NCC2016 Poster Abstracts
Monday, March 14, 2016 11:30 – 12:30
Baroniezaal (short presentations)
Meierij Foyer (slideshow, March 13-14, 2015)
Organization Section: NCC/ BCLA
Moderator: Robin Chalmers

Poster Number: 1
An investigation of trans-epithelial stromal Riboflavin absorption with Ricrolin TE (Update in Corneal Crosslnking & Keratoconus)
Tariq Alhamad, David O'Brart, Naomi O'Brart, Keith Meek
Purpose: To investigate transepithelial stromal riboflavin absorption with Ricrolin TE ® (Riboflavin 0.1%, 15% dextran T500 with trometamol (Tris-(hydroxymethyl) aminometane) and sodium ethylenediaminetetraacetic acid by analyzing light transmission properties of ex-vivo rabbit corneas. SETTING: School of Optometry and Vision Sciences, Cardiff, Wales.
Methodes: Ricrolin TE ® RTE drops were applied every 3 minutes for 1 hour to 12 rabbit corneas (4 with intact epithelium, 4 with superficial scratches, 4 with central 8.00 millimeter epithelial debridement). As a comparison, Ricrolin ® drops (Rnorm) (Riboflavin 0.1%, 15% dextran T500) were applied in an identical manner to 12 corneas (4 with intact epithelium, 4 with superficial scratches, 4 with central epithelial debridement). A control group of 4 corneas with intact epithelium received balanced saline 0.9%. To assess Riboflavin absorption, light transmission spectra of the corneas were analyzed with a spectrophotometer. RESULTS: The spectra of RTE and Rnorm treated corneas with intact epithelium and Rnorm with superficial scratches were similar to controls treated with balanced saline. Those with RTE and superficial scratches showed a homogeneous yellow discoloration of the cornea with a significant dip in light transmission between 400 and 490 nm, similar to that of the RTE solution. This was also seen, albeit of a greater magnitude in eyes receiving RTE and Rnorm with complete epithelial removal.
Conclusions: Administration of RTE and superficial epithelial scratches allows sufficient Riboflavin stromal absorption to alter the transmission spectra of ex-vivo rabbit corneas. This did not occur with RTE or Rnorm with an intact epithelium or Rnorm with superficial scratches.
Research funding received: -

Poster number: 2
Bacterial Contamination of Lens Cases whilst using a Povidone Iodine Based Disinfection System
Mark Willcox, Ajay Vijay, Ananya Datta, Jacqueline Tan,
Purpose: To evaluate the bacterial contamination rates of the lens cases used with a disinfection system containing Povidone Iodine (PI) over a 3 month period and compare this to previously published rates (using same case hygiene, sampling/microbial techniques) with other disinfectants (polyquaterium/aldox, polyhexanide or hydrogen peroxide).1
Methods: Forty subjects using frequent replacement lenses were dispensed with the PI based contact lens disinfection system to use with their habitual lenses. The subjects were instructed to rinse and air dry the lens case after lens storage and disinfection as well as replace their lens cases every month. Lens cases were collected after each 1 month of use. Lens cases were swabbed and bacterial contamination evaluated by standard microbial culture. Results: Seventy per cent of the lens cases were contaminated, with Gram-positive bacteria being the most common contaminant (49% of cases). Thirty four per cent of cases were contaminated with Gram-negative bacteria and 8% with fungi. When Gram-negative contamination occurred there were on average 2.5log10 ± 0.2 bacterial cells cultured. There were less cells of Gram-positive or fungi cultured (1-1.5log10). There were significantly more sterile lens cases with PI (30%) than polyquaterium/aldox (12%; p=0.043) or polyhexanide (10%; p=0.002), but not hydrogen peroxide (18%; p=0.097). Contamination with Gram-positives (49%) was significantly lower than polyquaterium/aldox (71%; p=0.047), polyhexanide (84%; p<0.001) or hydrogen peroxide (77%; p=0.001). Contamination with Gram-negatives (34 vs. ≥20%; p > 0.05) or fungi (8% vs. ≥12%; p>0.05) was not significantly different.
Conclusions: Bacterial contamination of lens cases occurred during use of the PI solution, but the overall rate or Gram-positive bacterial contamination was often less than with other disinfectant types.
1Reference: Willcox et al., Contact lens case

contamination during daily wear of silicone hydrogels. Optom Vis Sci. 2010; 87:456–464.
Research funding received: Study was supported by a grant from Ophtecs corp. Kobe, Japan

