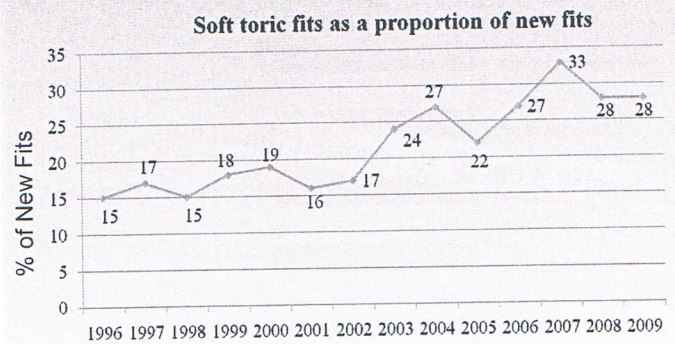


Cutting edge toric contact lens research – taking a turn for the better

I Pyzer FBDO(Hons)CL FIACLE

Growth in toric soft lens prescribing



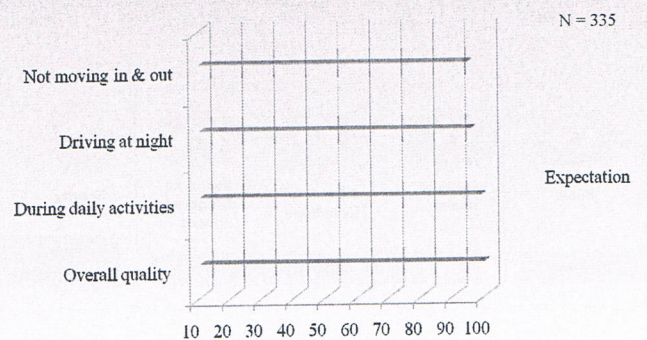
Morgan P. Trend in UK contact lens prescribing 2009. Optician 2009;237:8205 20-21.

Are soft torics meeting patients expectations, or...



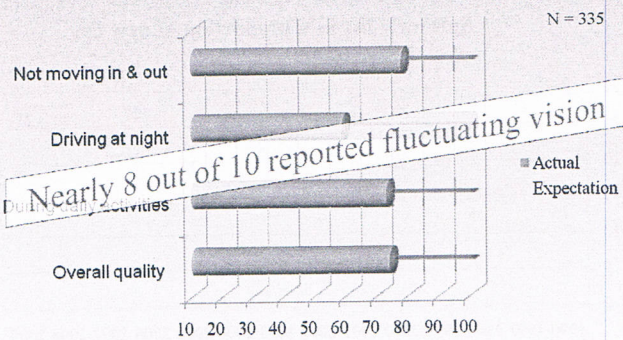
.....is it more often a near miss??!

Meeting expectations - vision?



How satisfied are patients with current soft toric contact lenses. AVO 2004

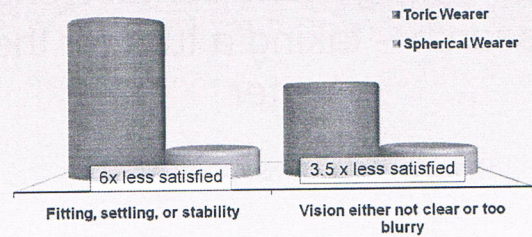
Meeting expectations - vision?



How satisfied are patients with current soft toric contact lenses. AAO 2004

Meeting expectations - vision?

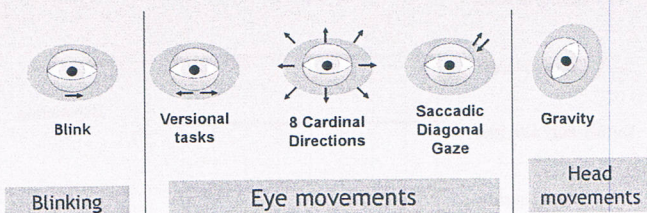
Visual satisfaction spherical vs toric lens wearers in their current lenses^{a,b}



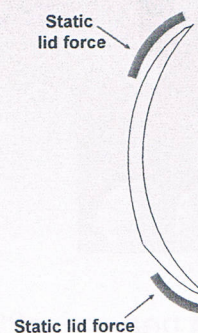
^aAssignment Consumer Awareness and Usage Study, Bruno and Ridgeway Research Associates Inc, March 2007

^bSignificantly statistical difference at 90% confidence level.

