

# Novel delivery system for reducing water consumption by altering hair wash frequency



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## Introduction

Our hair care routines are evolving to meet the demands of the modern world, with consumers becoming more mindful of how their choices impact the world around them. Consumers are seeking opportunities to adapt their hair wash routines to **incorporate more convenient and sustainable solutions**, particularly those who have adopted intensive hair wash routines to **combat scalp oiliness**. The aim of this study was to develop a novel encapsulation system to efficiently deliver actives to the hair and scalp and provide instant sebum reduction.



## Controlled delivery

Actives are released by a combination of erosion and diffusion, **allowing the controlled release over a longer period**. To demonstrate the diffusion process, dialysis method was used (2 ml sample, 12,000 Da cut, cellulose acetate bag, ethanol-water 80:20, 32°C release medium, HPLC quantification).

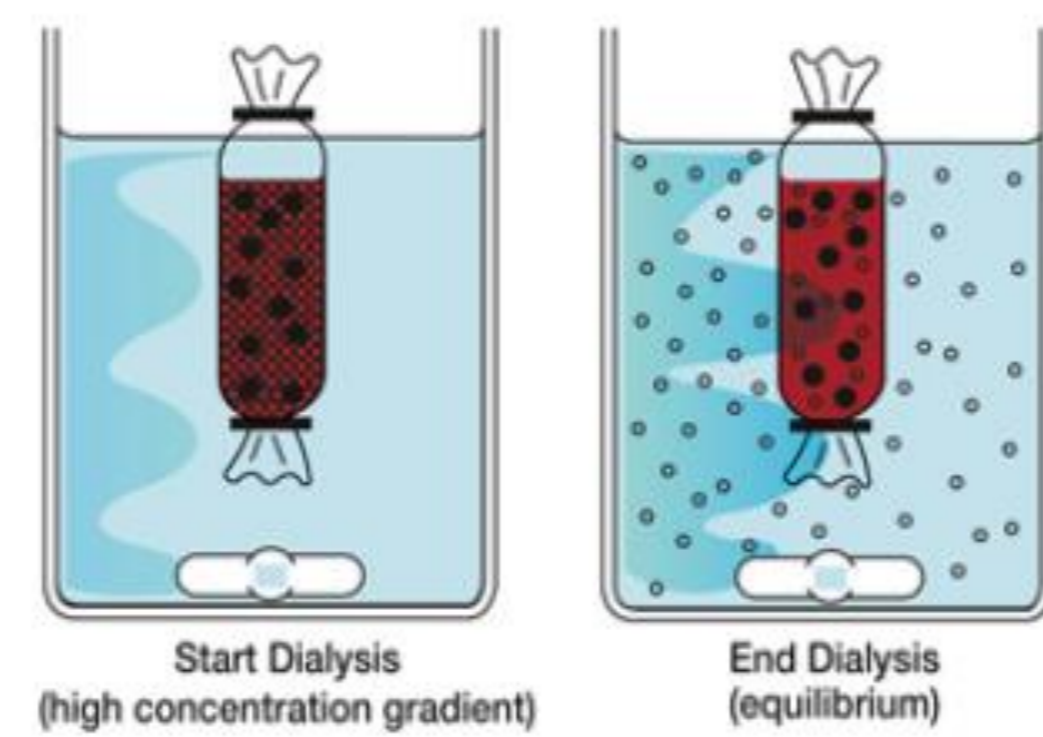


Figure 1: Mechanism of dialysis

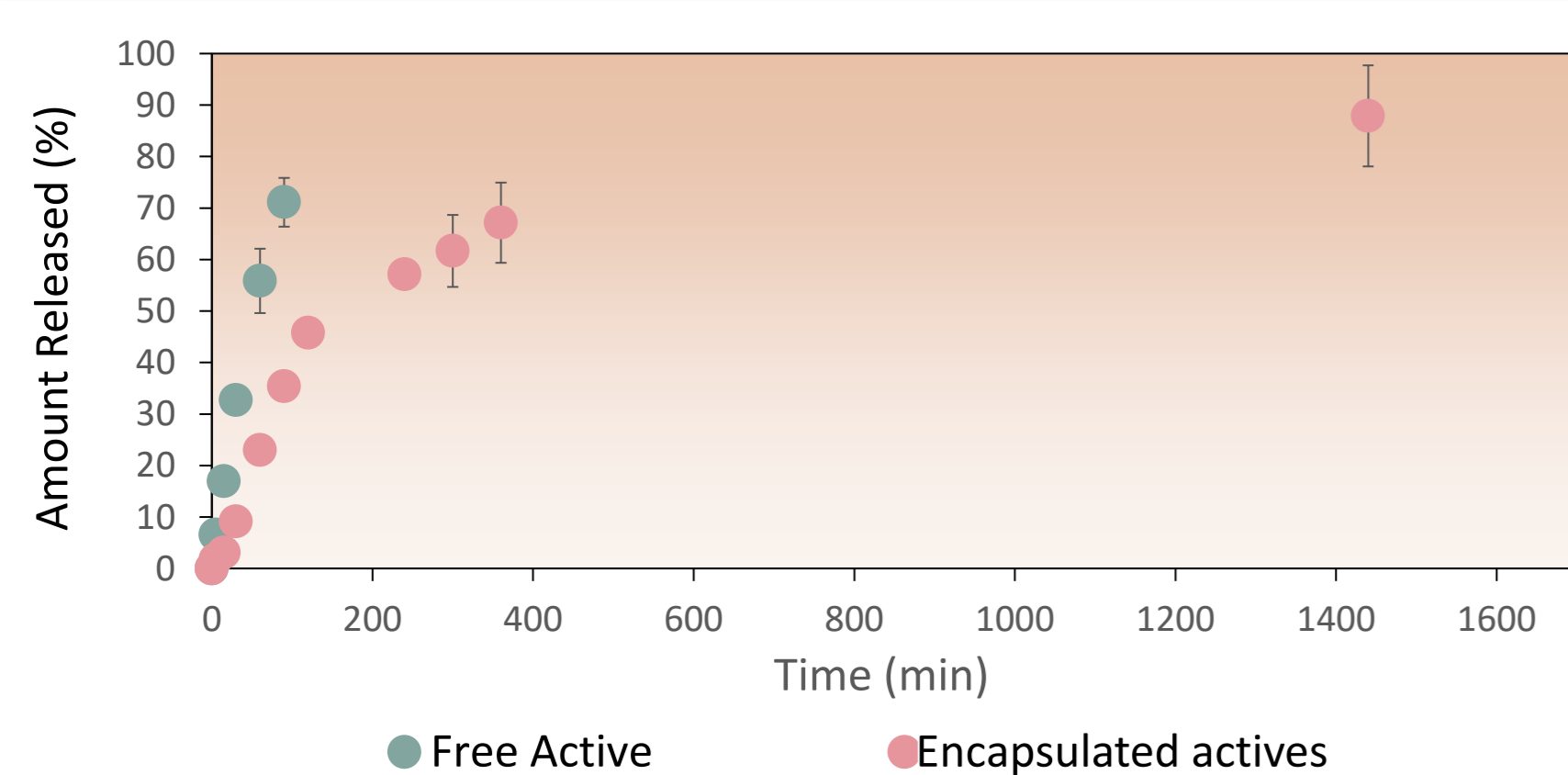


Figure 2: The release profile of encapsulated actives compared to the free actives

The actives contained within the encapsulation system were released at a slower rate compared to the free actives, demonstrating the benefits of encapsulation and its ability to deliver continued benefits.

To demonstrate the delivery benefit of the encapsulated system onto the skin compared to the free actives, an evaluation was performed using the Episkin™ model.

Analyses by HPLC after 1, 3 and 6 hours show an **increased permeation of the encapsulated system**, for a better delivery of actives to the skin.