Poster number: 3
Bowman layer transplantation to reduce and stabilize progressive, advanced keratoconus
Korine van Dijk, Vasilis Liarakos, Jack Parker, Lisanne Ham, Jessica Lee, Esther Groeneveld-van Beek, Gerrit Melles
Purpose: To evaluate the clinical outcome of mid-stromal isolated Bowman layer transplantation, a new surgical technique to reduce and stabilize ectasia in eyes with advanced keratoconus, to postpone penetrating keratoplasty or deep anterior lamellar keratoplasty and to enable continued daily contact lens wear.
Methods: In twenty-two eyes of 19 patients with progressive, advanced keratoconus, not eligible for UV-crosslinking, a mid-stromal manual dissection was made and an isolated donor Bowman layer was positioned within the stromal pocket. Before and up to 36 months after surgery (mean follow-up 21 (±7) months), best spectacle-corrected visual acuity (BSCVA), best contact lens-corrected visual acuity (BCLVA), Scheimpflug-based corneal tomography measurements, endothelial cell density, biomicroscopy, refraction, and intra- and postoperative complications were recorded.
Results: Two surgeries were complicated by an intraoperative perforation of Descemet membrane; no other intra- or postoperative complications were observed. Maximum keratometry decreased on average from 77.2 (±6.2) D to 69.2 (±3.7) D (P<.001) at one month after surgery and remained stable thereafter (P≥.072). Mean LogMar BSCVA improved from 1.27 (±0.44) before to 0.90 (±0.30) 12 months after surgery (P<.001), while BCLVA remained stable (P=.105). Mean thinnest point pachymetry increased from 332 (±59) µm preoperative to 360 (±50) µm at the latest follow-up (P=.012), and no change in endothelial cell density was found (P=.355).
Conclusions: With isolated Bowman layer transplantation, reduction and stabilization of corneal ectasia was achieved in eyes with progressive, advanced keratoconus. Given the low risk for complications, the procedure may be performed to postpone penetrating or deep anterior lamellar keratoplasty.
Research funding received: -

Poster number: 4
Power profile of RGP contact lenses with variable multifocal optical zone
Alejandro Cervino, Alberto Dominquez-Vincent, Jose J Esteve- Taboada, Robert Montes- Mico, Alvaro Pons Moreno
Purpose: To describe the power profile of multifocal center-distance design RGP lenses with variable multifocal optical zone, designed for customizing the fit based on pupil diameter measures (Multilife®, Conóptica SL, Barcelona, Spain).
Methods: For each of the available additions (up to +2.0 and +2.5 D), one lens for each of the 5 available central zone sizes (XS, S, M, L, and XL) was studied. Each lens was measured in vitro 10 times for an aperture radius of 4mm, using the NIMO TR1504® (Lambda-X SA, Belgium), a power mapping instrument based on the phase shifting Schlieren method.
Results: Pupil size required to obtained a specific addition depends on the distance zone diameter of each lens, that is, the greater the distance zone, the greater must pupil size be to obtain the same add. In other words, for any given pupil diameter, the XS lens gives greater addition values compared to the XL lens.
Conclusions: Performance of each lens depends strictly on the size of its central zone, where XS design may be more effective for near vision, and XL design for distance vision. Based on these results, contact lens practitioners may choose the multifocal lens that better fits the patient's pupil diameter.
Research funding received: Research supported by a Generalitat Valenciana research grant GV2015-043 to A. Cerviño

Poster number: 5
Visual Performance Assessment of Two Daily Disposable Multifocal Soft Contact Lenses
Robert Montes-Mico, Cécile Maissa, Jose J Esteve- Taboada, Teresa Ferrer- Blasco, Alberto Dominguez- Vincent
Purpose: To compare the performance of established presbyopes wearing two center near designs daily disposable (DD) multifocal (MF) contact lenses in a population of established presbyopes.
Method: A single - masked randomized crossover investigation was conducted on

70 medium/high presbyopes (add ≥+1.50D) who wore nelfilcon A multifocal (DACPMF) and omafilcon A DD multifocal (P1DMF) contact lenses in turn bilaterally for 5(+/- 1) days each. Stereoacuity was determined with the Howard–Dolman system at distances of 40 and 60 cm. Defocus curves were used to evaluate the subjects' visual acuity over a range of distances simulated via a series of positive and negative lenses. Other visual performance assessments included binocular visual acuity with ETDRS high contrast logMAR charts and contrast sensitivity measured using the VCTS test at distance and near.
Results: After 5(+/- 1) days of wear, significantly better stereopsis at near (DACPMF: 30.7(12.96) P1DMF: 40.6(5.75) sec arc; LSM Difference (DACPMF - P1DMF) = -9.81 (95% one-sided CI = -6.89)) and intermediate (DACPMF: 56.3(13.6) P1DMF: 70.1(14.5) sec arc $p<0.0001$) distances was recorded for the DACPMF correction. The mean absolute range of focus calculated from the individual defocus curves was respectively 3.6D for DACPMF and 3.0D for P1DMF (LSM Difference (DACPMF - P1DMF) = 0.63D (95% CI = (0.30,0.96)).
Conclusion: In this population of established presbyopes, both DACPMF and P1DMF performed well for most objective visual performance measurements assessed. However, the stereoacuity tests and the defocus curve metrics used in this study demonstrated greater depth perception/less compromise in binocular function (better stereopsis) and greater range of focus in the intermediate and near zones for the DACP center- near multifocal correction offering multiple add designs.
Research funding received: This study was funded by Alcon Research Ltd

