Quantity and Conformation of Lysozyme Deposited on Conventional and Silicone Hydrogel Contact Lens Materials Using an in vitro Model

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Introduction & Purpose
- Protein deposits can result in discomfort, reduced visual acuity and giant papillary conjunctivitis. 1-4
- Silicone hydrogel (SH) lenses exhibit differing deposition profiles to those seen with conventional lenses. 1-5
- In our previous work investigating protein deposition on SH materials, we have used an extraction buffer developed by Keith and colleagues. 6 However, this buffer is not compatible with all SH materials (data on file).
- The purpose of this study was to:
  - determine the quantity and activity of hen egg lysozyme (HEL) deposited on conventional and SH materials using an in vitro model.
  - investigate the ability (and compatibility) of a new modified extraction buffer consisting of 50:50 acetonitrile:0.02% trifluoroacetic acid to extract protein from certain SH contact lens materials.

Methods & Materials
- Conventional Materials:
  - Acuvue® 2 - Etafilcon A; Group I; AA
  - Proclear® - Omfalicon A; Group II; PC
- SH Materials:
  - Acuvue® Advance™ - Galyfilcon A; Group I; AA
  - Acuvue® OASYS™ - Senofilcon A; Group I; AO
  - Focus® Night & Day™ - Lottafilcon A; Group I; FND
  - O2 Optix™ - Lottafilcon B; Group I; O2
  - PureVision™ - Balafilcon A; Group III; PV
- Lenses (n=6) were doped in vitro in PBS (pH 7.4) containing HEL (Sigma; 2mg/ml) for 17 days at 37°C with constant shaking.
- Following doping, lenses were rinsed briefly with 1X PBS to remove any residual HEL.
- Rinsed lenses were placed in Kimble vials filled with the extraction buffer, as seen in Table 1.

Results
- Lysozyme deposited on AV2 exhibited the greatest activity (91±5%) and this was statistically different from all other lens types (p<0.001), as shown in Figure 3.
- The lowest activity of the lysozyme deposited was found on FND (24±11%), and O2 (23±11%). Lysozyme deposited on other lens materials exhibited intermediate activity (AA, 60±15; AO, 51±9; PV, 58±8, and PC, 38±3%).
- In terms of total lysozyme accumulation, AV2 showed the most, with 1800μg, PC and PV the next with 68μg and 44μg respectively. FND deposited the least, with 2μg. AO, O2, and AA accumulated similar amounts of lysozyme, approximately 6-9μg, as shown in Figure 4.

Conclusions
- Silicone hydrogels deposit lower amounts of lysozyme than either conventional Group II (PC) or Group IV (AV2) lenses, and the level of lysozyme denaturation varies with the composition of the SH material.

References

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Table 1: Optimal extraction buffer and volumes

<table>
<thead>
<tr>
<th>Lens</th>
<th>Buffer</th>
<th>Volume (ml)</th>
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</thead>
<tbody>
<tr>
<td>Acuvue 2</td>
<td>A20 9.2% TFA</td>
<td>4</td>
</tr>
<tr>
<td>PureOptix</td>
<td>A20 9.2% TFA</td>
<td>10</td>
</tr>
<tr>
<td>Focus Night</td>
<td>A20 9.2% TFA</td>
<td>10</td>
</tr>
<tr>
<td>60 Optix</td>
<td>A20 9.2% TFA</td>
<td>10</td>
</tr>
<tr>
<td>Acuvue Advance</td>
<td>A20 9.2% TFA</td>
<td>10</td>
</tr>
<tr>
<td>Acuvue OASYS</td>
<td>A20 9.2% TFA</td>
<td>10</td>
</tr>
<tr>
<td>Proclear</td>
<td>A20 9.2% TFA</td>
<td>10</td>
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