

Comparison of blue light-induced damage (BLD) in albino and pigmented mice

Purpose

This study aimed at comparing blue light-induced retinal injury (BLD) in albino Balb/cJRj and pigmented C57BL/6JRj mice.

Methods

BLD was induced bilaterally to male albino Balb/cJRj (Janvier Labs, 5 m.o.) and pigmented C57BL/6JRj mice (Janvier Labs, 4 m.o.). After an overnight dark adaptation and pupil dilation with tropicamide 30 min prior to induction, the mice were exposed to LED blue light (454 nm, 1000 lux) for one hour (albino) or three hours (pigmented). Scotopic flash electroretinography (ERG, Celeris, Diagnosys LLC) and spectral-domain optical coherence tomography (SD-OCT, Envisu R2200, Bioptigen Inc./Leica Microsystems) were performed at baseline and on Day 7 after induction. Retinal thickness was measured from SD-OCT images using a proprietary algorithm.

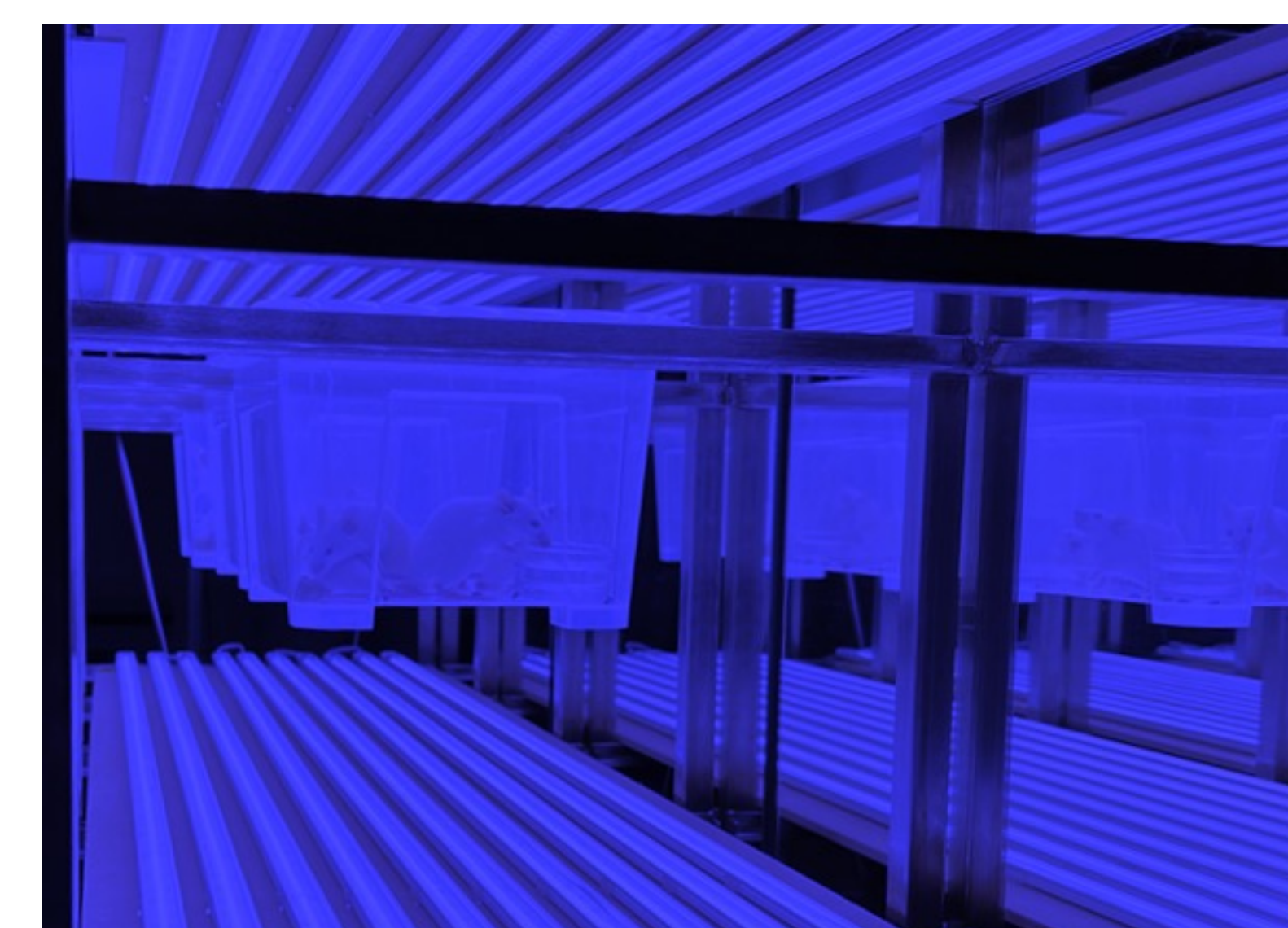


Figure 1. LED blue light damage induction system with RGB+CCT 24 V CRI 98 LED strips, 454 nm, 1000 lux.

Results

Albino mice: Seven days after BLD induction, ERG showed a significant impairment of visual function in Balb/cJRj mice. At the 0.1, 1, 3 and 10 cd.s/m² stimuli, a-wave amplitudes were reduced between 20-43%, and b-wave amplitudes were decreased between 26-30% as compared to naïve mice. The functional decline correlated with 38% retinal thinning in the BLD eyes. The retinal thinning was primarily identified in the outer retina.

Pigmented mice: In C57BL/6JRj mice BLD did not affect the a- and b-wave amplitudes. Minor structural changes were seen only in the photoreceptor outer segment/retinal pigment epithelium layer (3% reduction $p < 0.01$).

