Introduction

- The uptake and release of biocides from contact lens (CL) materials has been linked to microbial keratitis and potential cytotoxic responses.1,2
- Myristamidopropyl dimethylamine (MAP-D) is used as an antifungal and antiprotzoal agent in Alcon’s Opti-Free products (Aldox®).3
- Several studies have assessed the uptake and release of MAP-D and other biocide components from CL materials using HPLC techniques.4,5,6
- However, HPLC is time consuming and can have relatively low sensitivity.

Purpose

- The purpose of this study was to assess the uptake and release of radiolabeled MAP-D on soft reusable CL materials over 7 days.

Methods

- Three silicone hydrogel (SH) materials (lotrafilcon A, balafilcon A, senofilcon A) and two conventional hydrogel (CH) materials (omafilcon A, etafilcon A) were tested.
- PBS (ISO 18369-3); radioactive 14C (Moravek Inc., California, USA); MAP-D (5µg/mL) were used.
- Experiment 1 (N = 4 per material) assessed the 24-hr uptake and release kinetics of MAP-D from CLs.
  - incubation period of 8 hours followed by a release period of 24 hours in 2 mL PBS.
  - Aliquots at 1, 0.25, 0.5, 1, 2, 4, 8, 24 hours.
- Experiment 2 (N = 3 per material) assessed the uptake and release of MAP-D from CLs over a 7-day period.
  - CLs incubated in fresh 2 mL MAP-D solution for 8 hours followed by a 16-hour release in PBS.
  - An extraction of MAP-D from the lenses used hexane:isopropanol and chloroform:methanol.
  - Added the samples to scintillation fluor (PerkinElmer, USA) and counted the radioactive signal (Beckman Coulter, CA).
  - Radioactive counts per minute (CPM) was converted to µg based on a standard curve.

Results

Table 1. Summary of results for experiment 1

<table>
<thead>
<tr>
<th>Lens type</th>
<th>Total uptake (mean±SD) (µg)</th>
<th>Total release (mean±SD) (µg)</th>
<th>Extraction amount (mean±SD) (µg)</th>
<th>Percent release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lotrafilcon B</td>
<td>6.32±0.14</td>
<td>0.67±0.04</td>
<td>5.80±0.14</td>
<td>11%</td>
</tr>
<tr>
<td>Balafilcon A</td>
<td>6.13±0.38</td>
<td>0.55±0.03</td>
<td>5.73±0.09</td>
<td>9%</td>
</tr>
<tr>
<td>Senofilcon A</td>
<td>6.45±0.21</td>
<td>0.57±0.02</td>
<td>6.05±0.04</td>
<td>9%</td>
</tr>
<tr>
<td>Etafilcon A</td>
<td>4.00±0.55</td>
<td>1.66±0.11</td>
<td>2.49±0.04</td>
<td>42%</td>
</tr>
<tr>
<td>Omafilcon A</td>
<td>2.45±0.04</td>
<td>1.78±0.03</td>
<td>0.82±0.04</td>
<td>73%</td>
</tr>
</tbody>
</table>

Figure 1. Release kinetics of MAP-D over a 24-hour period (mean±SD).

Table 2. Summary of results for experiment 2

<table>
<thead>
<tr>
<th>Lens type</th>
<th>Total uptake (mean±SD) (µg)</th>
<th>Total release (mean±SD) (µg)</th>
<th>Extraction amount (mean±SD) (µg)</th>
<th>Percent release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lotrafilcon B</td>
<td>44.05±10.63</td>
<td>10.15±0.49</td>
<td>33.90±0.90</td>
<td>25%</td>
</tr>
<tr>
<td>Balafilcon A</td>
<td>43.55±1.08</td>
<td>8.11±0.53</td>
<td>35.44±0.19</td>
<td>19%</td>
</tr>
<tr>
<td>Senofilcon A</td>
<td>42.57±1.20</td>
<td>6.00±0.43</td>
<td>34.57±0.19</td>
<td>19%</td>
</tr>
<tr>
<td>Etafilcon A</td>
<td>26.88±0.57</td>
<td>21.44±0.71</td>
<td>5.44±0.44</td>
<td>20%</td>
</tr>
<tr>
<td>Omafilcon A</td>
<td>18.85±0.42</td>
<td>17.60±0.36</td>
<td>1.25±0.04</td>
<td>93%</td>
</tr>
</tbody>
</table>

Figure 2. Release kinetics of MAP-D over a 24-hour period (mean±SD).

Conclusions

- Radioactive labelling offers a highly sensitive and accurate technique to measure uptake and release of biocides from CL materials.
- Etafilcon A sorbed less MAP-D than the SH materials, but released a greater amount and percentage of MAP-D that was sorbed.
- The surface chemistry of the SH materials may not have a major impact on the sorption of MAP-D.
- The uptake and release kinetics of MAP-D may be driven by the siloxane content within the CL materials.

References


Disclosures

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