REPAIRING PARCHMENT USING HYDROGELS: INCORPORATING CROSSLINKERS TO INCREASE THE STRENGTH OF REPAIR AS MEASURED BY ULTIMATE TENSILE STRENGTH (UTS)

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- it under tension
- storing information
- humidity, temperature, mold, and/or microbes/bacteria
- fibers of Japanese tissue, (3) parchment shavings, and (4) materials derived from hides such as parchment glue, gelatin, acid-soluble collagen, and tropocollagen have previously been used to repair parchment

- Investigate a range of solvents, particles, and crosslinkers to
- application of the hydrogels



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Discussion

After varying the concentrations of the different particles, ethanol/water, and the crosslinker, the gelatin hydrogel with the crosslinker had the highest number of parchment samples that were repaired The 4% gelatin hydrogel with the addition of the crosslinker glutaraldehyde demonstrated the highest average UTS of 14.0 MPa, which is similar to other currently accepted repair methods (20.6 MPa) The new parchment had a point of failure at 59.6 N/mm², while the parchment repaired with the gelatin and crosslinker hydrogel failed at 9.7 N/mm²

Conclusions

- Applying the different hydrogels with a pipette and adding the crosslinker with a cotton swab on the edges of the tear allowed the hydrogel formulations to absorb into the collagen fibers, which resulted in the method with the highest average UTS
- 4% w/v gelatin, 0.2% w/v glutaraldehyde hydrogel resulted in the highest average UTS of 14.7 MPa
- Gelatin was observed to cause staining, discoloration, and a glossy appearance on the parchment; decreasing the volume of the gelatin hydrogel from 10µL to 5µL decreased but did not completely remove the staining
- **Future Directions:**
 - Testing the repairs on older damaged parchment
 - Testing hydrogel formulations composed of both gelatin and collagen
 - Repairing parchment with various other damages such as humidity or microbial degradation
- Fig 2. Torn goatskin parchment after applying a 4% w/v gelatin, 0.2% w/v glutaraldehyde, 50% v/v ethanol, 50% v/v water hydrogel (5x magnification)

– – C w/o c + & - stdev

2% Collagen w/o

2% Collagen w/

0.025

2% Alginate w/

References

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