

# Benchmarking Hydraulic Conductance Study on Market Leading Sensitivity Toothpastes

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## Introduction

The two widely accepted modes of action for providing relief from dentine hypersensitivity are nerve depolarisation (i.e., potassium nitrate) and dentine tubule occlusion (i.e., Stannous fluoride, Bioglass).

Dentine tubule occlusion can be measured in vitro via Hydraulic Conductance which determines the reduction in fluid flow rate through dentine tubules.

There are extensive variety of sensitivity toothpastes available with different occluding technologies to reduce dentine hypersensitivity.

In this research the ability of leading sensitivity toothpastes across the global market to occlude dentine tubules in an in vitro Hydraulic Conductance model was evaluated.

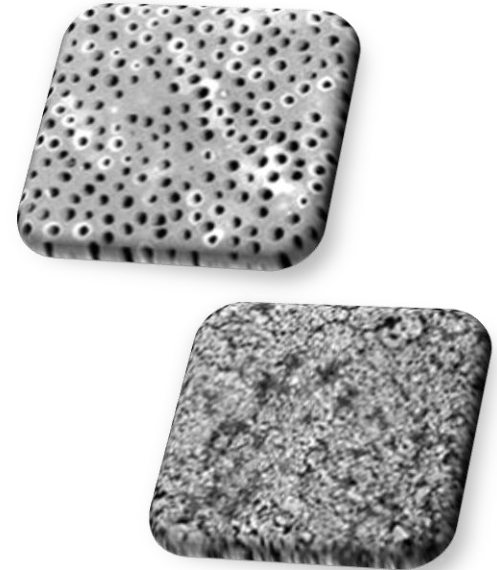


# Test Items

Product Name	Market	Technology	Aq / Non-Aq
Sensodyne Repair and Protect	UK	Novamin	Non-Aq
Sensodyne Complete Protection	USA	Stannous Fluoride	Non-Aq
Pepsodent Sensitive Mineral Expert Active	Indonesia	Active Remin Complex (Calcium Silicate & Sodium Phosphate)	Low Aq
Oral B Zahnfleisch & Schmelz Repair	DACH	Stannous (F & Cl), Zinc	Aq
Oral B Professional/ Zahnfleisch & Schmelz Pro- Repair	DACH	Stannous (F & Cl), Zinc	Low Aq
Elmex Sensitive Professional	DACH	Arginine	Aq
Colgate Total SF	USA	Stannous Fluoride	Aq
Crest Pro-Health	USA	Stannous (F & Cl)	Aq
Biorepair, Fluoride Free	Italy	Zinc Hydroxyapatite	Aq
Elmex Repair & Prevent	DACH	Zinc & Arginine	Aq
Oral B Sensitivity & GUM – CALM	UK	Stannous (F & Cl), Zinc	Aq
Colgate Total	Turkey	Zinc & Arginine	Low Aq
Oral B Pro Expert	Turkey	Stannous (F & Cl), Zinc	Low Aq
Sensodyne Fresh Impact	USA	Potassium Nitrate	Aq
Meridol	South Africa	Stannous Fluoride	Aq

