



Evaluation of topical therapeutic corneal tissue cross-linking using sodium hydroxymethylglycinate by intravital confocal microscopy in rabbit



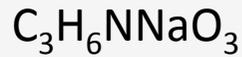
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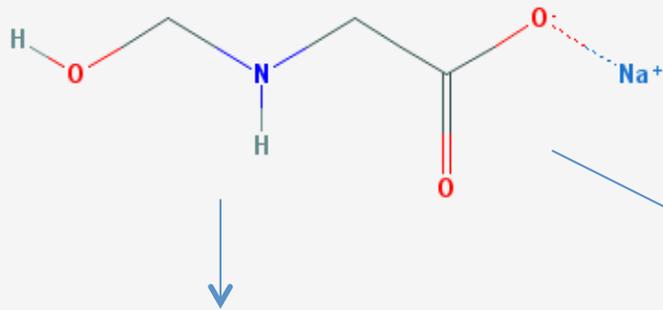
Introduction

In order to achieve better clinical results treating corneal ectasia
We are developing a practical treatment with chemical agent –
Sodium hydroxymethyl glycinate (SMG) using following **methods**:



- Glycine derivative
- Cosmetic Preservative
- Non-mutagenic
- Formaldehyde releaser

Sodium hydroxymethyl glycinate



Viscous eyedrops



Hydrogel Contact lens

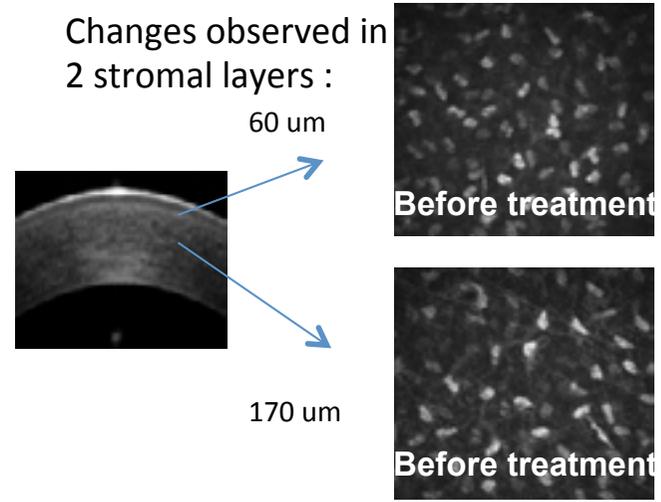
Despite the proven success of riboflavin photochemical (CXL) corneal stabilization in therapy of keratoconus several drawbacks remain. This study evaluates the use of a candidate topical therapeutic tissue cross-linking agent that is in current use as a cosmetic preservative



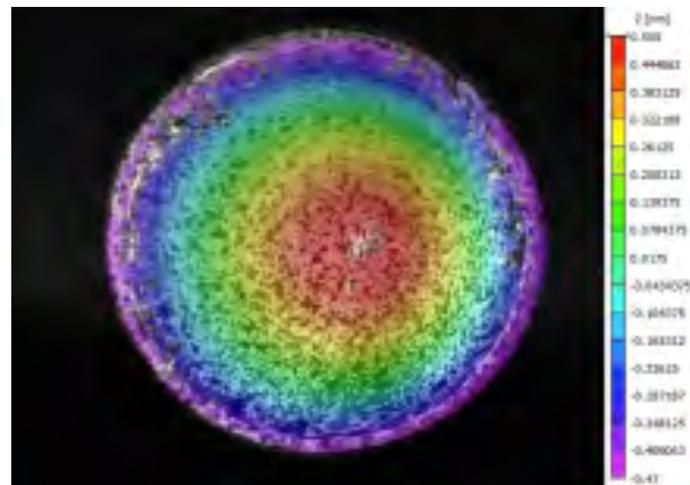
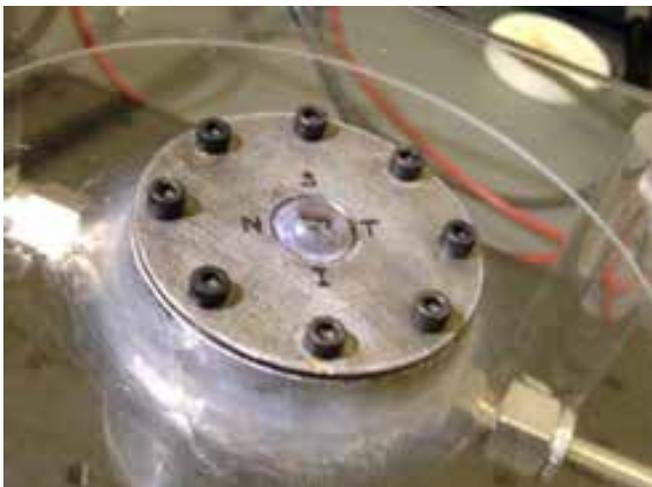
Vacuum reservoir solution

