Extraction of hyaluronic acid and chondroitin sulfate from marine biomass for their application in the treatment of the dry eye disease

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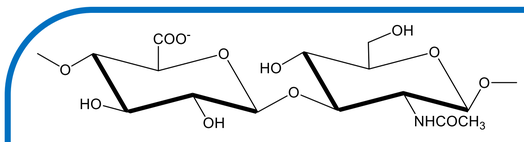
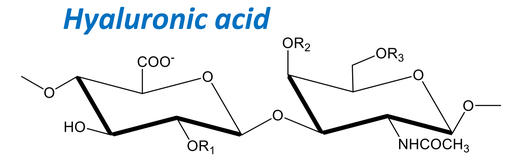
INTRODUCTION

Hyaluronic Acid (HA) and **Chondroitin Sulfate (CS)** have shown improvements in the corneal epithelial barrier in patients with **Dry Eye Disease (DED)**[2]. They are used in pharmaceutical applications due to their biocompatibility, viscoelasticity, lubricity and immunostimulatory effects. In this study, they are extracted from **marine wastes** using **natural, green and novel solvent systems** to replace time-consuming and expensive conventional methods and maintaining the quality and purity of the isolated HA and CS. The solvent systems are based on **natural terpenes** with therapeutic effects. HA, CS and the terpene-based solvent systems will be evaluated for DED treatment[3,4].

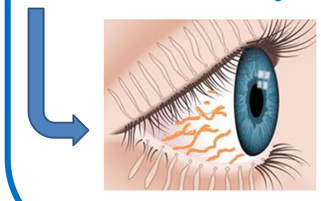
AIM



Hyaluronic acid



Chondroitin sulfate



Dry eye

Improved symptoms of DED

METHODS

1. Solvent systems preparation

Combinations of Menthol, Camphor, Thymol & Borneol → Heating & Stirring → Natural Solvent Systems

2. Extraction from marine by-products

Codfish bones; Mussels; Tuna vitreous humour → Marine by-products + Natural Solvent Systems → Dissolved HA/CS

3. HA and CS precipitation

Solvents + HA/CS + Anti-solvent: Ethanol → Precipitated HA/CS

4. Bio-assays

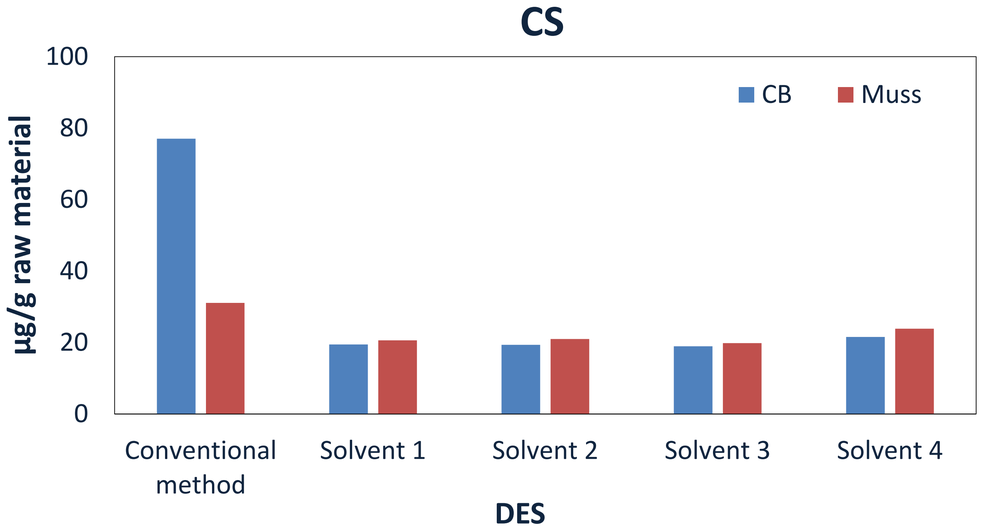
In vitro studies on conjunctival, corneal and epithelial human cell lines of the therapeutic mixture of the solvents + HA/CS & the isolated HA/CS

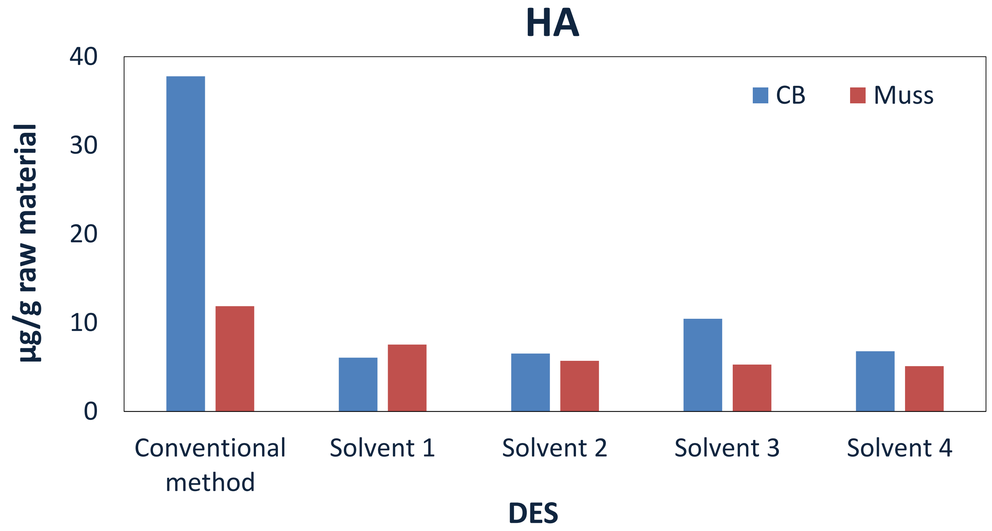
Solvents + HA/CS; Precipitated HA/CS →

- **Cytotoxicity**
- **Muco-adhesion**
- **Anti-oxidant activity**
- **Cellular uptake**
- **Anti-inflammatory effect**

RESULTS

Quantification of HA and CS disaccharides using HPLC and Capillary Electrophoresis





CONCLUSION

HA and CS are efficiently extracted from marine sources using a novel, green and low-cost technique by their dissolution in terpene-based solvent systems. HA and CS as well as the terpene solvent systems are currently being tested to assess their safety and applicability in the dry eye disease treatment.

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