Reasons for toric lens instability



Static forces acting on a toric soft lens

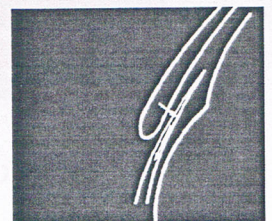


The Watermelon Seed Principle

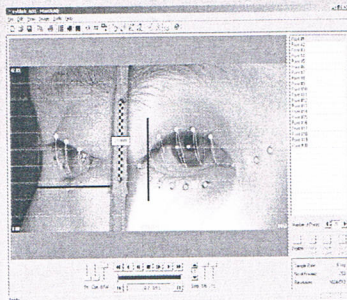
Upper lid pressure applied to the prism ballast wedge follows the "watermelon seed" principle of load more mass away from the water eye.

By Anthony J. Hinkle, B. Optom, F.A.A.O.

For a toric lens to provide a toric prism ballast wedge, it is important that the lens be understood as the "watermelon seed" principle. Such an understanding is helpful in ensuring the lens is positioned correctly and that the lens is not too large or too small.



Dynamic forces acting on a toric soft lens

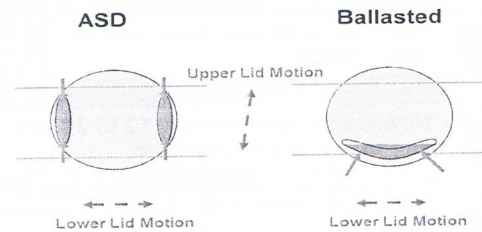


Queensland University of Technology Australia

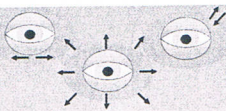


Dynamic forces acting on a toric lens: ASD vs Prism ballast

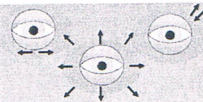
Blink



For illustrative purposes



Eye Movement

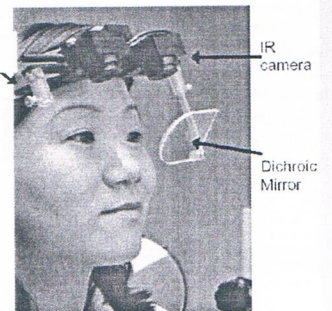


Eye movements – Zikos study

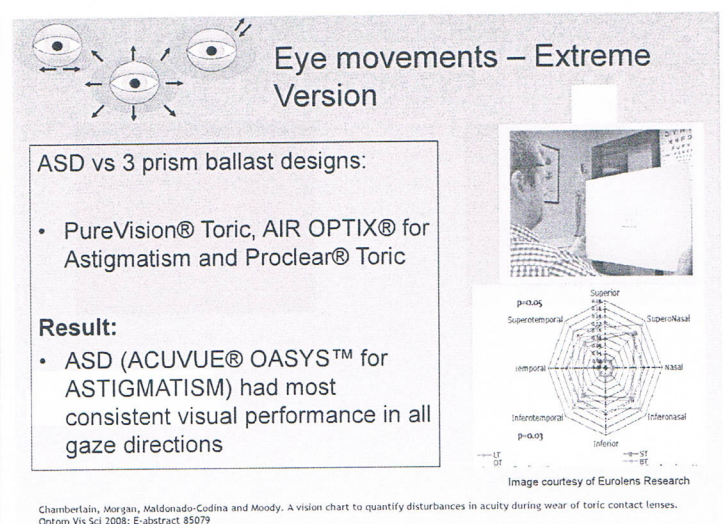
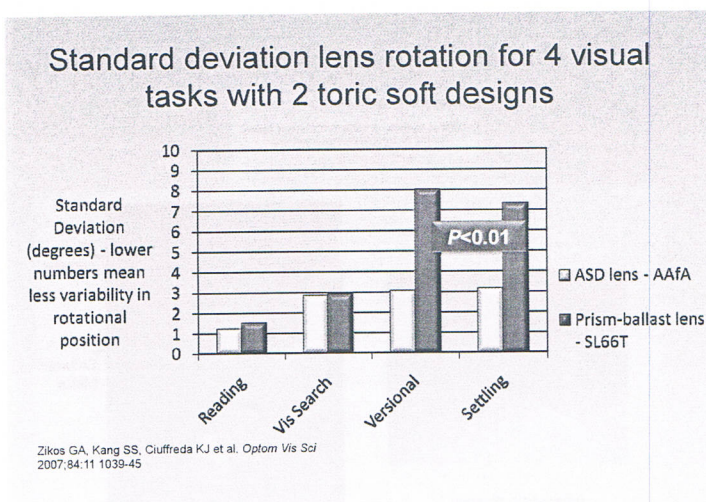
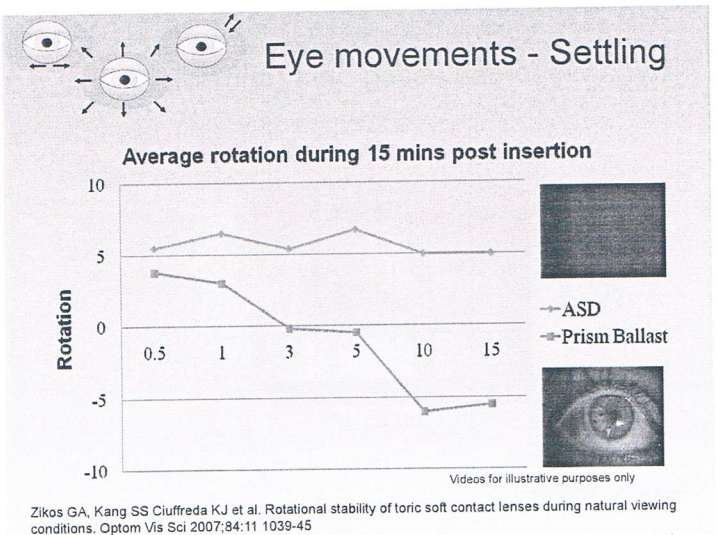
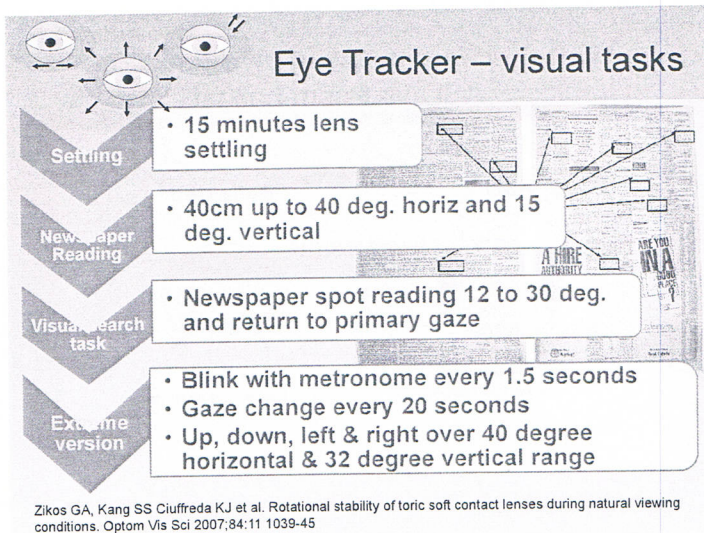
ORIGINAL ARTICLE
Rotational Stability of Toric Soft Contact Lenses
During Natural Viewing Conditions