Effect of the treatment is evaluated with microscopy and biomechanical tests.

HRT-Rostock Cornea Module



Biomechanical (Inflation) testing

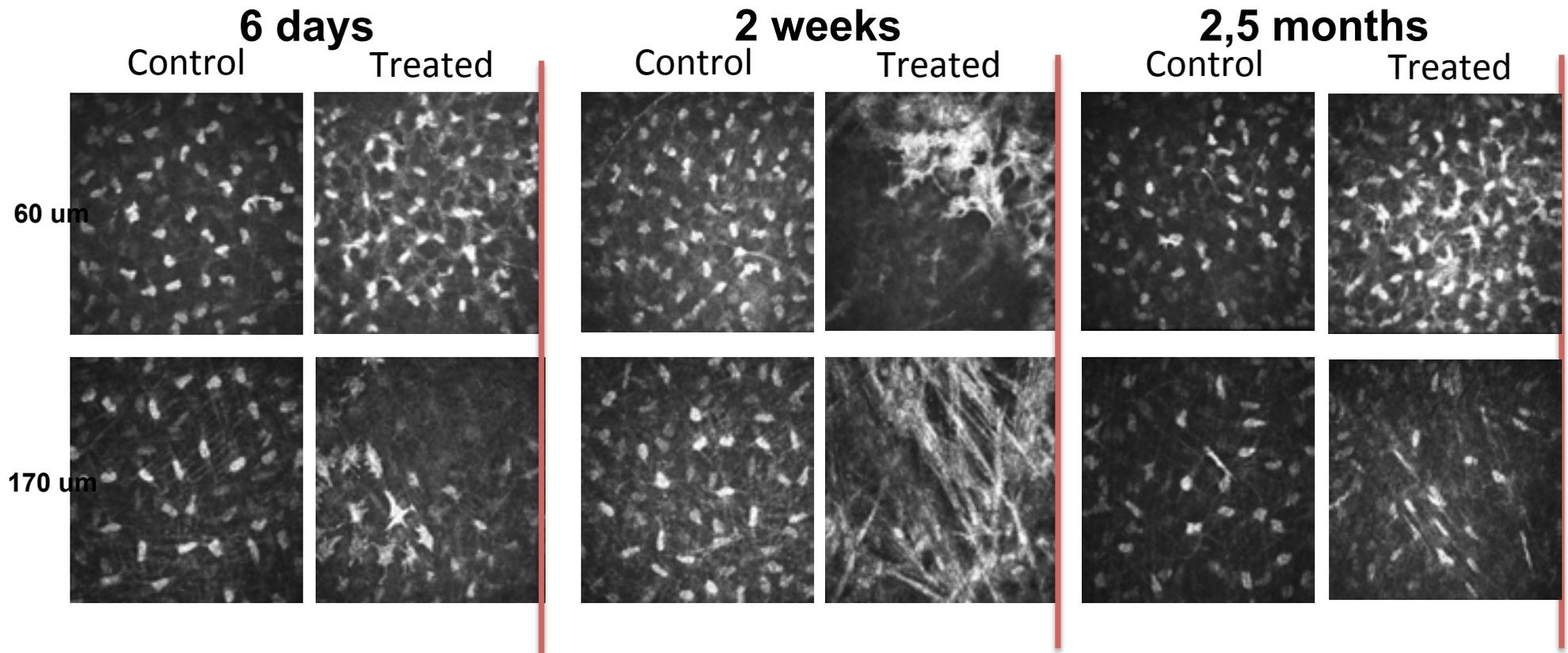


Measures corneal strength by inflation followed by topographic analysis

Changes in the cornea treated with reservoir are similar to CXL

The parameters for non-toxic cross-linking were defined [3% solution of SMG for 5 minutes]. Confocal microscopy identified 3 major patterns of keratocyte change:

- Anterior stromal keratocyte apoptosis occurred within the first few days of the initial treatment,
- Mid stromal keratocyte activation (spindle-like) occurred from weeks 1-3,
- Syncytial-like anterior stromal keratocyte activation occurred beginning at week 3.



Healing of the epithelial defect with and without treatment

Endothelial cell count

Before the treatment

3 days after the treatment

Viscous eyedrops (VE)



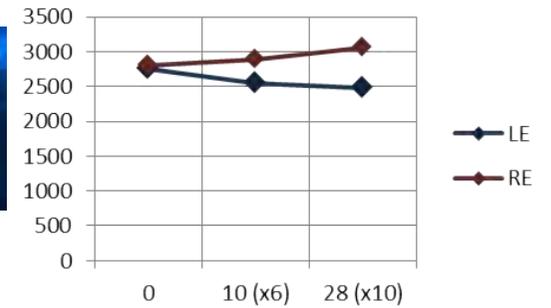
Control

Treated

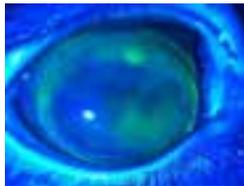