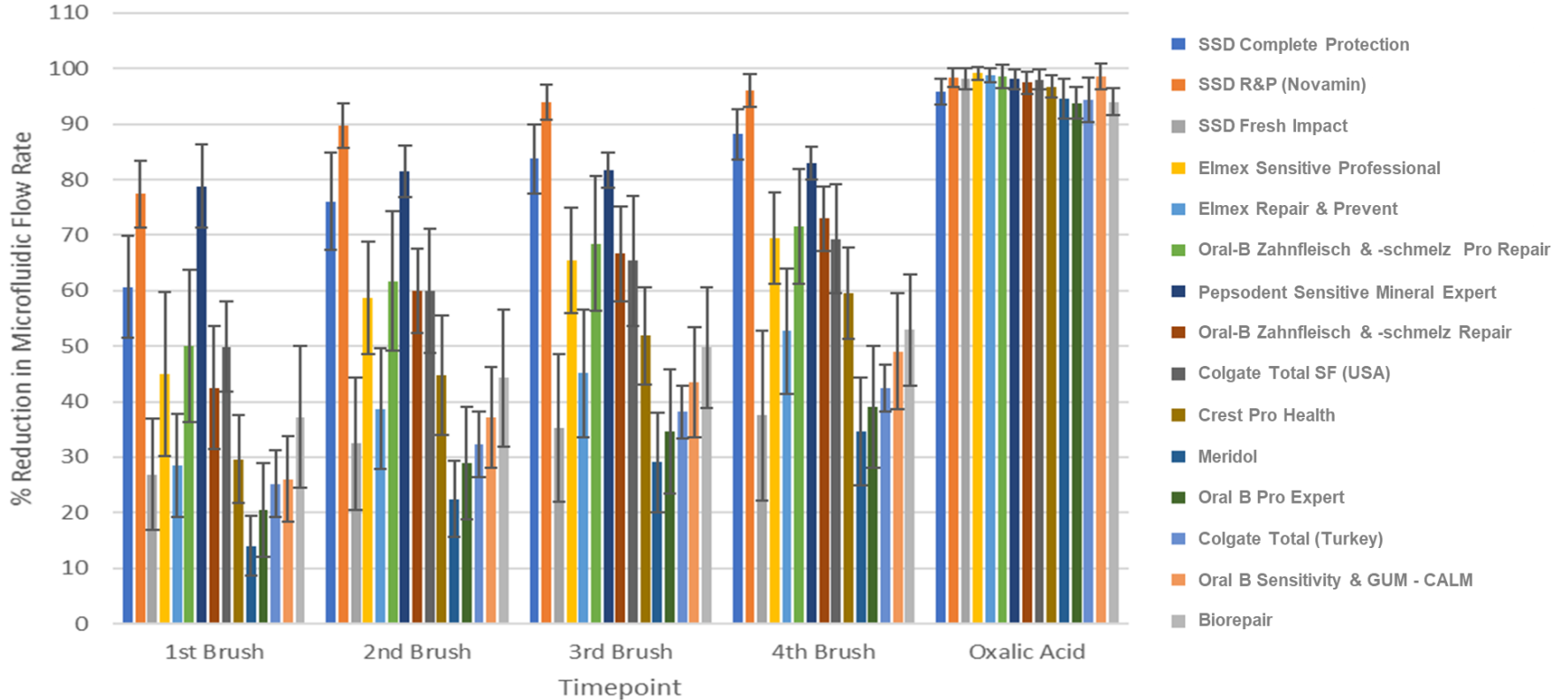
## Hydraulic Conductance (Acute Model)

- Study was performed via a real time HC model that uses a pressure controller using an air compressor, a microfluidic cell with a dentine disc and a digital flow sensor to accurately measure the flow rate of a physiological solution through the dentin disc.
- 8 dentine discs allocated for each test item and the baseline flow rate was measured through the prepared dentine discs for 5 min.
- Each toothpaste was tested by brushing the dentin disc with the toothpaste via 4 successive brushing steps and measuring the fluid flow rate after each brushing for 5 min.
- The flow rates after toothpaste application were then compared with baseline flow rate to give an indication about how well the toothpaste occludes the tubules.
- The flow rate is expressed as the hydraulic conductance of the dentine disc.
- Sensodyne Fresh Impact with potassium nitrate is a non-occluding toothpaste and used it this study as a negative control.