Infrared CL Position
Tracking Image



Eye Tracker

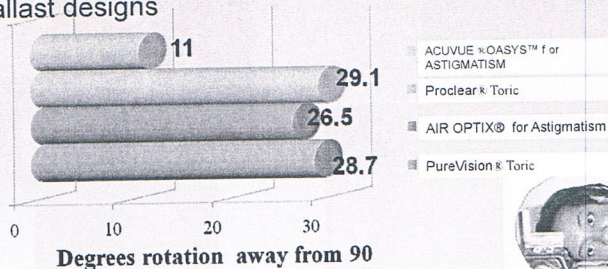




Head movements – Gravity

Result:

ASD also less affected by gravity compared to prism ballast designs

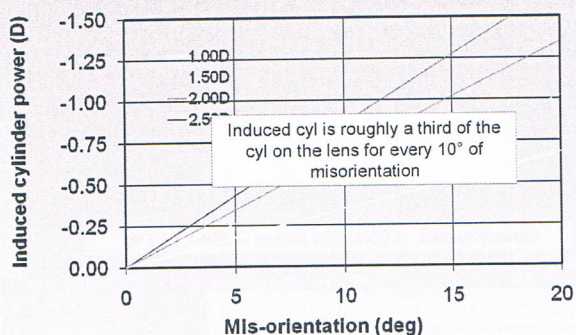


Young G and McIlraith R. Toric soft contact lens visual acuity with abnormal gaze and posture. Optom Vis Sci 2008; E-abstract 85051

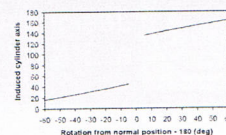
Insert 'defies gravity' video

Effects of mis-orientation on VA

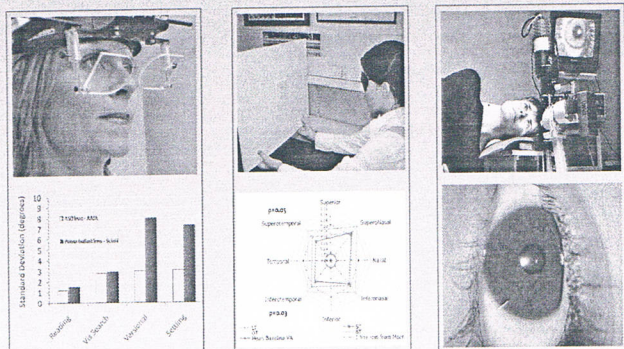
Error due to 10° (CW) mis-orientation
Rx: -3.00/-2.00 x 180 → +0.37/-0.75 x 42



Effects of mis-orientation on VA



Key Points



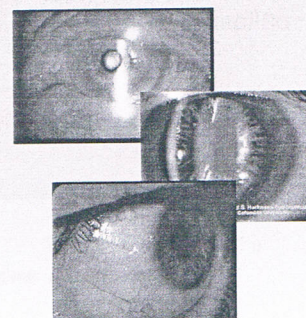
1. Zikos GA, Kang SS, Ciuffreda KJ et al. Optom Vis Sci 2007;84:11 1039-45
2. Chamberlain P, Morgan P, Maldonado-Codina C, Woody K. Optom Vis Sci 2008; E-abstract 85079
3. Young G, McIlraith R. Optom Vis Sci 2008; E-abstract 85051

Health considerations

Corneal Oxygen Consumption



UV protection



Impact of rotation control on lens thickness



Prism ballast designs are thickest inferiorly



Non ballast / dynamic stabilised designs are thickest peripherally at 3 & 9 O'clock

