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Location of non-polar lipids in monthly replacement silicone hydrogel contact lens materials

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Purpose: The integration of a cholesterol ester (CE)-based fluorescent probe into silicone hydrogel (SiHy) contact lens (CL) materials using a confocal laser scanning microscopy (CLSM) technique was investigated under conditions that mimic a monthly daily wear regimen.

Method: Four SiHy CL materials (senofilcon C, lotrafilcon B, comfilcon A and samfilcon A) were incubated in an artificial tear solution (ATS) for different time points, ranging from 16 hours (h) to 30 days. Daily wear was simulated by incubating CLs in consecutive, alternating cycles of fresh ATS (16 h) followed by an 8h cleaning in OptiFree Puremoist. ATS with trace amounts of NBD-6 Cholesterol (CE-NBD, Avanti, 810251) was used. After each time point, CLs were examined by CLSM to map the distribution of CE-NBD through the CL.

Results: CE-NBD exhibited different patterns of integration, depending on the lens type. The integration of CE-NBD was homogenous from the anterior to posterior surface in senofilcon C and comfilcon A, at all time-points. However, CE-NBD localization was heterogeneous in lotrafilcon B and samfilcon A, with greater amounts at the surface. As the total amount of CE-NBD increased over time in these latter two CLs, the difference in concentration between the surface and bulk decreased. By 30 days, CE-NBD had established a homogenous distribution in lotrafilcon B.

Conclusions: CE-NBD lipid distribution throughout CLs varied with lipid type, lens material chemistry and exposure time. Among the 4 materials examined, CE-NBD showed a homogenous distribution from the anterior to the posterior surface most rapidly for senofilcon C and comfilcon A. These differing patterns of lipid integration may impact lens performance over time.

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