Poster number: 7
Patient and practitioner experience with a new soft multifocal
Anna Sulley, Anne Madec-Hily, Faith Currier
Purpose: Clinical performance and fitting success of a new daily disposable, centre-near multifocal contact lens (MFCL), with design optimised for add and refractive error (1DAMMF), has previously been investigated. A large scale, multi-centre study was conducted to identify performance, satisfaction and behaviour change with 1DAMMF in everyday practice.
Methods: This was a two-month, monadic, non-interventional study among eye-care practitioners (ECPs) and patients in UK and USA with 1DAMMF. Performance and fitting success were evaluated via ECP online surveys (pre- and post- study), and initial and follow-up experience logs. Data were collated and analysed by an independent market research agency.
Results: ECPs (n=234) fitted 1,993 patients; 1,537 completed experience logs at follow-up. Mean patient age was 54 years. 24% were neophytes, 76% current CL wearers. Overall success rate at follow-up was 83%; purchase rate was 68%. There were no differences in purchase rate by Rx, add power or age. Results across Rx and add range were consistent with the clinical study. Following the fitting guide increased ease of fit and success; fewer trial lenses were needed (2.6 with guide vs 3.2 CLs/patient with partial/no use) and ratings were higher for overall and near vision (89% vs 84%, 83% vs 76% respectively; $p<0.05$). ECP-reported success with 1DAMMF increased 24% compared to rating with MFCLs prior to the study (63% to 78%). ECPs who rated previous MFCL success rate as ≤75% (n=192) were more likely to indicate 1DAMMF as easiest to fit compared those with higher success ratings ($p<0.05$). ECPs agreed fewer visits were needed to fit 1DAMMF compared to other MFCLs (2.0 vs 2.5, $p<0.05$).
Conclusions: Results corroborate success rates and ease of fit, particularly when using the fitting guide. All groups showed high and consistent success and satisfaction in practice, regardless of vision correction needs. The results led ECPs to anticipate fitting more MFCLs to all patient types with the lens.
Research funding received: Study supported by Johnson & Johnson Vision Care

Poster number: 8
Influence of contact lenses on corneal thickness measured by optical coherence tomography
Jana Niessen, Rolf Simon, Stefan Bandlitz
Purpose: To analyse the influence of displacement artefacts caused by soft contact lenses with various spherical power on the optical coherence tomography (OCT) measurement of corneal thickness.
Methods: Using spectral domain OCT (iVue, Optovue, Inc., Fremont, USA) the central corneal thickness (CCT) of 16 subjects (7M, 9F; mean age 24.8 SD±2.0 years) was measured manually with the calliper tool of the instrument. Afterwards CCT was

measured 5 minutes after inserting a silicon-hydrogel-lens (balafilcon A, n=1.426) of different spherical power (-6.00, -3.00, plano, +3.00 and +6.00 D). Measurements were performed by one examiner on three different images per lens and the average was calculated. Lens power was chosen in a randomized order and masked against the examiner. One-way ANOVA and multiple comparisons with Bonferroni corrections were used for statistical analysis of differences between CCT without lens and with the various lens powers.
Results: CCT without contact lens was 521±56µm. CCT measured with the contact lens on the eye was statistically significant thinner for the -6.00D (-5.9µm), the -3.00D (-7.4µm), the 0.00D (-7.1µm), the +3.00D (-8.00µm) and the +6.00D (-9.30µm) lens ($p<0.001$). CCT for the +6.00D lens was thinner (-3.4µm) than for the -6.00D ($p=0.023$). However, there was no statistically significant difference between the other lens powers ($p>0.05$).
Conclusions: With the OCT-device used in this study it was possible to measure corneal thickness with and without contact lens. The thinner measurements in CCT with contact lenses is likely to be caused by optical distortions induced by the refractive index of the contact lens material. Differences between the lenses of the same material is likely to be caused by the different thickness of the lenses. In clinical practice and in research care should be taken when interpreting OCT images of CCT changes (e.g. edema) under different contact lenses.
Research funding received: -

Poster number: 9
Clinical Performance of comfilcon A Silicone Hydrogel Contact Lenses with Two Lens Care Systems
Jose Vega, Gary Osborn
Purpose: This 1-month prospective study investigated the clinical performance of the comfilcon A silicone hydrogel contact lens when used with both the Synergi® and Biotrue® lens care solutions.
Methods: This work was a randomized, single-masked, crossover study in which forty-eight subjects used the comfilcon A lens with each of the two lens care products for one-month each. Follow-up visits for each solution took place at one week, two weeks and four weeks: with a one-week wash-out period between the solutions. Lenses were worn on a daily wear schedule. Key outcome measures for this study included biomicroscopic, (Efron grading scale 0-4, scored to nearest 0.1), and subjective comfort to the lens/solution combinations (0-100 visual analog scale).
Results: 51 one subjects were consented to the study. The group consisted of 34 females 17 males, with a mean ± standard deviation age of 33.3 ± 10.9 years (range 19 to 57 years). Forty-eight were dispensed lenses and forty-six completed. Some differences were seen between the two solutions for biomicroscopy. Overall the Biotrue solution was associated with a higher degree of corneal staining at 1-week (0.67 ± 0.47 vs. 0.34 ± 0.40, $p<0.0001$), 2-weeks (0.59 ± 0.54 vs. 0.38 ± 0.46, $p<0.0001$), and 4-weeks (0.62 ± 0.51 vs. 0.31 ± 0.42, $p<0.0001$). At the one week visit, solution-induced corneal staining (SICS) was reported in 27 of the 47 Biotrue follow-up visits. There were zero reports of SICS with Synergi. Overall comfort scores were similar between the Biotrue and Synergi at 1-week (82.8 ± 13.9 vs. 85.6 ± 11.8, $p>0.05$), 2-weeks (83.2 ± 14.8 vs. 84.7 ± 14.9, $p>0.05$), and 4-weeks (84.5 ± 14.0 vs. 85.3 ± 14.3, $p>0.05$).
Conclusions: The comfilcon A lens performed well with both solutions for subjective comfort and corneal response. A greater SICS-type response was evident for the Biotrue® solution.
Research funding received: Financial support for this study was provided by CooperVision
All information gathered in this abstract is proprietary of CooperVision.