Control

Treated



Vacuum reservoir solution (CR)



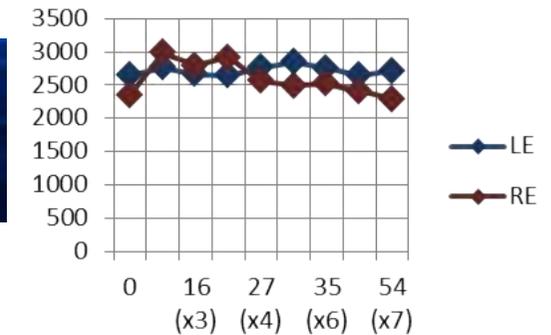
Control

Treated



Control

Treated



Hydrogel Contact lens (CL)



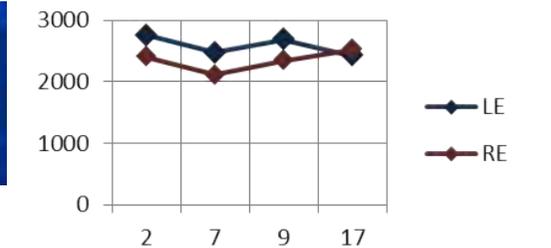
Control

Treated



Control

Treated



Biomechanical tests results are pending.

Our previous experiments showed that these treatment conditions promote crosslinking and increase strength of the cornea.

Corneal thickness, endothelial cell density, and epithelial defect changes were not significantly affected.

Conclusion

Topical application of a 3% SMG solution (for 5 minutes) via a corneal reservoir method appears to be safe to the rabbit cornea and induces a wound healing response in the corneal stroma. Similar changes by confocal microscopy have been reported for UVA-riboflavin therapy (CXL) albeit at later time points. This method holds promise for clinical use since neither epithelial debridement nor UVA irradiation are necessary



References

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