Corneal oxygenation during toric CL wear

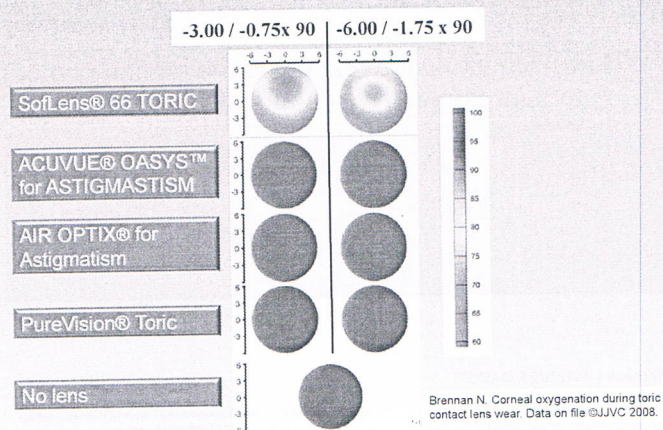
Aim: Estimate local corneal O₂ deficiencies in open (DW) & closed (EW) eyes during soft toric CL wear

1	2	3	4	5
ACUVUE® OASYS™ for ASTIGMATISM	AIR OPTIX® for Astigmatism	PureVision® Toric	SofLens® 66 TORIC	No Lens
Lenses studied: -3.00/-0.75 x 90 and -6.00/-1.75 x 90				

Brennan N. Corneal oxygenation during toric contact lens wear. Awaiting publication.

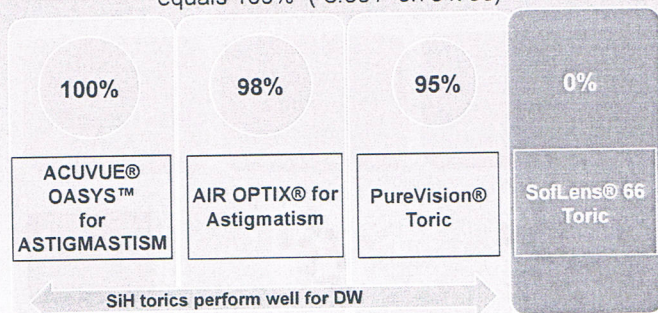


Corneal oxygenation during DW toric CL wear



Corneal oxygenation during DW toric CL wear

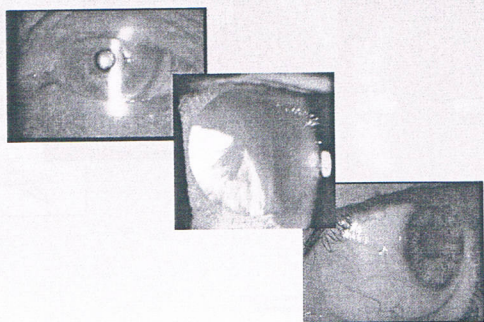
% of corneal surface area where total oxygen consumption equals 100% (-3.00 / -0.75 x 90)



Data on file ©JJVC 2008.

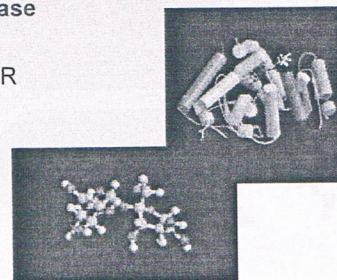
Health considerations

UV protection



Hypothesis: UV damages aqueous ascorbate?

Can UV absorbing contact lenses prevent a decrease in aqueous humour ascorbic acid using NMR spectrometry

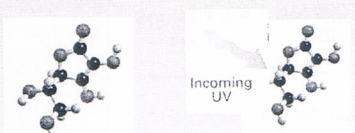


Chandler H, Reiter K, Nicholls J. Impact of UV blocking hydrogel polymers on the prevention of UV induced ophthalmic damage

Ascorbate = an antioxidant which soaks up damaging free radicals

UV destroys ascorbate in the aqueous

Increased free radicals => risk cataracts & AMD?