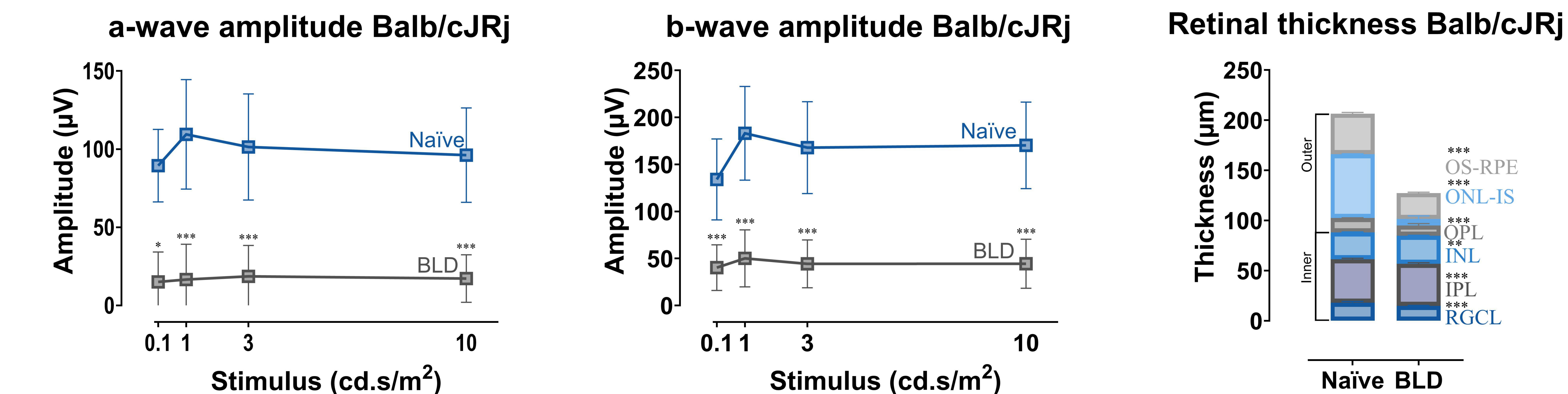


Figure 2. Five months old male albino Balb/cJRj mice were exposed to bright blue light (1000 lux) for one hour. Seven days after induction significant reduction in ERG amplitudes and thinning in inner and outer retina were observed. Data are presented as mean ± SD from 8 naïve and 20 BLD eyes. Data are analysed by unpaired t-test. Significance * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

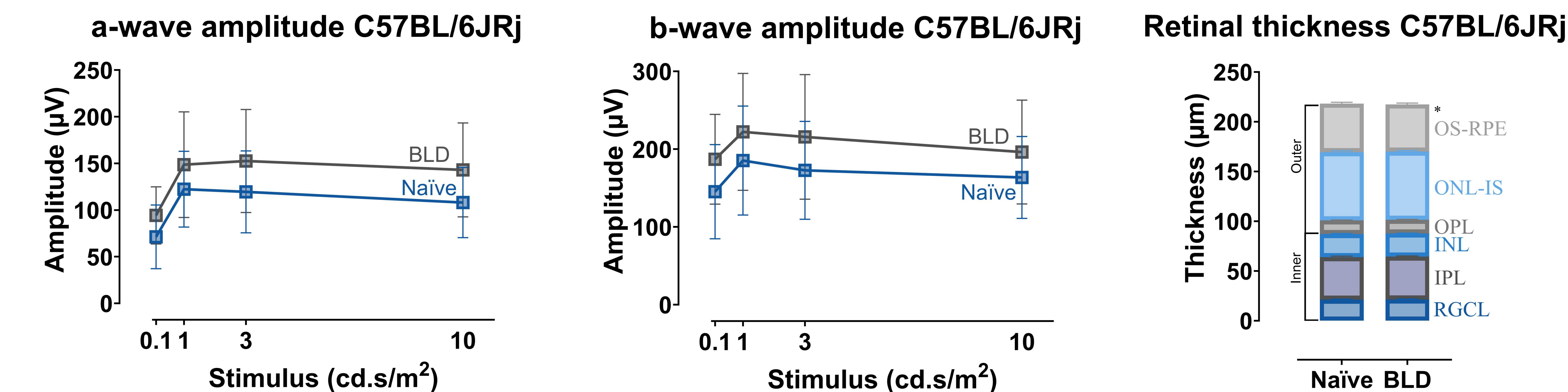


Figure 3. Four months old male pigmented C57BL/6JRj mice were exposed to bright blue light (1000 lux) for three hours. Seven days after the induction, no significant changes were seen in ERG amplitudes. Retinal thinning was seen only in the photoreceptor outer segment/retinal pigment epithelium layer. Data are presented as mean ± SD from 8 naïve and 16 BLD eyes. Data are analysed by unpaired t-test or Mann-Whitney. Significance * $p < 0.05$.

Conclusion

One hour at 1,000 lux is sufficient to induce BLD in albino Balb/cJRj mice. Pigmented C57BL/6JRj mice remain resistant to BLD even at the 3-hour exposure of 1,000 lux blue light, which is in accordance with previous reports.

The newly designed, custom-made BLD induction system demonstrates the capability to simultaneously induce photoreceptor damage in up to 12 mice.

Furthermore, this system can be utilized to induce comparable photoreceptor damage in albino rats.

Disclosures
 LT, RT, PP, BL, HN, AMH, OV, XR, AMK, SB, MCG: none
 GK: Experimentica Ltd. (I,S)

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