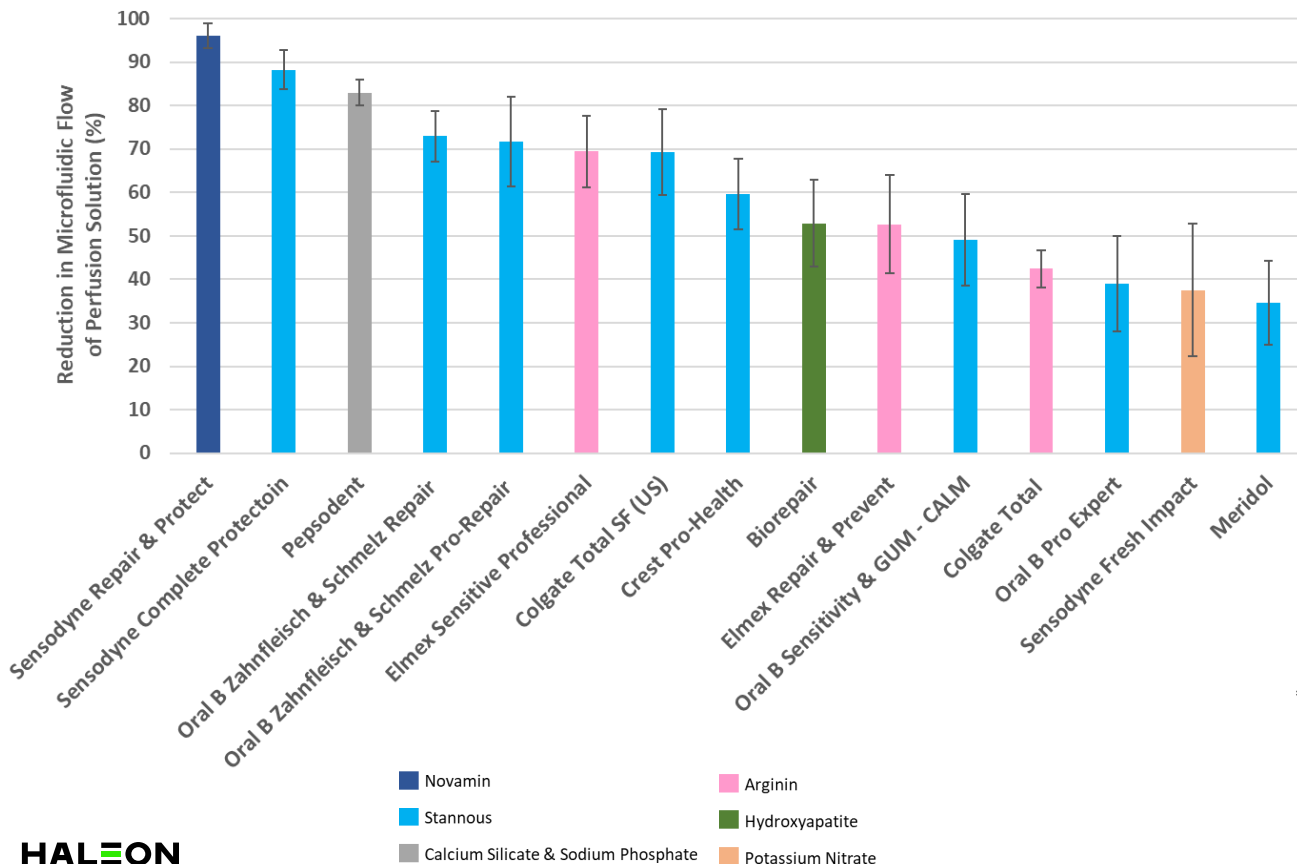
# Results

## Overview of 4 Brushings



# Results

## HC: 4th Brush

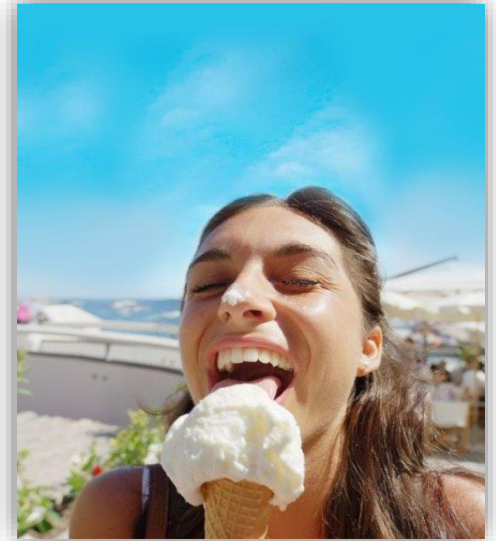


Product Name	Stat Grouping*
Sensodyne Repair and Protect	A
Sensodyne Complete Protection	B
Pepsodent Sensitive Mineral Expert Active	C
Oral B Zahnfleisch & Schmelz Repair	D
Oral B Professional/ Z & S Pro-Repair	D
Elmex Sensitive Professional	D
Colgate Total SF	D
Crest Pro-Health	E
Biorepair, Fluoride Free	E, F
Elmex Repair & Prevent	E, F
Oral B Sensitivity & GUM – CALM	F
Colgate Total	F,G
Oral B Pro Expert	F,G
Sensodyne Fresh Impact	F,G
Meridol	G

\*Products that do not share a letter are significantly different.

# Conclusion

- ❖ The study demonstrates that three toothpastes were significantly more effective in occluding dentine tubules than the rest of the toothpastes:
  - 1- Sensodyne Repair & Protect containing Novamin™ reduces the flow rate significantly (96.05%;  $p \leq 0.03$ ) more than other tested products.
  - 2- Sensodyne Complete Protection containing Stannous Fluoride shows the second best tubule occlusion in this study with 88.2% reduction in microfluidic flow rate.
  - 3- Pepsodent Sensitive with Active Remin Complex technology with 82.97% reduction in FFR.
- ❖ Non-Aqueous products seem to perform better than products that contain water.
- ❖ Results show a wide range of efficacy for products containing Stannous F/Cl which can be due to the impact of other ingredients in enhancing stannous to occlude efficiently or overall stability of the product.



# Thank you

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