Chandler H, Reiter K, Nicholls J. Impact of UV blocking hydrogel polymers on the prevention of UV induced ophthalmic damage

4 test groups

UV-B dose equivalent to exposing the human cornea to approximately 16 hours of sunlight

Class I Senofilcon A + UVB	Patched eye	Lotrafilcon A + UVB	No CL + UVB
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Senofilcon A = ACUVUE® OASYS™
 Lotrafilcon A = AIR OPTIX® NIGHT&DAY®

Chandler H, Reiter K, Nicholls J. Impact of UV blocking hydrogel polymers on the prevention of UV induced ophthalmic damage

Results

UV BLOCKING

Class I Senofilcon A + UVB

Ascorbate level remained same as unexposed patched eye ($p=0.71$)

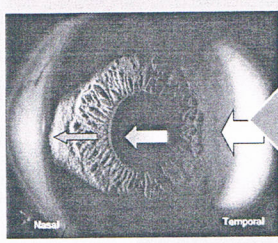
Lotrafilcon A + UVB

Ascorbate level significantly reduced (both $p<0.03$)

UV BLOCKING

Chandler H, Reiter K, Nicholls J. Impact of UV blocking hydrogel polymers on the prevention of UV induced ophthalmic damage

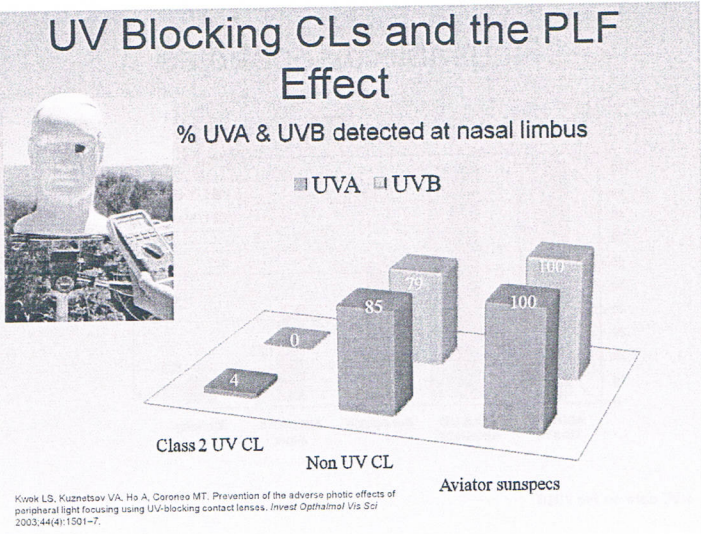
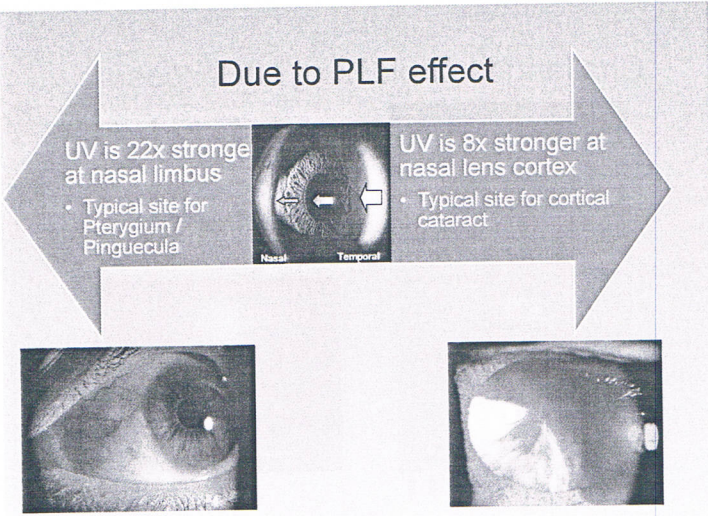
Peripheral light focus effect (PLF)



