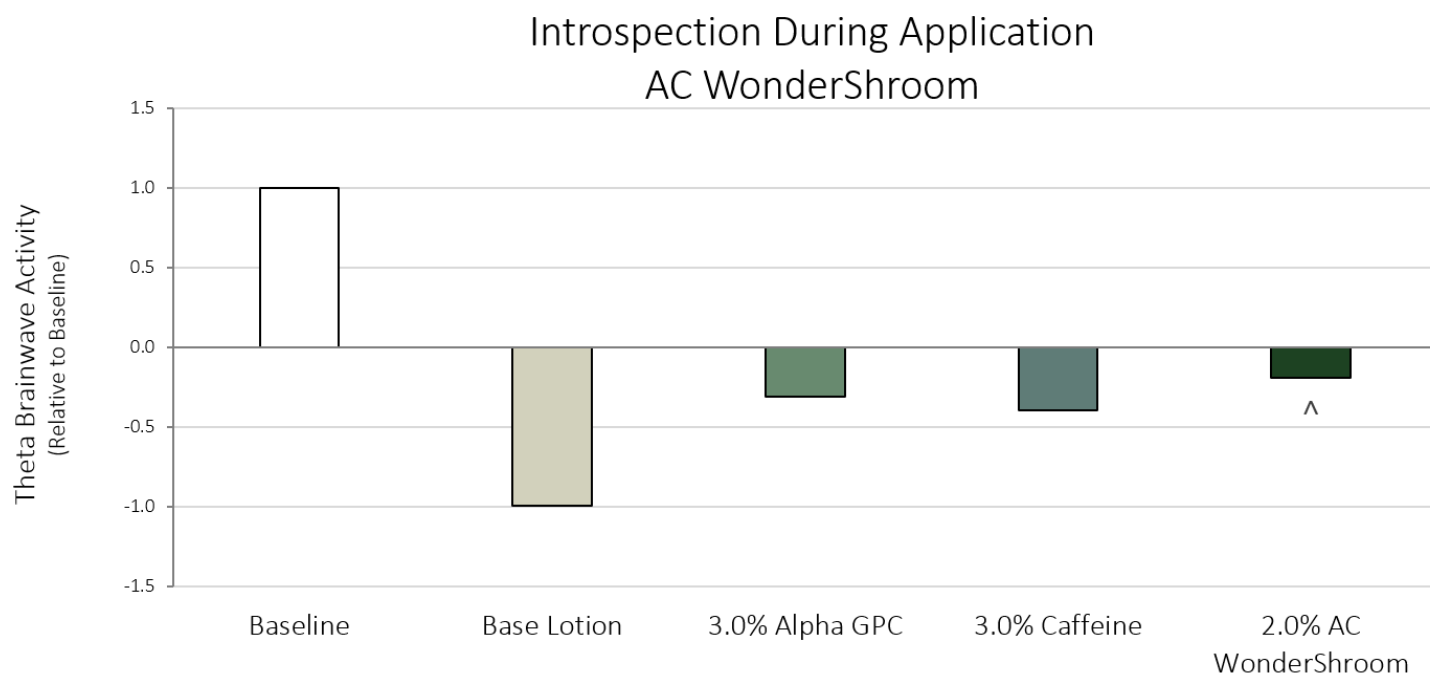


Figure 4. Theta Brainwave Activity During Product Application Relative to Baseline. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

Table 7. One-way ANOVA Results of Theta Brainwave Activity During Application. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

	Base Lotion vs 3.0% Alpha GPC	Base Lotion vs 3.0% Caffeine	Base Lotion vs 2.0% AC WonderShroom
P-value	0.051	0.074	0.048^

