# REMINERALISING LIGHT-CURABLE RESIN-BASED DESENSITISERS DOPED WITH BIOACTIVE MICRO-FILLERS

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## Introduction

**Dentin hypersensitivity is one of the major challenges in dental practice. The hydrodynamic theory explains the phenomena as the fluid flow in the exposed dentinal-tubules increases nerve stimulation of the pulp. Current treatments include tubular occlusion (e.g. oxalates); yet there is a clinical need for a long-term, acid-resistant, bioactive, therapeutic agent which could not only occlude but favour dentin remineralisation.**

## Objectives

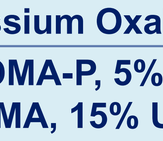
**Evaluating:**
**1) Hydraulic conductance of dentine**
**2) Remineralisation potential**
**Induced by experimental light-curing resin-based desensitisers containing bioactive glasses and calcium phosphates**

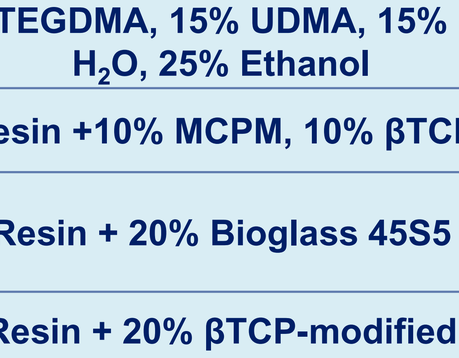
## Materials & Methods

| Material | Composition |
|---|---|
| Oxagel | Potassium Oxalate (Kota) |
| Control Resin | 15% GDMA-P, 5% HEMA, 15% TEGDMA, 15% UDMA, 15% $H_2O$, 25% Ethanol |
| Resin+Phosphates | Resin +10% MCPM, 10% βTCP |
| Resin+BAG | Resin + 20% Bioglass 45S5 |
| Resin+βPort | Resin + 20% βTCP-modified Portland cement |
| Resin+BAG-Zn | Resin + 20% Zinc-Polycarboxylated Bioglass 45S5 |