Poster number: 10
In-vivo dehydration comparison of omafilcon A and stenfilcon A with delefilcon A
Jill Woods, Farah Panjwani, Dominik Papinski, Jajaiah Varikooty, Lyndon Jones
Purpose: To compare the in vivo dehydration across a typical wearing day of three daily disposable (DD) materials of varying compositions, using a gravimetric method. The DD materials comprised a hydrogel (omafilcon A, Proclear® 1 Day; P1D), a silicone hydrogel (SiHy) (stenfilcon A, MyDay®; MD) and a modified 'water-gradient' SiHy (delefilcon A, Dailies Total1®; DT1).
Methods: Participants were fit contralaterally with P1D/DT1 and MD/DT1 on separate days. The lens allocation to eye was randomized; investigators and

participants were masked. After 12-hours, the lenses were removed and immediately weighed (W12). For mean baseline water content (baseWC) of each power worn, 3 lenses of the same power and lot number were weighed after being removed from the blister pack and blotted (wetW), and again after full dehydration (dryW). The mean baseWC and 12hr water content (WC12) were calculated: baseWC% = (wetW-dryW)/wetW x 100 WC12% = (W12-dryW)/W12 x 100 Actual water content reduction (ΔWC) and relative percentage dehydration (RPD) were calculated: ΔWC = WC12-baseWC RPD = (ΔWC/baseWC) x 100
Results: 18 participants completed each day. The mean baseWC were similar to published values (DT1 33.07% vs P1D 61.41%; DT1 31.62% vs MD 54.05%). The mean RPD after 12 hours wear was higher for DT1 compared to both P1D (11.50% vs 2.58%, p<0.001) and MD (9.21% vs 5.22%; p=0.023). The mean ΔWC was higher for DTI compared to P1D (3.82% vs 1.59%; p=0.001) but not different between DT1 and MD (2.91 vs 2.82; p=0.866).
Conclusions: It is generally accepted that higher WC materials exhibit greater dehydration than lower WC materials, but that was not the case in this study. Over the 12 hour period, despite having the lowest baseWC, the surface modified DT1 lost a higher percentage of its initial WC than both P1D and MD.
Research funding received: Funding for this research was provided by Cooper Vision

Poster number: 11
Short-term comfort comparison of a low modulus hydrogel vs a higher modulus silicone hydrogel daily disposable lens
Jill Woods, Alison Ng, Doerte Luensmann, Lyndon Jones
Purpose: Daily disposable contact lenses (DDs) are now widely available in both silicone hydrogel (SH) and hydrogel (H) materials. While SH materials have the advantage of higher oxygen transmissibility they have higher moduli, which reportedly may result in reduced comfort. This study assessed the short-term comfort of two DD lenses with similar water content (WC) but differing moduli: a H-DD (etafilcon A; 1-Day Acuvue® Moist®; Johnson & Johnson; WC = 57%; modulus = 0.29MPa) and a SH-DD (somofilcon A; clariti® 1 day; CooperVision; WC = 56%; modulus = 0.50MPa).
Method: 120 subjects wore the lenses contralaterally, in a randomized, double masked design. 60 were habitual H-DD wearers (all 1-Day Acuvue Moist), 60 were non-DD habitual wearers (various H and SH reusable lenses). Subjects rated lens comfort (0-100) at dispensing and after each hour (0hr to 8hrs) and indicated whether they had a lens preference at the final visit.
Results: Mean subjective comfort was not different between lenses at insertion or after 8hrs; insertion: 89±14 H-DD vs 87±14 SH-DD (p=0.180); 8hr: 83±17 H-DD vs 82±18 SH-DD (p=0.836). Based on equivalency margins of ±5-points, the lenses showed equivalent comfort at insertion (p=0.03) and at 8hrs (p=0.001). When subjects were grouped by habitual lens/modality, there were also no comfort differences between lenses; insertion: habitual H-DD p=0.389, habitual non-DD p=0.297, 8hr: H-DD p=0.228, non-DD p=0.341. Lens preference was not different between lenses at dispensing (p=0.434) or at the final visit (p=0.551). Both lenses exhibited a significant reduction in comfort over 8hrs (both p<0.001).
Conclusions: Initial and 8hr comfort was not compromised with the SH-DD compared to the H-DD, despite its higher modulus. Results suggest that practitioners should not anticipate lower comfort with a SH-DD, allowing them to consider material properties such as oxygen permeability when prescribing DDs.
Research funding received: Funding for this research was provided by Cooper Vision.