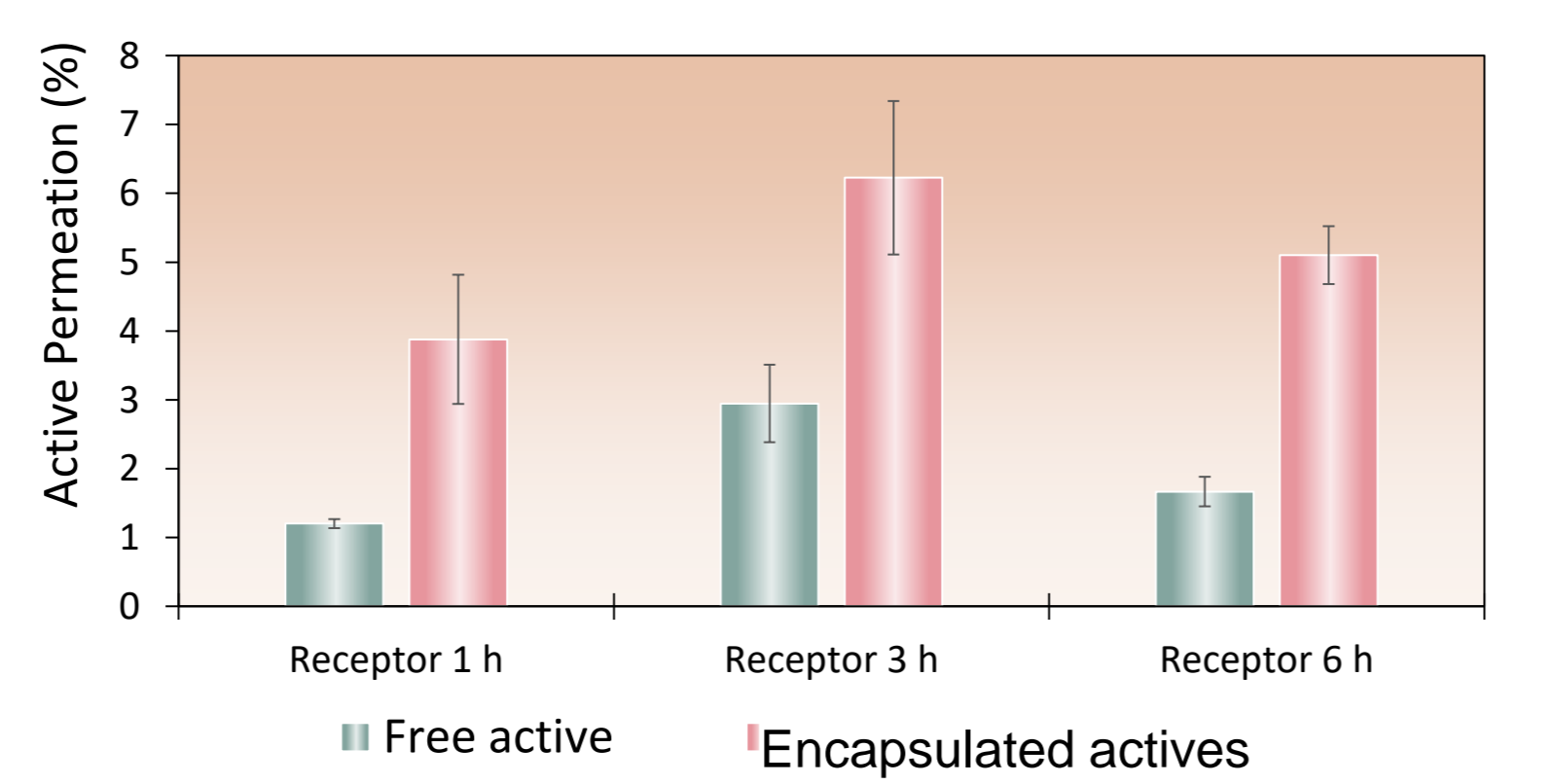


Figure 3: Skin permeation using Episkin™ model

## Conclusion

- Novel encapsulated system with **slow and continuous delivery** allowing **higher permeation** than free actives.
- **Instant oiliness reduction** from the first application, with continual improvement after repeated applications
- **Consumer perceivable** improvements in hair aesthetics
- Offer consumers the ability to adapt their usual hair wash routine, leading to **water saving and carbon emission reduction** that positively impact our environment.

## Scalp oiliness reduction

The instant improvement in scalp oiliness was evaluated both instrumentally and via sensory evaluation (20 volunteers, male and female). Panellists were asked to refrain from washing their hair for 2 days prior to the study, then washed their hair for 7 consecutive days using a shampoo and a conditioner with 1% of encapsulated actives, or equivalent % of free actives or placebo.

The encapsulated system delivered a **significant reduction in scalp oiliness**, which was effective from the initial application and continued to improve with repeated use. This result was **consumer perceivable** compared to the other regimes tested.

