

# HARDNESS AND ACID RESISTANCE OF THE PROTECTIVE LAYER FORMED ON DENTINE BY DESENSITISING TOOTHPASTES

Haleon Data on File; Report QD-RPT-118201; 2024; presented at IADR 2024 (New Orleans)

Sensodyne Clinical Repair with Novamin technology Forms a harder layer compared to certain other occluding technologies and that the reparative layer is also significantly more resistant to dietary acid challenge

## STUDY OBJECTIVE

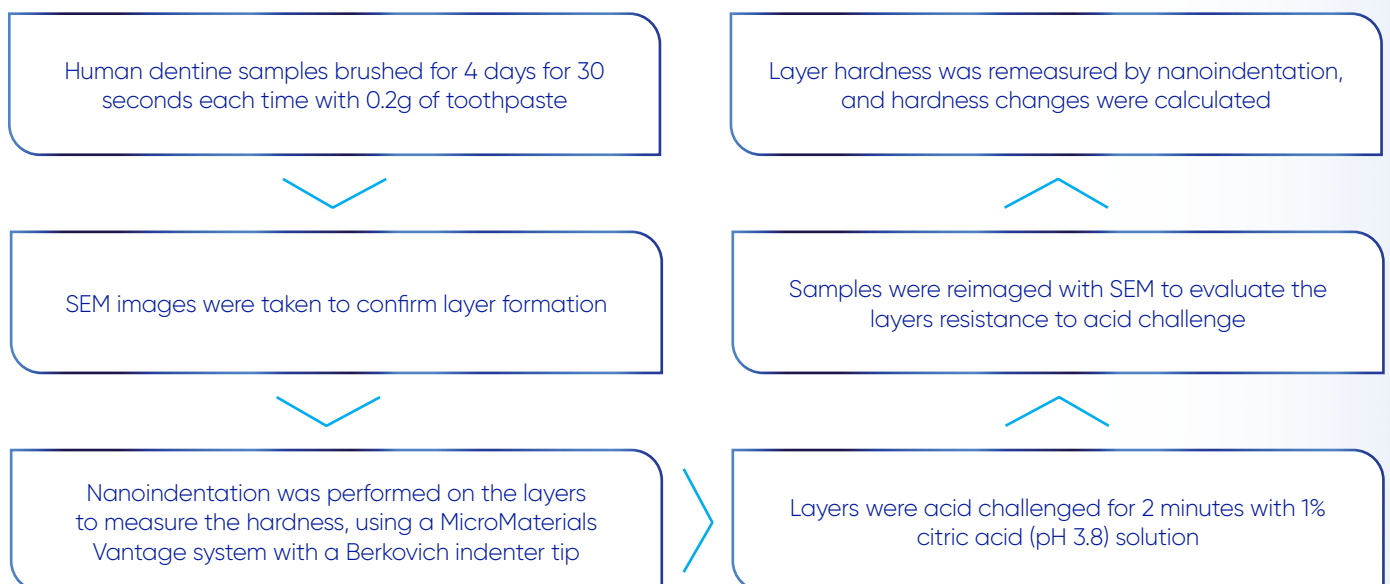
The study examined the nanomechanical properties of four desensitising toothpastes: Sensodyne Clinical Repair, Elmex Sensitive Professional Repair and Prevent, Medipair Sensitive and Colgate Sensitive Pro-Relief, using Artificial saliva as the control

## TEST PRODUCTS

Product (sourced May-June 2023)	Functional ingredient
Sensodyne Clinical Repair	5% Novamin, 0.315% sodium fluoride (1450ppm Fluoride)
Elmex Sensitive Professional Repair and Prevent (Germany)	8% Arginine, zinc, Sodium Mono- fluorophosphate (1450ppm Fluoride)
Colgate Sensitive Pro-Relief (Turkey)	8% Arginin, Sodium Mono-fluorophosphate (1450 ppm Fluoride)
Pepsodent Sensitive Mineral Active (India)	Calcium silicate and sodium phosphate, Sodium Mono-fluorophosphate (1000 ppm Fluoride)
Medipair Sensitive (China)	Bioactive glass ceramic (hydroxyapatite, tricalcium phosphate)
Control Artificial Saliva	N/A

## SAMPLE PREPARATION AND METHODOLOGY

- 25 human dentine blocks sectioned to 5 x 3.5mm with a final thickness of ~1mm, from root dentine
- Etched with 1% citric acid for 30 seconds to remove the smear layer and washed with deionised (DI) water for 1 minute
- Samples were then subjected to sample treatment as per the diagram below.