lens and nasal limbus

Corneal optics focus and intensify rays entering from temporal periphery

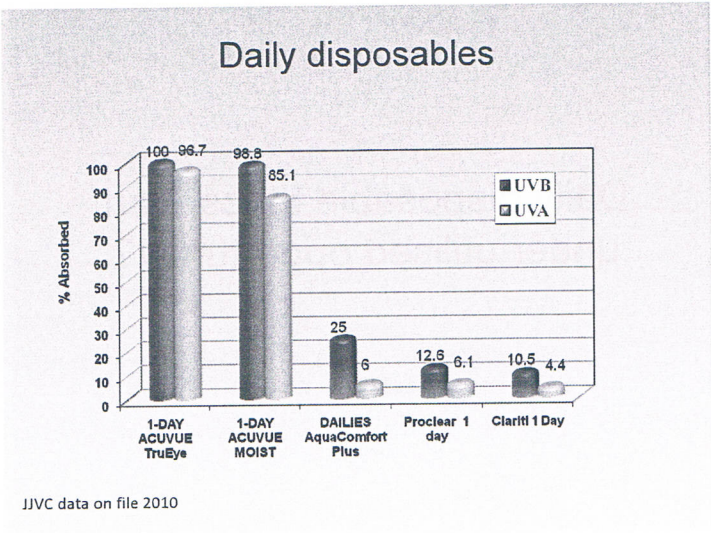
Kivok LS, Daszyński DC, Kuznetsov VA, Pham T, Ho A, Caroneo MT. Peripheral light focusing as a potential mechanism for phakic dysphotopsia and lens phototoxicity. *Ophthalmic Physiol Opt* 2004;24(2):119-29.



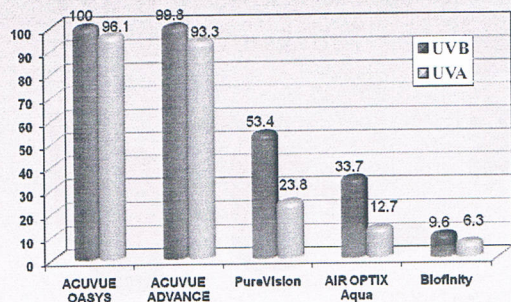
Ultra Violet Protection

- ISO & ANSI standards classify UV blocking CL's in groups based on absorptive capacity at min. thickness (usually @-3.00D)
- Only products achieving this can claim UV protection
- ISO Standards 8321-2 & 8599

Class 1	Class 2	Class 3
>90% UVA	>70% UVA	>50% UVA
> 99% UVB	>95% UVB	>95% UVB

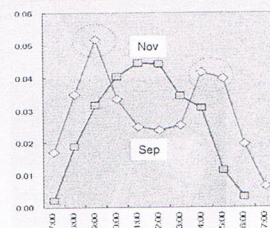
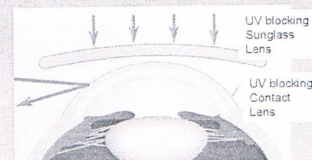
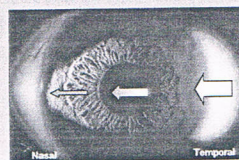


Reusable disposables



JJVC data on file 2010

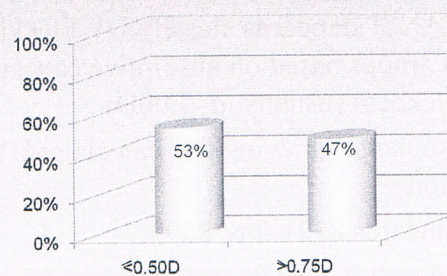
Challenges of blocking UV exposure



Sources of exposure

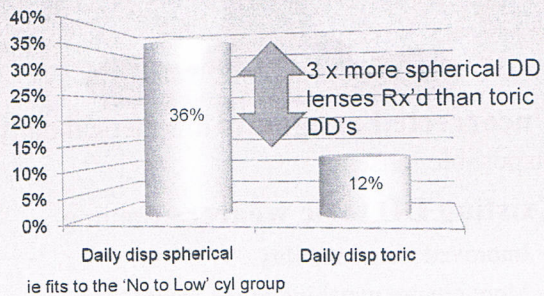
Daily disposable torics – an under utilised opportunity?