Deep Sleep During Application AC WonderShroom

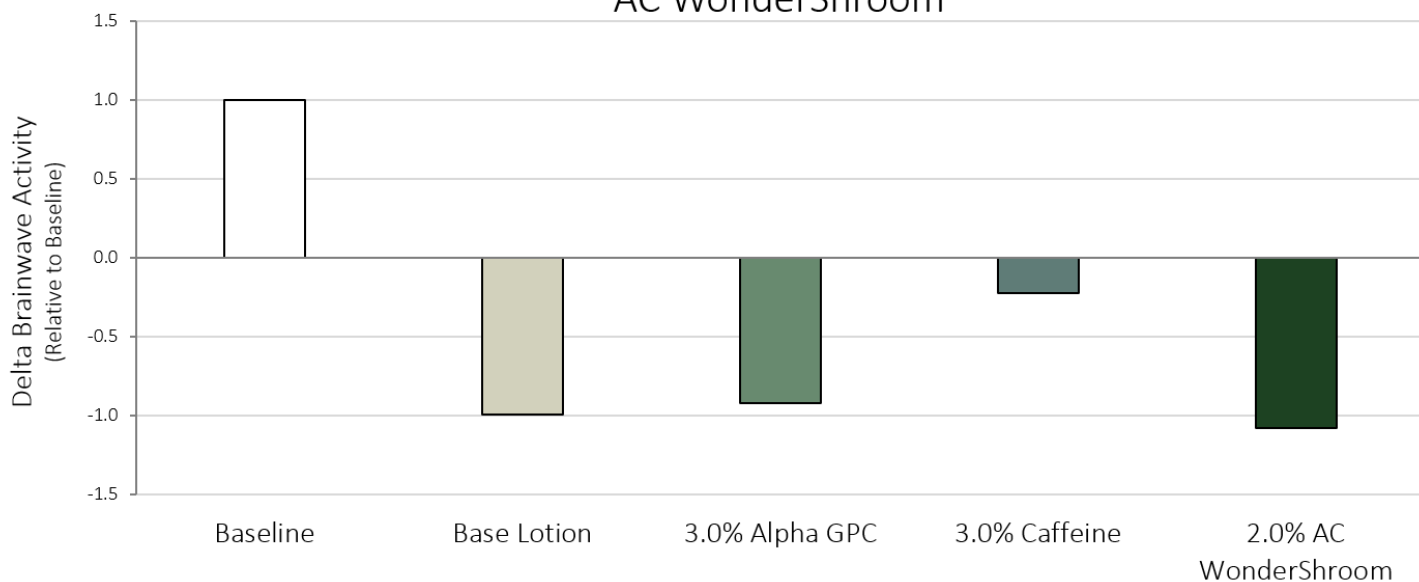


Figure 5. Delta Brainwave Activity During Product Application Relative to Baseline.

Table 8. One-way ANOVA Results of Delta Brainwave Activity During Application. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

	Base Lotion vs 3.0% Alpha GPC	Base Lotion vs 3.0% Caffeine	Base Lotion vs 2.0% AC WonderShroom
P-value	0.084	0.052	0.059

Discussion

The ability of **AC WonderShroom** to elicit active thinking properties upon application was assessed via Beta brainwave activity during 30 seconds of application. As shown in Figure 1, Beta brainwave activity was reduced by 0.9% during Base Lotion application, indicating the Base Lotion does not exert significant active thinking properties (Figure 1; Table 4). Conversely, 2.0% **AC WonderShroom** significantly increased Beta brainwave activity by 1.6% during the 30-second application compared to Baseline brainwave activity (Figure 1; Table 4). Furthermore, 2.0% **AC WonderShroom** significantly increased active thinking properties compared to both 3.0% Alpha GPC and 3.0% Caffeine. These results demonstrate **AC WonderShroom** has effective immediate and short-term active thinking properties during application.

To determine whether the observed increase in Beta brainwave activity was a true, isolated response rather than part of a generalized chain in brain activity, Alpha, Gamma, Theta, and Delta brainwave activity were also evaluated. A significant increase in Gamma brainwave activity was observed following application of 2.0% **AC WonderShroom**, 3.0% Alpha GPC, and 3.0% Caffeine further supporting the observed increase in active thinking, as Gamma activity is associated with higher-order cognitive processing and may complement the observed changes in active thinking (Figure 3; Table 6). No significant increases were observed for any of the remaining brainwave frequencies following application of Base Lotion and 2.0% **AC WonderShroom** (Figures 2, 3, 4, 5). Furthermore, 2.0% **AC WonderShroom**, 3.0% Alpha GPC, and 3.0% Caffeine reduced Alpha brainwave activity, compared to Baseline, indicating topical application did not elicit relaxation properties (Figure 2; Table 5). Theta brainwave activity, which is associated with introspection, was significantly reduced with 2.0% **AC WonderShroom** application compared to Base Lotion (Figure 4; Table 7). No significant difference in Delta brainwave activity was observed for all test materials, demonstrating application did not induce deep sleep associated brainwave activity with application (Figure 5; Table 8). Collectively, these findings demonstrate 2.0% **AC WonderShroom** increased Beta brainwave activity, and Gamma brainwave activity, without significantly eliciting the remaining brainwave frequencies, supporting the observed response is specific to active thinking properties rather than an increase in overall brainwave activity.

In conclusion, these results indicate **AC WonderShroom** increases Beta brainwave immediately during application when added to personal care products at recommended use levels. Collectively, **AC WonderShroom** enhances the psychological response when applying a cosmetic product, by increasing active thinking, which can augment the consumer experience. These results support the intended design of **AC WonderShroom** as an active thinking ingredient, demonstrating a selective enhancement of Beta brainwave activity without meaningful changes to the other major brainwave frequencies.

References

1. Sharma AN, Patel BC. Laser Fitzpatrick Skin Type Recommendations. [Updated 2022 Mar 9]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK557626/>