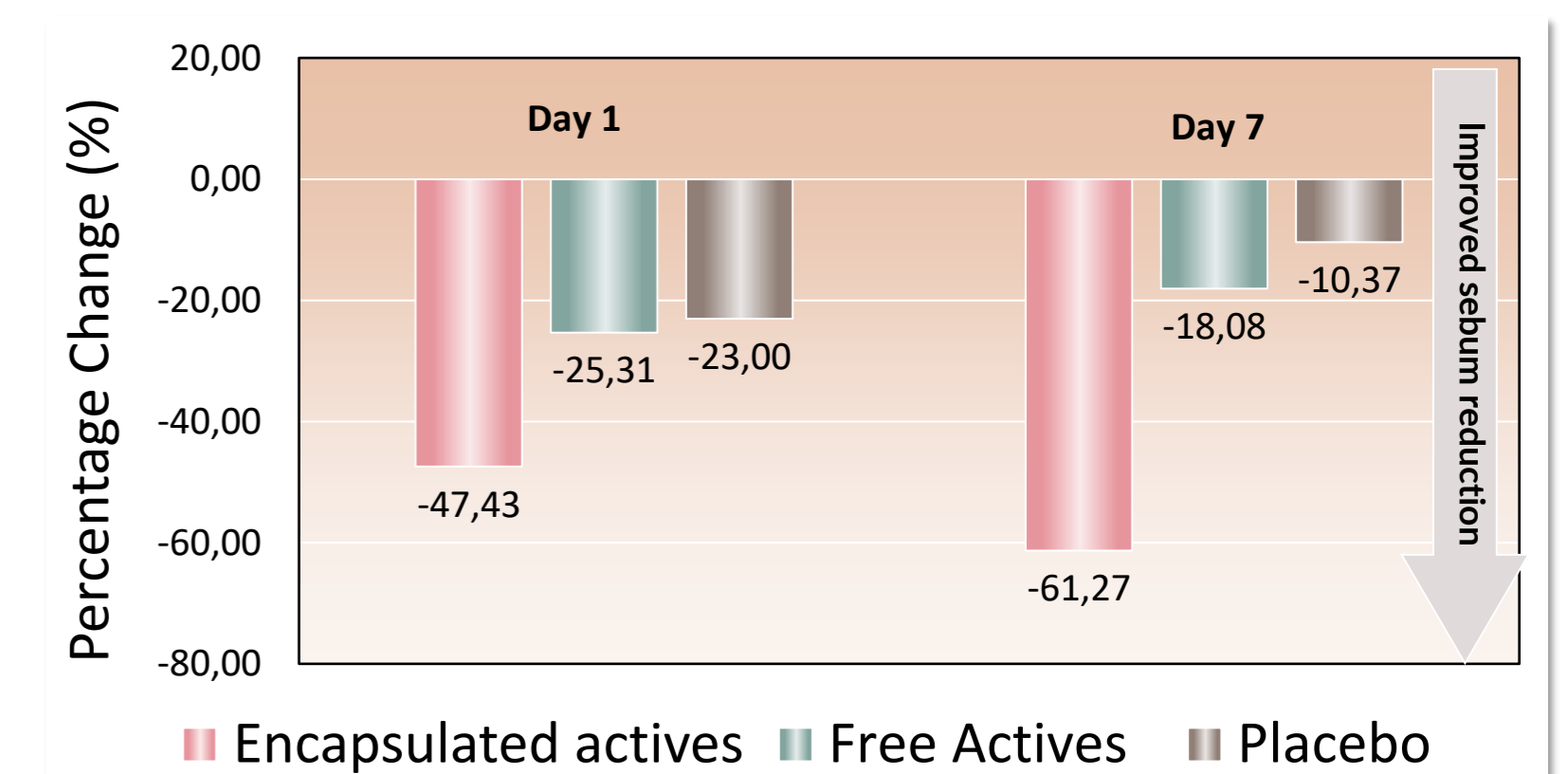


Figure 4: Sebumeter evaluation results

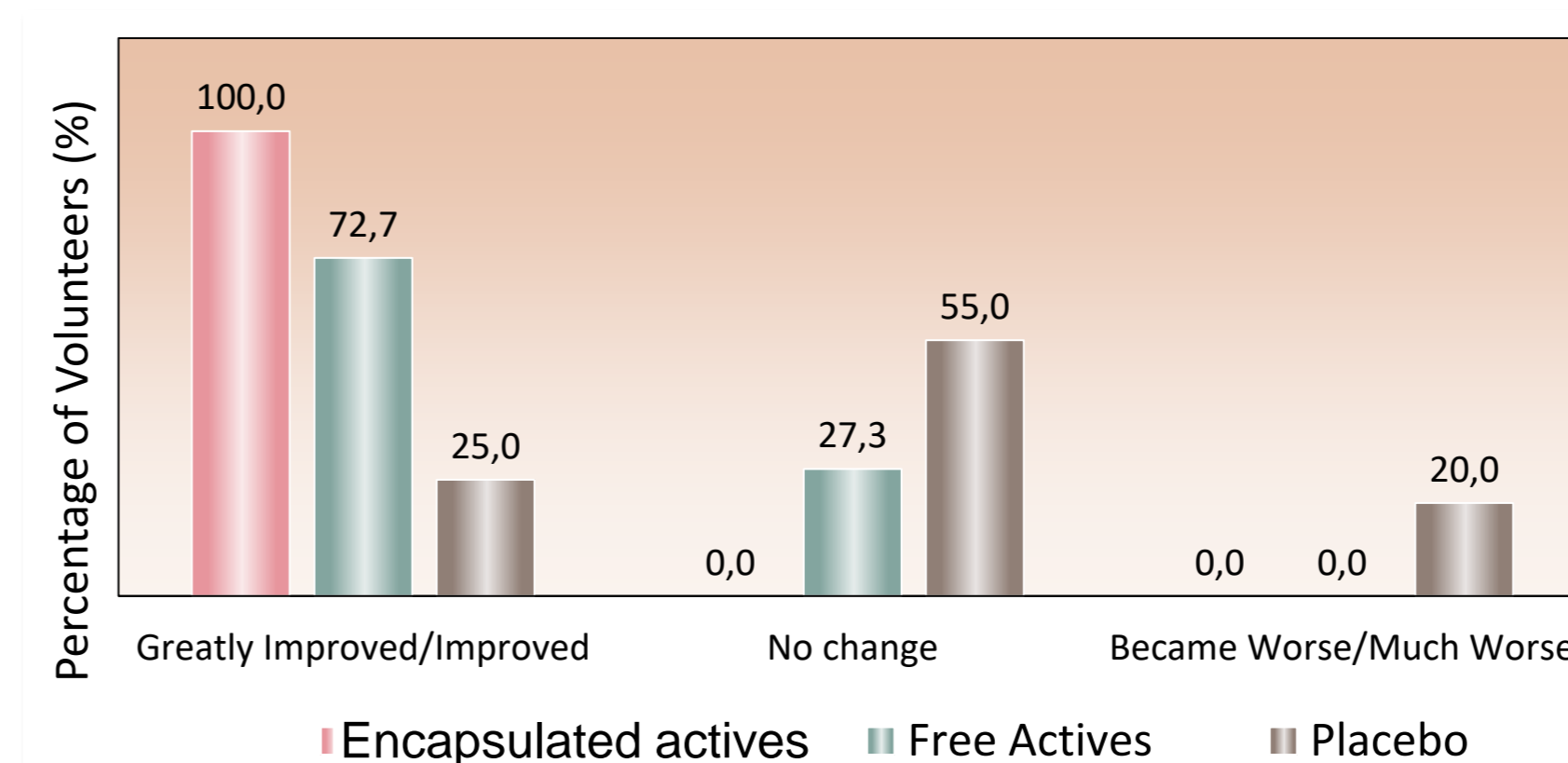


Figure 5: Volunteer perception of a clean hair sensation after completing the full treatment regime

The panellists were also asked whether they experienced a clean hair sensation, of which **100% of panellists indicated improvements in the feel of clean hair** following the repeated use of the encapsulated system.

## Hair wash cycle reduction

A salon evaluation was conducted to determine consumer perception of their **ability to extend hair wash cycles** following use of the encapsulated actives. 20 panelists (female) were asked wash their hair at increased intervals with a shampoo and a conditioner (intervals of 2, 3, 5 and 7 days) containing 1% encapsulated actives or placebo. At day 0 and after the wash cycles, panelists indicated their preferred hair wash routine.

