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Sensorial Attributes of Denture Fixative and Product Usage Experience

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Aims

The aim of this research was to study and understand the process of denture fixative polymer hydration over time and its correlation to sensorial attributes, in order to improve the consumer product usage experience, by:

- Developing new or enhancing current image-based approaches that capture relevant physical and physiological properties that drive product performance and sensorial attributes.
- Performing sensory study to explore and define sensorial attributes associated with denture fixatives.

Material & Method

- In this research, the sensorial attributes of two commercial and one experimental formulation, with a different polymer system, were studied.

Table 1. Denture fixatives and its composition

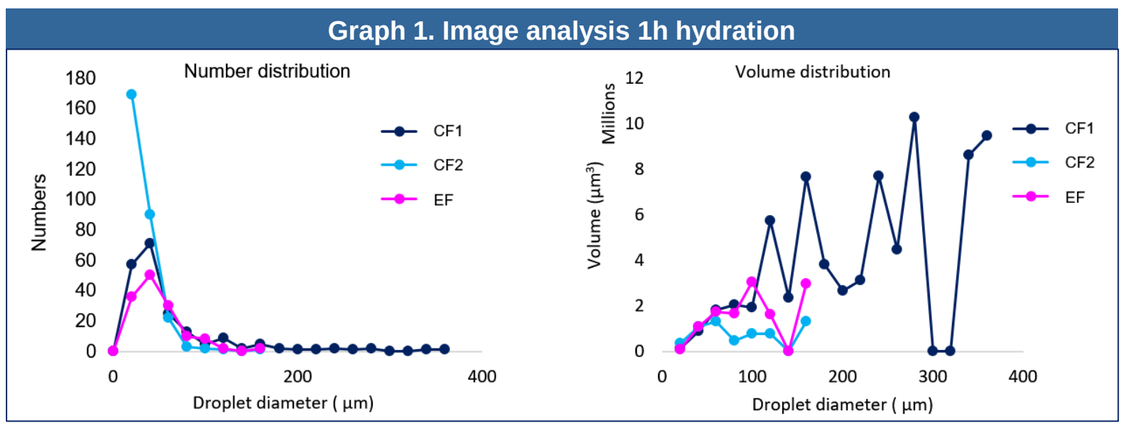
Denture Fixative	Composition (as per Product Pack)
Commercial Formulation 1 (CF1)	Calcium/sodium PVM/MA copolymer, petrolatum, paraffinum liquidum, cellulose gum
Commercial Formulation 2 (CF2)	Calcium/zinc PVM/MA copolymer, paraffinum liquidum, petrolatum, cellulose gum, silica, CI 14720, CI 16185, aroma, menthol, limonene
Experimental Formulation (EF)	Confidential (contains anionic polymer)

- Microscopy - The long term hydration of denture fixative was recorded by phase contrast light microscopy and fluorescence microscopy (Evos FL, Waltham, US) equipped with a GFP (470/22 - 525/50 nm) light cube. Sample was loaded and focused under GFP mode to monitor the migration of the edges. The image of hydration was taken at the end of each hour for up to 12 hour. The last image after 1 h and 12 h hydration was analysed using ImageJ to obtain the area fraction of the oil droplets, droplet numbers and droplet size (Ferret and area equivalent). Droplet volume was calculated from the area equivalent droplet size.
- Sensory Study – The lexicons for sensorial attributes related to denture fixative were generated by 25 semi-trained panellist (Full and Partial denture wearers). The study was conducted in two phases, Phase I – to define lexicons and develop vocabulary and Phase II – to test product and determine sensorial attributes from 30 min to 240 mins.

Results

- After 1 h hydration (as shown in Figure 1 and Graph 1)
  - All samples showed small droplets with a size smaller than 100 µm. CF2 showed large number of smaller droplets as compare to CF1 and EF,
  - As for volume distribution, CF2 & EF had droplets occupying much larger area as compared to CF1.
- After 12 h hydration (as shown in Figure 1 and Graph 2)
  - The droplet size were much larger, 400 µm, as compare to 1 h hydration. CF1 showed less droplets but of larger size, where as CF2 had most frequent droplet size of about 200 µm.
  - As for volume distribution, CF1 occupied larger volume followed by CF2. EF with an anionic polymer produced more droplets but of a smaller droplet size, approximately 200 µm, thereby occupying less volume within the sample.