**30 Permanent Molars**

**1 mm Dentin Discs (n=5)**





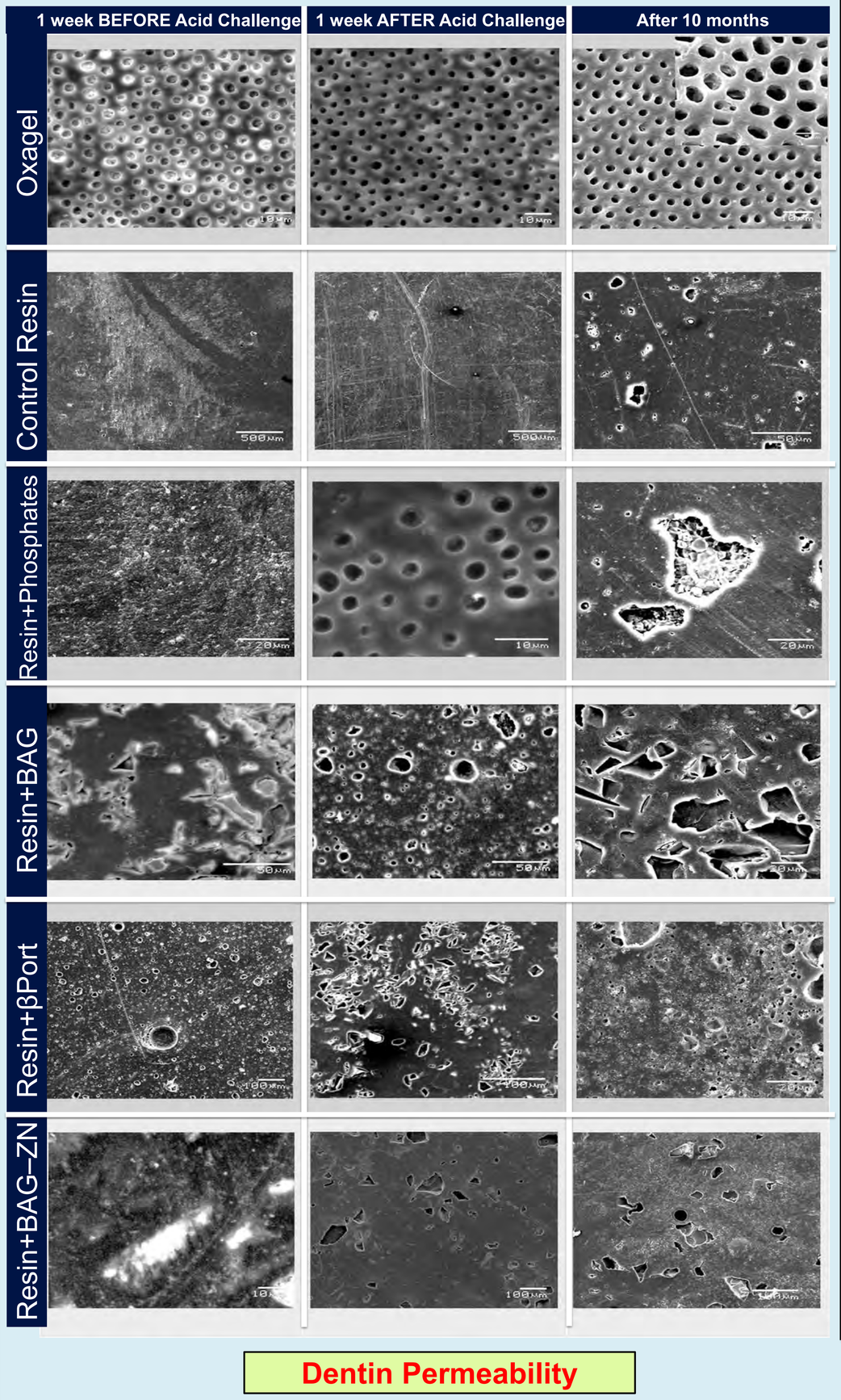

**Maximum Permeability**

**Application of Material**
- Oxagel
- Control Resin
- Resin+BAG
- Resin+BAG-Zn
- Resin+BPort
- Resin+Phosphates

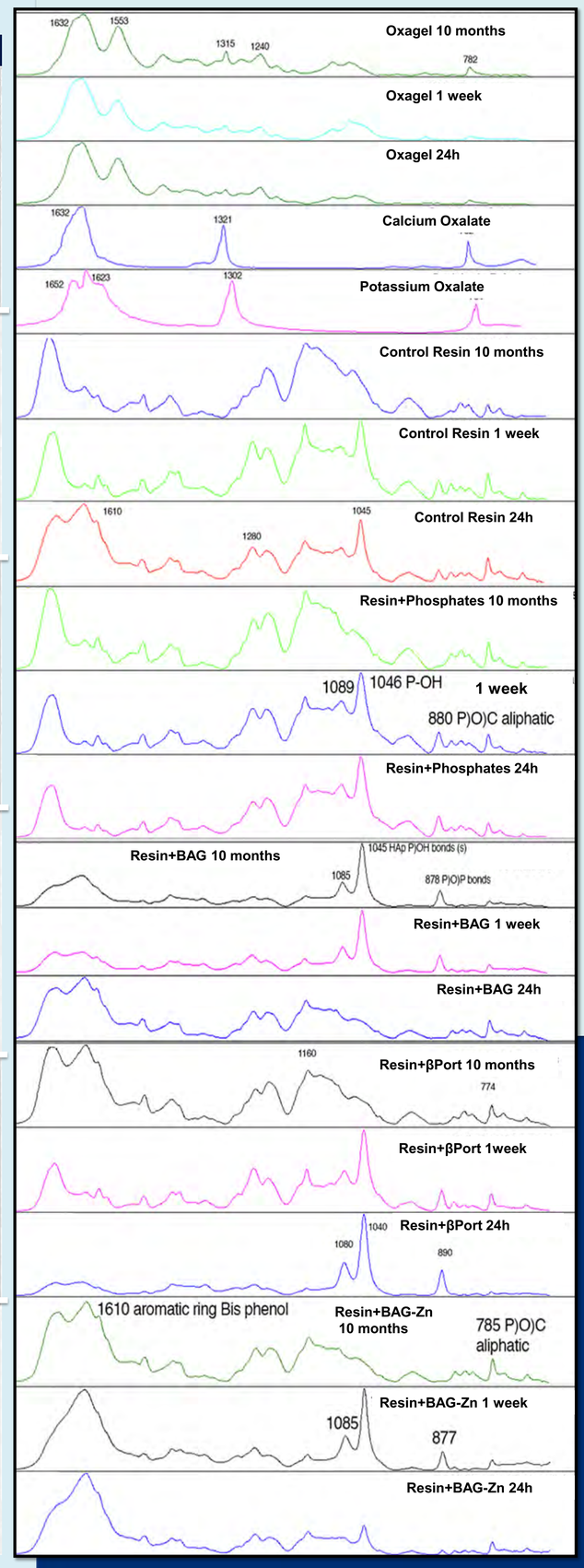
**Experiments:**
**1 week, 10 months before & after acid challenge**
- Dentin Permeability
- FTIR
- SEM