Poster number: 13
Prosthetic Replacement of the Ocular Surface Ecosystem(PROSE) devices in coexisting Steven Johnson Syndrome and Keratoconus
Srikanth Dumpati, Varsha Rathi, Preeji Sudharmann, Preetam Kumar
Purpose: To study the role of Prosthetic Replacement of the Ocular Surface Ecosystem (PROSE) devices in patients with co-existing Steven Jonhson Syndrome and Keratoconus.
Method: Retrospectively 3 patients were identified and reviewed from computerized medical record database that shows Steven Jonhson Syndrome (SJS) and Keratoconus (KC). Patient's data such as age, gender and visual acuity before and after lens wear and

symptoms and before and after lens wear and follow up was recorded.
Results: 6 eyes of 3 patients had SJS and KC. The symptoms of pre PROSE wear photophobia decreased with lens wear. Patients were able to tolerate light and were able to open eyes. Visual acuity improved from 0.9 ± 0.6 Log MAR to 0.4 ± 0.5 Log MAR with PROSE wear in these patients over follow up of 24 months. The patients were using the lenses on an average of 9 hours per day. With these lenses limitation were debris formations after 4.5 hours of lens wear in all 3 patients. One patient showed bulbar congestion and pain in both eyes.
Conclusion: The visual acuity and symptoms were improved with Prosthetic Replacement of the Ocular Surface Ecosystem (PROSE) in coexisting Steven Johnson Syndrome and Keratoconus.
Research funding received: nill

Poster number: 14
Monitoring contact lens discomfort using a wrist-mounted electronic logger
Michael Read, Nancy Keir, Carole Maldonado-Codina, Philip Morgan
Purpose: To investigate contact lens comfort with use of a wrist-mounted electronic logger.
Methods: Thirty symptomatic contact lens wearers wore study contact lenses for 3 days. On the first 2 days senofilcon A and balafilcon A lenses were worn as a matching pair (randomised). On day 3, a pair of balafilcon A lenses were worn. On each day, the subject wore a wrist mounted activity logger. On day 1 and 2, the subject pressed a button on the logger whenever they became aware of their lenses. On day 3, the subject used a multiple click protocol (1 = mild awareness to 3 = strong awareness). Logger data was exported and compliance was confirmed by use of the body temperature and movement data.
Results: Lens awareness logger (LAL) events were similar on days 1 and 2 (18.1 vs. 17.6 events per day). There were significantly more LAL events for balafilcon A (22.1 events per day) in comparison with senofilcon A (13.1 events per day) (p=0.006). The LAL event profile during wear highlighted peaks in awareness following lens application and towards the end of the wearing cycle. Comparison of the LAL event profile for the two lens types showed significant differences in lens awareness, particularly in the first half of the wearing cycle. LAL events on day 3, showed a uniform distribution of single and double clicks through the day, but a marked peak in triple clicks in the last couple of hours of lens wear.
Conclusions: The LAL was able to differentiate between the study lenses and demonstrated differences in their LAL event profiles. Lens awareness appeared to increase not only in frequency, but also in intensity towards the end of the wearing cycle. The ability of the LAL to track lens awareness suggests it is likely to be a useful tool in furthering our understanding of contact lens associated discomfort.
Research funding received: This study was funded by CooperVision Inc.

Poster number: 16
Comparison of Dk/t values of daily disposable soft toric contact lenses using high resolution thickness profiling
Elizabeth Lumb, Andrew Symons
Purpose: To measure all-lens thickness for a range of daily disposable soft toric contact lenses in order to calculate average Dk/t from the central 6mm zone and evaluate those values against the Holden-Mertz criterion for daily wear.
Method: Four lens powers (+4.00/-1.75 X 160, +1.00/-1.25x70, -3.00/-1.25x70, -7.50/-1.75x160) for each of three daily disposable soft toric lenses (Etafilcon A, Nelfilcon A, Somofilcon A) were profiled using the Phase Focus Lens Profiler, (Phase Focus Limited, Sheffield UK). The system produces high resolution thickness maps (±50nm) of the entire contact lens immersed in saline and reconstructs diffraction patterns, created with a scanning LASER, to produce dimensional maps using proprietary software algorithms. These powers were selected to evaluate maximum plus and minus powers and two mid-power lenses. Thickness measurements across the entire lens profile were recorded at 7 micron intervals. In addition to minimum, maximum and average thickness of the whole lens, average thickness was also determined for the central 6mm region. Dk/t was calculated accordingly using manufacturer-stated Dk values from package inserts (Etafilcon A: 21.4, Nelfilcon A: 26, Somofilcon A: 60).
Results: Average (6mm) central lens thickness values (microns) for all four lens powers respectively were: Etafilcon A: 152.3, 122.0, 99.9, 120.0; Nelfilcon A: 182.7, 143.1, 123.1, 133.1; Somofilcon A: 245.3, 198.2, 146.4, 145.0 Dk/t values for the same

powers were: Etafilcon A: 13.9, 17.7, 20.9, 20.1; Nelfilcon A: 13.7, 17.0, 21.1, 18.3; Somofilcon A: 24.6, 30.8, 43.6, 43.8.
Conclusions: Lens thickness in the central 6mm zone across the brands and powers evaluated ranged from 99 to 245 microns. All four powers for the Somofilcon A lens surpassed the Holden-Mertz Dk/t requirement for daily wear (24.1). In comparison, only the minus powered lenses for the Etafilcon A and Nelfilcon A lens approached this threshold whereas the high-plus lenses did not reach this value.
Research funding received: -