Similar % split between:
Patients with 'No to low' Vs higher cyls



1. Eurolens data 2009

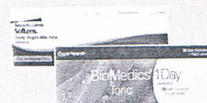
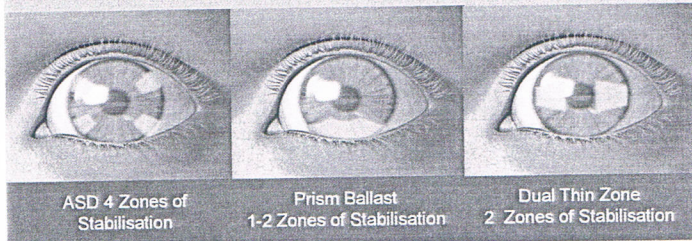
Dissimilar % split between: Spherical Vs toric daily disposables¹



1. Morgan PB and Efron N. Prescribing soft lenses for astigmatism. *Contact Lens Ant Eye* 2009;32:2 97-98.

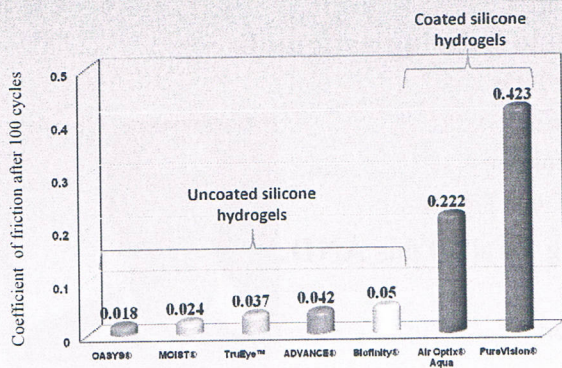
Three Different Design Types

Vision



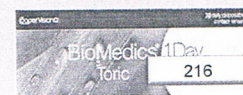
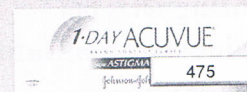
Coefficient of friction¹

Comfort

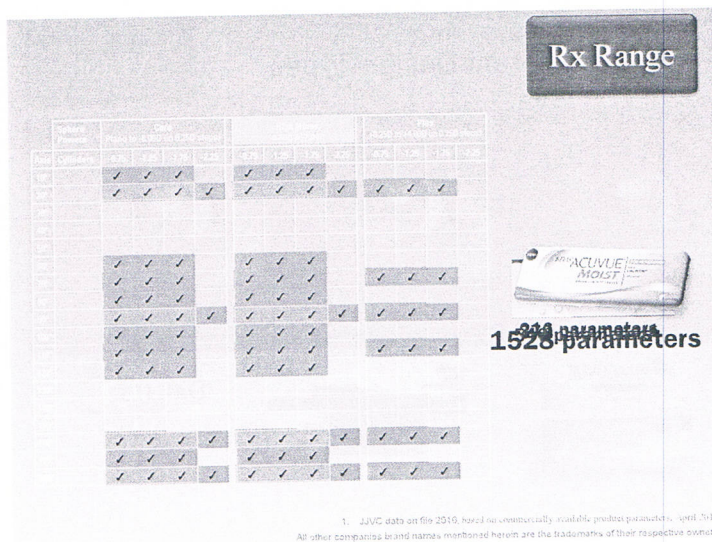


1. J1/CDData on file 2005

Rx Range



Typical reusable toric over **2,000** different power combinations



Opportunity #1: Existing DD CL Wearers



- **Uncorrected astigmats** in spherical daily disposable lenses
 - Improved visual stability
 - More precise matching to cyl / axis
 - Greater comfort
- **Existing DD toric wearers** wanting
 - Improved visual stability
 - More precise matching to cyl / axis
 - Greater comfort

Opportunity #2: Existing reusable toric wearers

- **Wanting DDs but previously unsuitable:**
 - Limited power range or visual instability
 - Discomfort
 - Handling



Opportunity #3: Non-CL wearers

- **Spectacle wearing astigmats** wanting DDs
 - Hygiene
 - Convenience
 - For PT or FT wear
- Looking for all of this **AND..**
 - Vision
 - Comfort