Graph 1. Image analysis 1h hydration



Graph 2. Image analysis 12h hydration

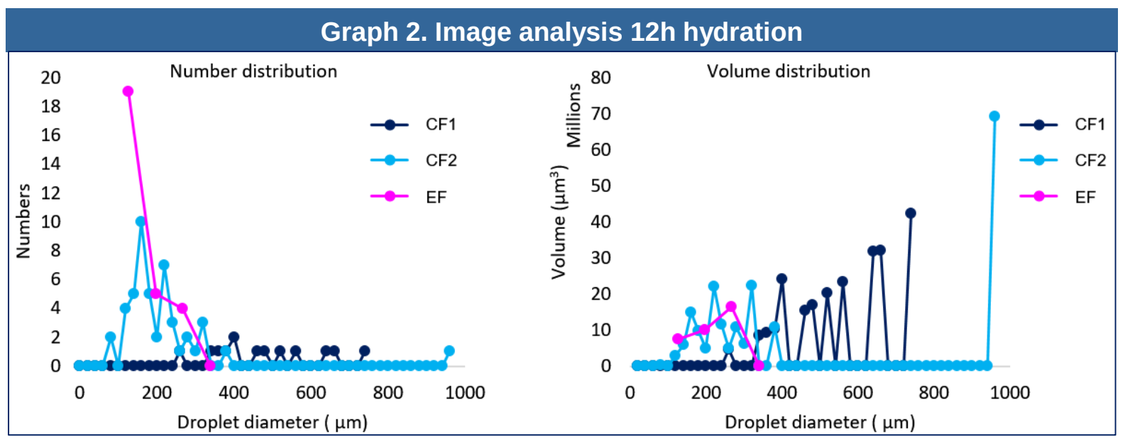
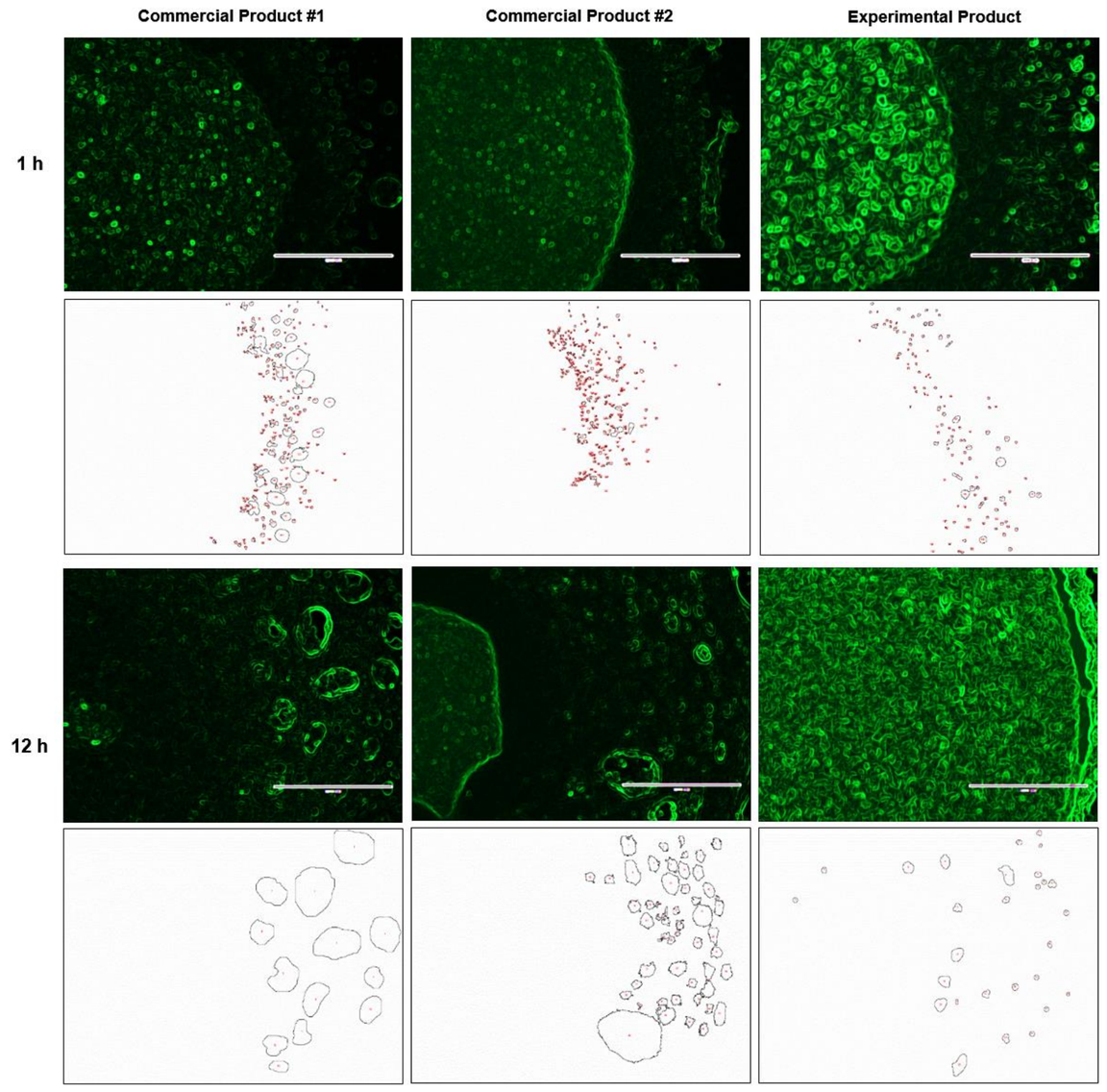
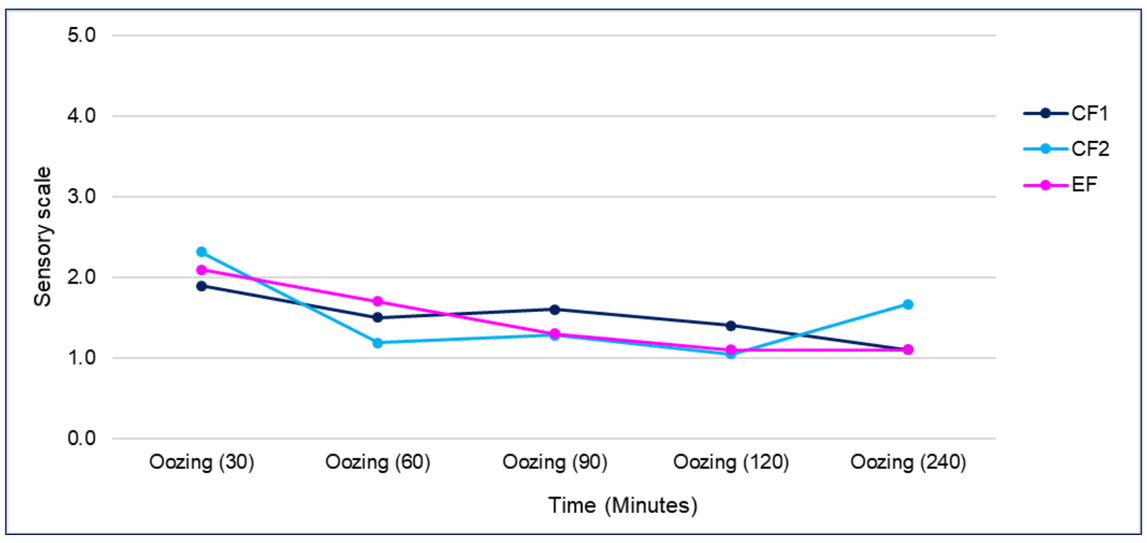


Figure 1. 1 h and 12 h Fluorescence microscopy hydration image of denture fixatives



Sensory study results:

- 'Oozing' lexicon was used to describe the mouthfeel associated with oil droplets being exuded from the edges of denture due to hydration over time.
- It was observed that the maximum mouthfeel of oozing was experienced in the first 90 mins of testing which gradually reduced by end of 240 mins (4 h).
- Oozing was experienced the most with CP1 followed by CP2 and least to no oozing for EF.



Conclusions

- Over a period of 12 hours, the hydration studies indicated that the oil phase of the formulations exuded from the edges as droplets, as the mucoadhesive polymers hydrated, resulting in a mouthfeel described as 'oozing' in the sensory study (determined with a panel of 25 fixative users).
- Furthermore, the size of the oil droplets also played a significant role in the mouthfeel experience of the fixative. The 'oozing' behaviour of the fixative was shown to be highly dependent on the dissolution rate of polymer.
- The addition of an anionic polymer into a fixative formulation was able to slowdown the rate of dissolution of the fixative resulting in controlled exudation of the oil droplets and an improved product usage experience.

References

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