Poster number: 17
Optical coherence tomography for in vivo measurement of contact lens thickness
Rolf Simon, Jana Niessen, Stefan Bandlitz
Purpose: The aim of this study was to compare the in vivo measured contact lens thickness using spectral domain optical coherence tomography (OCT), with the manufacturers' values of contact lens centre thickness.
Methods: Central corneal thickness (CCT) of 16 subjects (7M, 9F; mean age 24.8 SD±2.0 years) was measured using the automatic mode of a spectral domain OCT (iVue, Optovue, Inc., Fremont, USA). Afterwards the CCT of the combination cornea and silicon-hydrogel-lens (balafilcon A) of different spherical power (-6.00, -3.00, plano, +3.00 and +6.00 D) was measured. The difference between OCT measurement of CCT with and without contact lens was calculated by the cornea change analysis mode (t-oct). The paired t test or Wilcoxon signed-rank test was used to compare the given manufacturers' values (t-manu) with those determined by OCT. The limits of agreement according to Bland and Altman were determined to compare t-oct and t-manu.
Results: The mean differences between t-oct and t-manu showed that CCT measured with t-oct was statically significantly thicker (0.032mm; CI 0.021 to 0.043; p<0.001) for the -6.00 D lens, (0.023mm; CI 0.013 to 0.033; p<0.001) for the -3.00 D lens, (0.007mm; CI 0.004 to 0.010; p<0.001) for the plano lens and thicker (0.008mm; CI 0.001 to 0.016; p=0.006) for the +3.00 D lens, while it was similar (-0.006mm; CI -0.019 to 0.005; p=0.495) for the +6.00 D lens.
Conclusions: Using the OCT automatic mode for cornea change analysis, it was possible to measure the central thickness of different contact lenses in vivo. Differences between the measured thicknesses and the manufacturers' values are likely to be caused by lens decentrations, optical distortions induced by the contact lens material, and by the influence of tear film thickness under and on the contact lens. Further research is needed to address these influencing factors.
Research funding received: -

Poster number: 18
In vitro measurement of contact lens fluorescence
Sarah Smith, Michael Read, Carole Maldonado-Codina, Philip Morgan
Purpose: Fluorescence may be observed if soft contact lenses are applied to the eye soon after the use of fluorescein. The aim of this work was to quantify fluorescence in a range of commercially available soft contact lenses using a novel in vitro method.
Methods: Eight lens materials were tested (Enfilcon A, Etafilcon A, Nelfilcon A, Ocufilcon D, Omafilcon B, Senofilcon A, Somofilcon A, Stenfilcon A). Each lens was soaked in 10ml 0.003% w/v fluorescein solution for 60 seconds and then rinsed and agitated in 10ml 0.9% w/v saline for 60 seconds. The rinsing stage was repeated a further 4 times. A Canon digital camera was used to capture the images using cobalt blue light with a medium-yellow excitation filter to enhance the contrast by removing blue light scatter. The protocol was repeated for a second lens of each material. Using a custom designed MATLAB script, the observed fluorescence could be quantified as the mean pixel intensity (MPI) of the image using the green channel of the original RGB image.
Results: Overall, the MPI was shown to vary with the water content of the lens material (r=+0.92). The lowest water content lens tested (Senofilcon A) had an MPI of 82, and the highest water content lens tested (Nelfilcon A) had an MPI value of 236. There was no statistical difference between MPI values of silicone hydrogels versus hydrogels, ionic and non-ionic lenses or daily disposable versus reusable lenses (all P>0.05). A paired t-test showed no statistical difference between the data sets used to test repeatability (P=0.94). The 95% limits of agreement were -32.0 to +33.90.
Conclusions: This method can be used to quantify lens fluorescence in vitro and

suggests that the measured fluorescence when soft contact lenses are exposed to fluorescein is associated with the water content of the lens material.
Research funding received: None