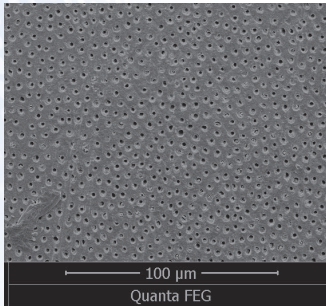


Load control nanoindentation was performed to 1.5 mN using a MicroMaterials Vantage system with a Berkovich indenter tip

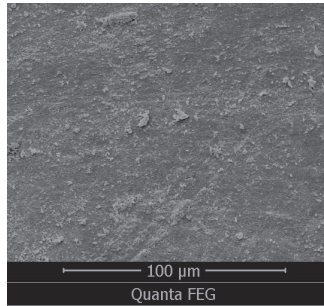
## RESULTS

### Before Acid Challenge

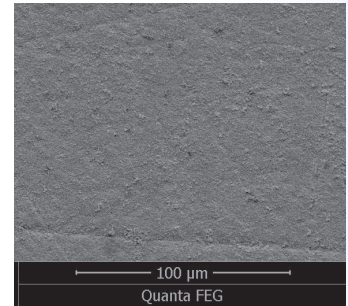
SEM images of dentine discs from five treatment groups, showed exposed open tubules in the control group and protective layer formation after 4 days of brushing with all tested dentifrices



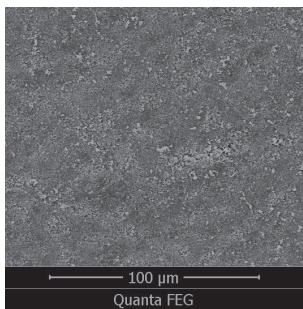
Artificial saliva control



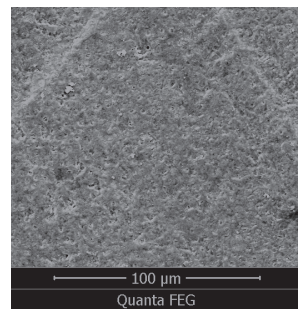
Sensodyne Clinical Repair



Medipair Sensitive



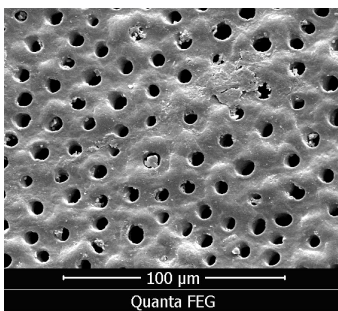
Colgate Sensitive Pro-Relief



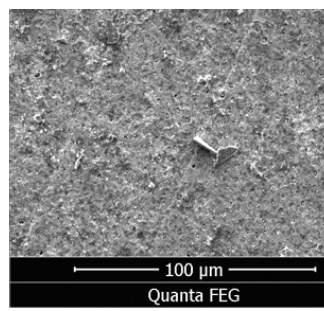
Elmex Sensitive Professional Repair and Prevent

### After Acid Challenge

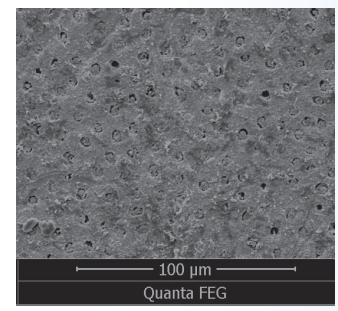
SEM images of dentine discs from five treatment groups after acid challenge show some reduction in occlusion by some of the toothpastes tested, and also the effect of acid on the dentine itself.



