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Equivalences between refractive index and equilibrium water content of conventional and silicone hydrogel soft contact lenses from automated and manual refractometry[†]

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KEYWORDS

Atago N-2E • CLR 12-70 • conventional soft contact lenses • equilibrium water content • refractive index • refractometry • silicone hydrogel • sucrose • Brix scale.

ABSTRACT

Purpose

The purpose of the present study was to develop mathematical relationships that allow

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obtaining equilibrium water content and refractive index of conventional and silicone hydrogel soft contact lenses from refractive index measures obtained with automated refractometry or equilibrium water content measures derived from manual refractometry, respectively.

Methods

Twelve HEMA-based hydrogels of different hydration and four siloxane-based polymers were assayed. A manual refractometer and a digital refractometer were used. Polynomial models obtained from the sucrose curves of equilibrium water content against refractive index and vice-versa were used either considering the whole range of sucrose concentrations (16-100% equilibrium water content) or a range confined to the equilibrium water content of current soft contact lenses (~20-80% equilibrium water content).

Results

Values of equilibrium water content measured with the Atago N-2E and those derived from the refractive index measurement with CLR 12-70 by the applications of sucrose-based models displayed a strong linear correlation ($r^2 = 0.978$). The same correlations were obtained when the models are applied to obtain refractive index values from the Atago N-2E and compared with those (values) given by the CLR 12-70 ($r^2 = 0.978$). No significantly different results are obtained between models derived from the whole range of the sucrose solution or the model limited to the normal range of soft contact lens hydration.

Conclusions

Present results will have implications for future experimental and clinical research regarding normal hydration and dehydration experiments with hydrogel polymers, and particularly in the field of contact lenses. © 2006 Wiley Periodicals, Inc. J Biomed Mater Res Part B: Appl Biomater, 2006

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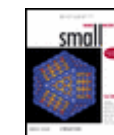


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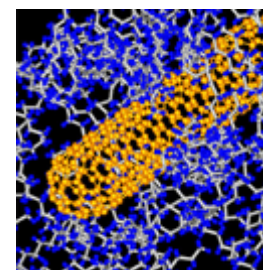
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