## Results

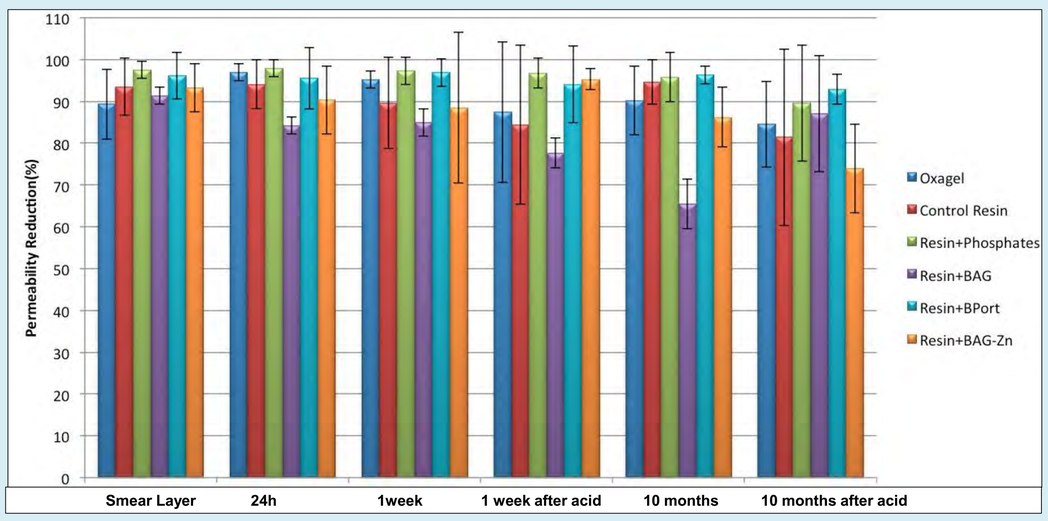
### SEM




### FTIR-ATR




### Dentin Permeability




**The outcomes analyzed by repeated measures ANOVA indicated a reduction in the initial permeability (>80%) for all treatments and this effect persisted after one week with no differences between the tested treatments ($p>0.05$). After 10 months storage, Oxagel, Resin-CTR, Resin-Phosphates and Resin-Beta maintained ($p>0.05$) their initial dentin permeability values whereas Resin-BAG and Resin-BAGZn demonstrated a significant increase in dentin permeability ($p<0.05$). FTIR-ATR analysis demonstrated that there was less mineral deposition after 10 months for all treatments, in particular following a citric acid challenge. However, both Resin-Beta and Resin-Phosphates were able to maintain some mineral calcium-phosphate (1040cm$^{-1}$) on the dentin surface. Resin-CTR demonstrated an important reduction of aromatic compounds (1610cm$^{-1}$) which suggested that polymer degradation occurred over time.**

## Conclusion

**In conclusion, it can be suggested that the light-curing experimental desensitisers doped with calcium phosphates or modified Portland cement are able to reduce dentin permeability similar to the Oxagel control values. However, these innovative systems may offer higher resistance to degradation of surface deposition in an acidic environment.**
**These bioactive desensitizers may also be able to remineralise the dentin via $Ca/PO_4$ mineral deposition.**