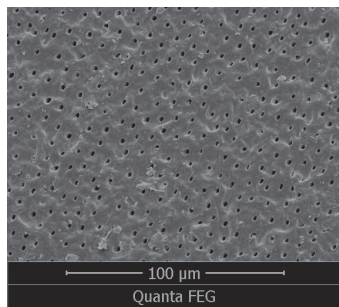
Artificial saliva control



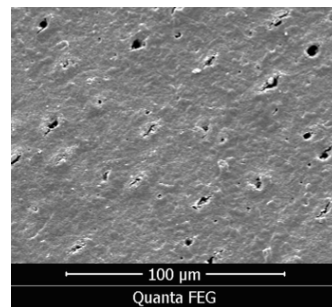
Sensodyne Clinical Repair



Medipair Sensitive



Colgate Sensitive Pro-Relief

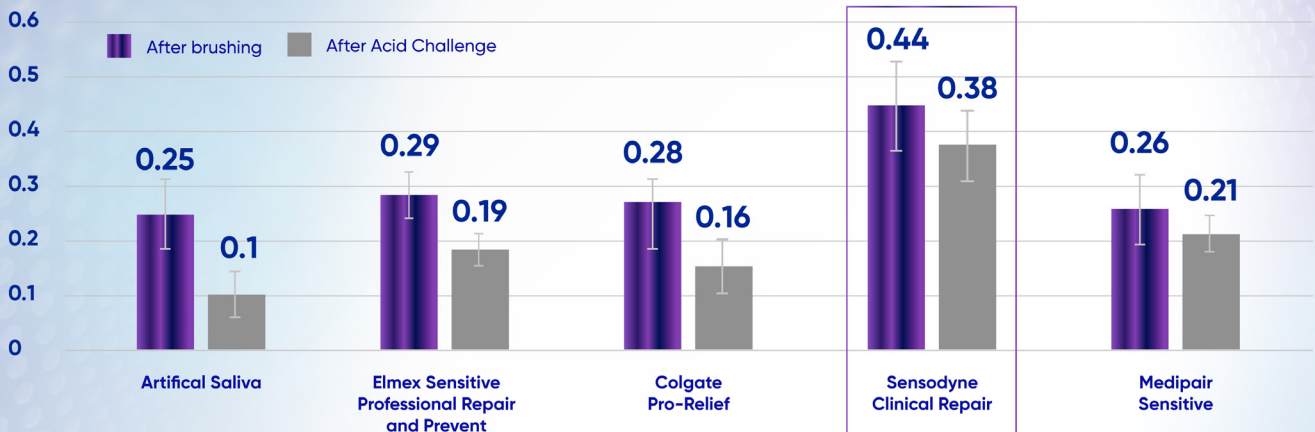


Elmex Sensitive Professional Repair and Prevent

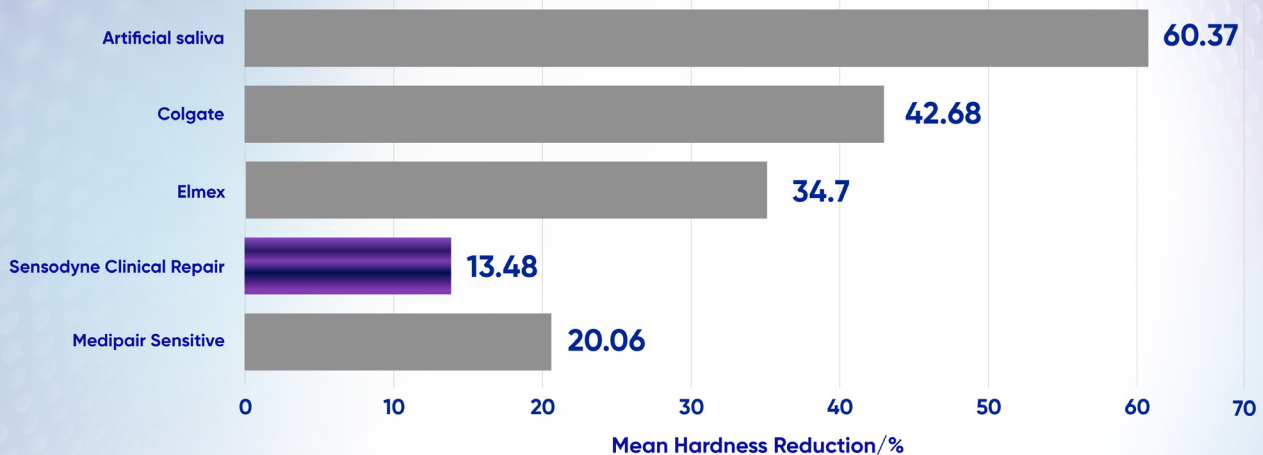
## RESULTS

- Sensodyne Clinical Repair produced a significantly harder layer ( $P \leq 0.05$ ), compared to other occluding technologies, with a hardness value of  $0.44 \pm 0.09 \text{ GPa}$ . This layer was 76% harder than the dentine control ( $0.25 \text{ GPa}$ ;  $P \leq 0.05$ )
- Hardness values were lower after the acid challenge for all groups however Sensodyne Clinical Repair had a significantly smaller reduction of 13.4% compared to dentine control (highest reduction 60%)
- Colgate Sensitive Pro-Relief had the second biggest drop in hardness of 42.8% followed by Elmex Sensitive Professional Repair and Prevent (34.4%) after the acid challenge

### Hardness of Occlusive Layers formed by desensitising toothpastes after brushing and acid challenge



### Percentage of Layer Hardness Reduction after Acid Challenge



## CONCLUSION

All 4-toothpastes used in this study occluded the dentine tubules by forming a layer over exposed dentine after 4 days of brushing. However, the mechanical properties of the layers were different. Sensodyne Clinical Repair containing Novamin formed a significantly harder layer compared to other occluding technologies. The layer formed by the Novamin was also the more acid resistant with a significantly lower hardness reduction percentage. Therefore, it may provide better protection against the mechanical, chemical, and abrasive challenges within the oral cavity