Poster number: 19
Impact of Packaging Saline Wetting Agents on Wetting Substantivity
Jessie Lemp, Leroy Muya, Jami Kern, Karen Sentell, Jennifer Lane
Purpose: Two in vitro studies evaluated an investigational lens packaged in a saline solution containing copolymer 845 (CO845) and a novel wetting agent EOBO (polyoxyethylene-polyoxybutylene) for improved wetting substantivity.
Methods: Lotrafilcon B lenses with and without EOBO added to the packaging saline solution already containing CO845 were evaluated for wetting substantivity via the sessile drop technique (VCA Optima system). Study 1: Contact angle measurements were obtained after 0x, 3x, 5x and 10x successive saline/air exposure cycles to capture changes in contact angle over time. Study 2: Contact angle measurements were obtained out-of-pack and after 16 hours of incubation in 1mL saline/lens at 35°C.
Results: Lotrafilcon B lenses packaged in saline containing EOBO+CO845 were associated with significantly lower contact angles after ten successive saline/air exposure cycles compared to lenses without EOBO (13°± 9 vs. 35°± 9; p<0.0001). After 16 hours' incubation in saline, the contact angles of the investigational lenses containing EOBO in the packaging solution were maintained significantly lower relative to control lenses (8°± 2 vs. 21°± 2; p<0.001).
Conclusions: The addition of EOBO to the saline of the lotrafilcon B lens containing CO845 improved wetting substantivity of the lotrafilcon B lens when measured by multiple in vitro techniques.
Research funding received: Research conducted by Alcon Research Ltd. All authors are employees of Alcon Research Ltd.

Poster number: 20
Comparison of residual peroxide after neutralization of two marketed one-step hydrogen peroxide systems
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Purpose: To compare residual peroxide (R-H2O2) of Clear Care Plus (CCP) and PeroxiClear (PC) after neutralization in laboratory-cycled cases and patient-used cases.
Methods: R-H2O2 of neutralized CCP and PC (N=5 CCP and PC cups/discs) was measured via UV spectroscopy in parts per million (ppm) after 1, 15, 30, 45, 60, 75, 90 and 100 cycles at manufacturer-recommended neutralization times (NT; CCP=6hrs, PC=4hrs) at ambient room temperature. Additionally, 132 subjects used CCP and PC systems in randomized order for 30 days to disinfect silicone hydrogel lenses. Lens cases were collected at Day 30 and the appropriate solution was added to each case (10mL/case) to measure R-H2O2 via UV spectroscopy at NT.
Results: At NT, mean R-H2O2 for CCP was <10ppm after 30 cycles and 5ppm after 100 cycles; PC averaged 55ppm and 72ppm after 30 and 100 cycles. In 30-day used cases, R-H2O2 of CCP and PC at NT was 26.2±41.17 and 229.7±280.13 respectively, (p<0.001).
Conclusions: The CCP and PC hydrogen peroxide systems used by subjects resulted in slightly higher R-H2O2 concentrations at NT than laboratory-cycled systems; however, the manufacturer- recommended 6-hour NT of CCP allows for more-complete neutralization of H2O2 than the 4-hour NT recommended with PC. 99% of 30-day patient-used CCP systems neutralized H2O2 to ≤100ppm, below the level detectable by ocular tissues.
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Poster number: 21
Performance of a Novel Silicone Hydrogel Lens Among Contact Lens Wearers That Use Digital Devices and Report Dry Eyes
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Purpose: Dry eyes are commonly associated with overexposure to digital devices and can have an impact on the lens wearing experience. A unique silicone hydrogel lens (samfilcon-A) designed to retain moisture and provide a smooth surface was evaluated among a population of lens wearers that use digital technology and report having dry eyes.
Method: Subjects that spent at least 3 hours each workday using a computer or electronic device and experienced dry eyes were assessed in this 2 week, single-arm study. Patients were enrolled by 22

independent investigators. Following 7 days of wear, subjects completed an internet survey to capture their perspectives regarding the product. Investigators completed slit lamp examinations (SLE) and exited the subjects, after 2 weeks.
Results: 226 eligible subjects that experienced dry eyes were enrolled. There was no significant difference in SLE>Grade 2 findings between Dispensing and 2-week visits, and no adverse events. The proportion of subject agreement regarding performance attributes associated with focusing for a long time at digital devices and general wear experiences were significantly greater than 50% ($p<0.05$). While focusing for long times at digital devices, subjects agreed the lenses were comfortable (88.9%), helped eyes stay moist (80.5%), provided clear vision (88.9%), prevented blurriness (81.0%), and prevented eyes from feeling dry (80.5%). For general wear experiences, subjects agreed the lenses provide clear vision throughout the day (90.3%), provide clear vision when driving at night (90.3%), and made them less aware they are wearing lenses (77.4%). Preference over habitual lenses on these questions were also significant ($p<0.05$).
Conclusion: Prolonged use of digital devices can contribute to alterations in blink rate and tear film integrity resulting in symptoms of dryness. The performance ratings demonstrated that the novel samfilcon-A (Bausch+Lomb Ultra) lenses can help practitioners improve the contact lens wearing experience for those that use digital devices and report dry eyes.
Research funding received: This study was sponsored by Bausch+Lomb.