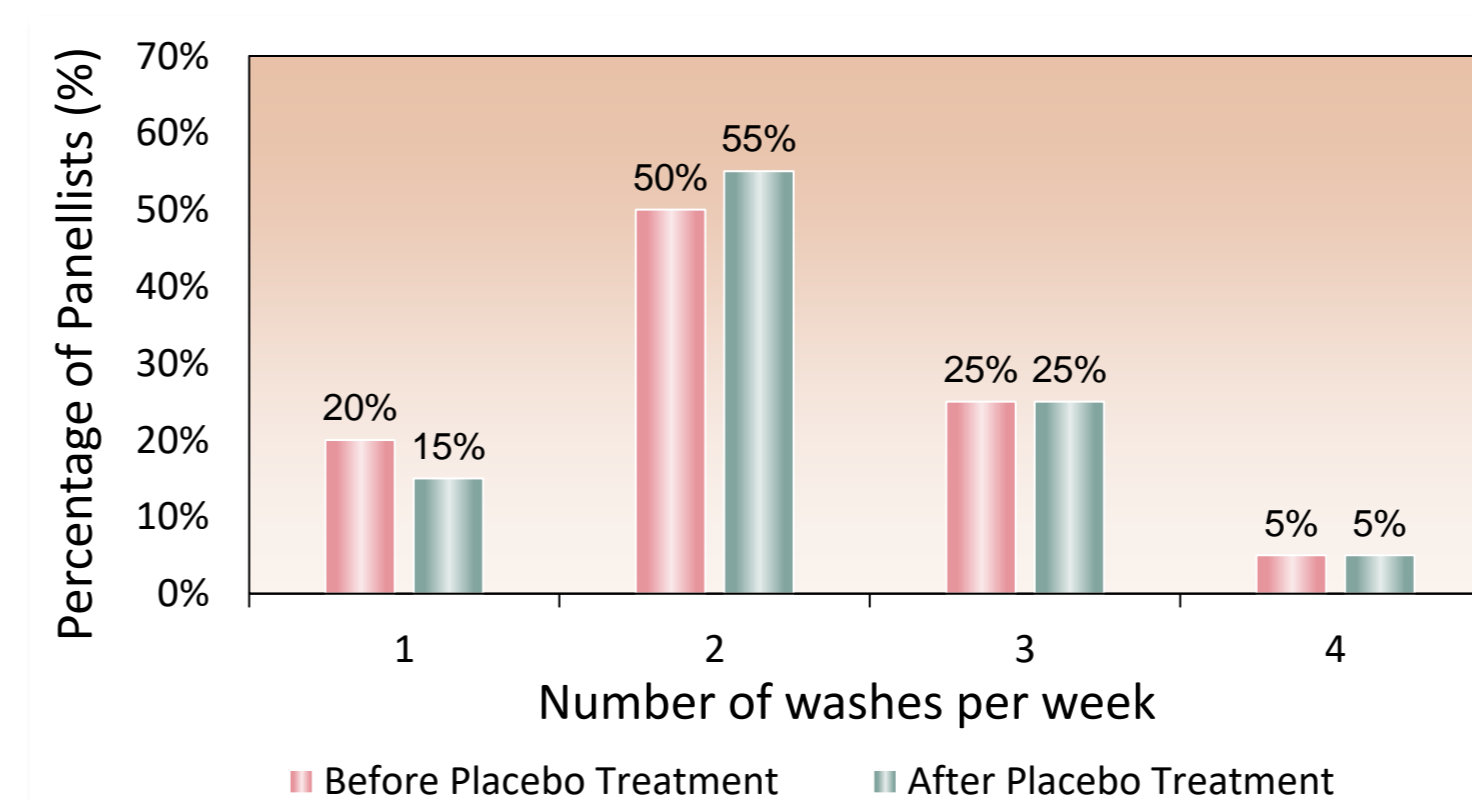


Figure 6: Change in wash frequency following the use of the placebo regime

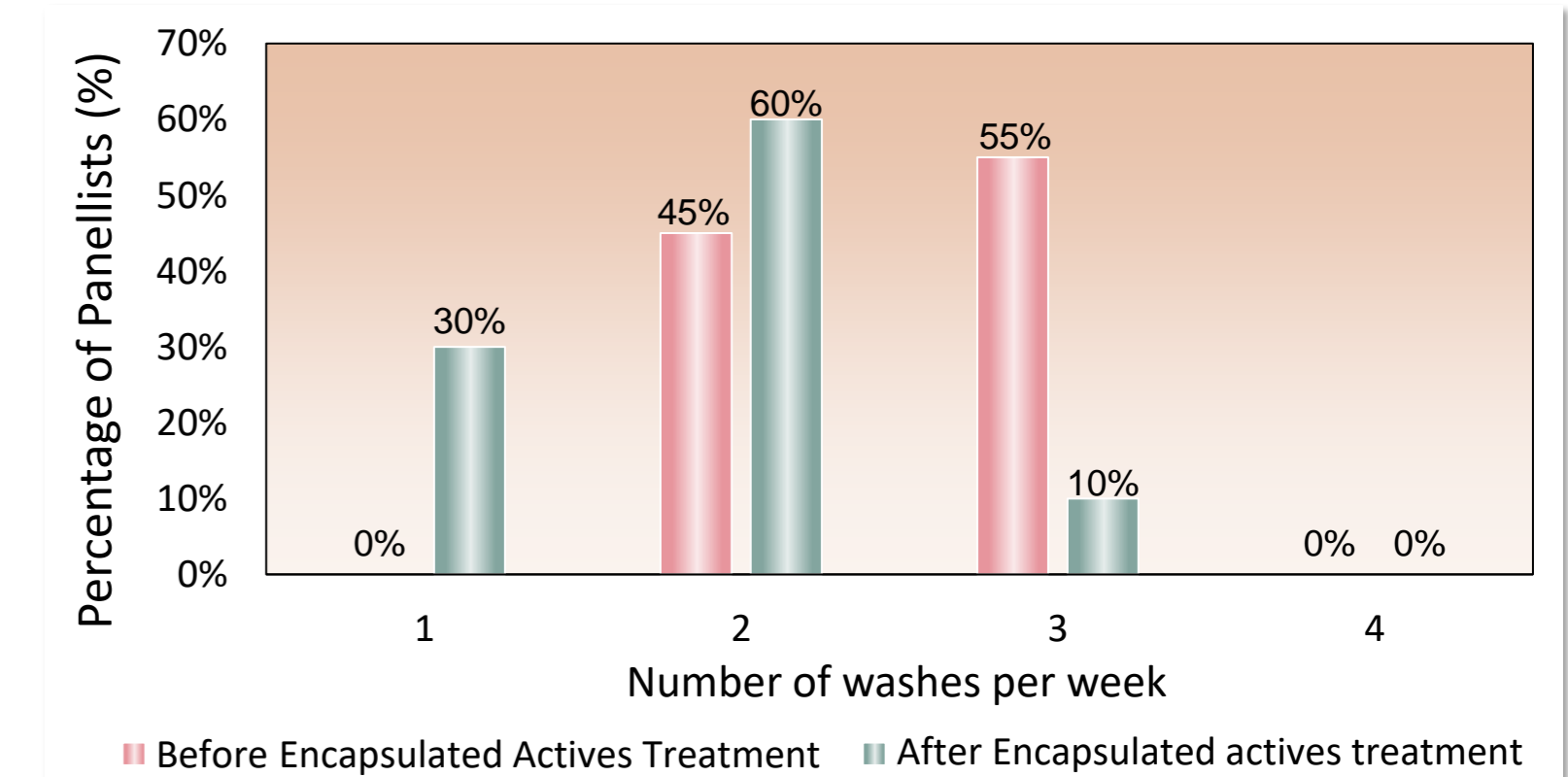


Figure 7: Change in wash frequency following the use of the encapsulated system regime

The results indicate an average **reduction in wash cycles of 29.4%** for the encapsulated system regime with more panellists indicating that they could wash their hair either once or twice per week, compared to an increase of 2.2% for the placebo regime.

Further calculations had lead us to the conclusion that for every tonne of encapsulated actives used, **129.4 million litres of water** can be saved and **229,412 kgCO<sub>2</sub>** of carbon emissions linked to the use of hot water can be avoided.



## References

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