Poster number: 22
Assessing multiple measurements of tear osmolarity with TearLab System – an independent study
Dorota Szczesna- Iskander
Purpose: To evaluate the variability of TearLab Osmolarity System based on multiple measurements, in a group of non-contact lens wearers with normal tear film and to assess the relationship of tear osmolarity (TO) to other clinical measures of tear film such as Fluorescein and Non-Invasive Tear Film Break-Up Time (FBUT and NIBUT).
Methods: Twelve healthy subjects (30±6 years of age) with normal tear film were included in the study. For assessing symptoms, the Ocular Surface Disease Index (OSDI) was used. Clinical parameters included measurement of FBUT, NIBUT (videokeratoscope based) and tear meniscus height (TMH), with slit lamp graticule. Ten consecutive osmolarity measurements were taken at 1-minute intervals from both eyes by the same examiner: a set of five measurements was followed by a set of another five measurements after a 15-minute break at one visit for all the subjects. To evaluate the variability of osmolarity measurements cumulative coefficient of variation was calculated.
Results: Up to two outlying values of TO were identified for each subject (Thompson's tau method) and excluded from the statistical analysis. The average TO was 304.6±8.4mOsm/L and the standard deviation for left and right eyes ranged between 1.9–7.1 and 1.5–8.3, respectively. Although TO was averaged from 8 to 10 consecutive measurements no statistically significant correlations were found between TO and: OSDI (Pearson's $r2=0.089$, $p=0.174$), FBUT (Pearson's $r2=0.07$, $p=0.106$), NIBUT (Pearson's $r2=0.004$, $p=0.392$), and TMH (Pearson's $r2=0.017$, $p=0.274$). The measurement variability stabilised after around 5 consecutive readings.
Conclusions: Higher variation observed on right eyes suggests the sensitivity of the method on the sample collecting technique. Randomly occurring outlying high and low values and high cumulative coefficient of variation suggest the need of performing more than a few measurements on each eye. This aspect of measurement may be of importance when assessing influence of contact lens material on TO.
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Poster number: 23
Can special tinted soft contact lenses help to reduce migraine attacks?
Sebastian Schubert, Peter Storch, Frank Richter, Wolfgang Sickenberger
Purpose: The primary objective was to investigate if special tinted soft contact lenses have a positive effect on migraineurs.
Methods: 20 migraineurs from the Jena University Hospital were included in a single center, patient masked cross-over-study. Therapy and placebo tinted SCL

(TSCL) were fitted at baseline in a randomized order. Migraine attacks were documented in headache diaries for wearing periods three months each. The MIGRAINE DISABILITY ASSESSMENT (MIDAS) and the DEPRESSION, ANXIETY AND STRESS SCALE (DASS) were used. The number of migraine attacks and days with migraine, length of the headache periods, characters of the headaches, localization and associated symptoms of both periods were assessed and compared.
Results: Complete data sets of n=12 female patients (32.4±8.8 years) were assessed in the pilot study. The cohort consisted of different migraine types (n=3 migraine with aura, n=3 migraine without aura and n=6 other types of migraine). Following general results can be stated out of the number of complete data sets and the different migraine diagnosis: With both TSCL a decrease of MIDAS and DASS scores were determined in relation to pre-study status. Therapy-TSCL showed a stronger effect in the category massive disturbance. A comparison of therapy-TSCL vs. placebo-TSCL showed no preference (less migraine attacks n=4, no change in migraine attacks for n=3, more attacks for n=5). Heavy intensities of headaches were lower with the therapy-TSCL. Headache periods of more than 7h and one-sided, pulsating headaches decreased stronger with therapy-TSCL. Subjective improvement for n=8 with the therapy-TSCL and for n=2 with both TSCL were documented. N=10 were less light sensitive with TSCL. Also, n=10 intended to continue to wear the therapy-TSCL.
Conclusion: Both, placebo and therapy TSCL tend to reduce migraine symptoms. The therapy-TSCL showed a stronger effect by trend. Further studies with higher number of cases in different migraine types are required. Key Words: Migraine, headache, tinted soft contact lenses, MIDAS, DASS
Research funding received: -

Poster number: 24
Reasons for adherence to spectacle wear compared to contact lens wear
Mera Haddad
Purpose: To investigate reasons for adherence to spectacle wear compared to contact lens wear
Methods: Thirty subjects were interviewed about the reasons for adherence to spectacle wear and not trying contact lenses as alternatives to spectacles. The questionnaire studied the subjects' knowledge about contact lenses as an option to correct their refractive error and reasons for not trying contact lenses. Descriptive analysis was used to calculate frequencies, percentages, means and standard deviations.
Results: The sample included 16 male and 14 female with an average age of 21.1 years (range 19-23) were interviewed. Subjects had been wearing spectacles for many years (average duration ± SD, 6.4 ± 4.0) and the majority of subjects (66.7%) were diagnosed by ophthalmologists and not optometrist. The results showed that 40% considered contact lenses as alternative to glasses, whereas 60% were happy with their glasses. For both groups (happy or not happy with glasses), the main reasons that prevented them from considering contact lenses was the fear of possible contact lens complications mainly dryness and infection and compliance with contact lens hygiene. In addition, the ophthalmologist's advise of Lasik surgery prevented them from trying contact lenses. Other reasons included the lack of information about the benefits of contact lenses and a few subjects reported unsuitability for contact lens wear.
Conclusion: This study probes three concerns which limit the use of contact lenses as alternative to glasses. Dryness is the most common concern, compliance/patient hygiene and referral to Lasik surgery by ophthalmologists. Addressing these barriers may help improving contact lenses so that it would be considered as a first option to correct refractive errors. In addition, increasing the awareness of the benefits of contact lenses is essential and is a joint task for both optometrists and ophthalmologist.
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