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Ocular parameters changes in the IRBP knockout mouse eye.

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Abstract

Purpose : Despite the high prevalence of myopia in the worldwide population, underlying mechanisms are unclear. Interphotoreceptor retinoid-binding protein (IRBP) is major protein of the subretinal space. It plays a crucial role in the visual cycle. Our laboratory previously reported eye size defects at postnatal day 8 (P8), profound myopia and retinal degeneration at P30 in the IRBP knockout (KO) mice, indicating a role for IRBP in eye development. The purpose of this study was to determine which ocular parameters affecting optical power are altered in IRBP KO mice.

Methods : Both male and female C57BL/6J (WT) and congenic IRBP KO mice at P30 (WT, n=8; KO, n=6) and P55 (WT, n=3; KO, n=5) were subjected to whole-eye biometrical imaging using a Bioptigen R4310 deep imaging spectral domain optical coherence tomography system (SD-OCT). Parameters included central corneal thickness (CCT), anterior chamber depth (ACD), lens thickness (LT), vitreous depth (VD), and retinal thickness (RT). Mean thicknesses (+/- standard deviation; SD) were recorded. An unpaired t-test with Welch's correction assuming unequal variances was used to assess statistical significance between groups.

Results : SD-OCT analysis revealed that at both P30 and P55, VD was significantly deeper in IRBP KO (P30: 1018 ± 51.26 µm in KO, 638 ± 37.59 in WT, $p<0.0001$; P55: 899.6± 15.12 in KO, 564± 8.72 in WT, $p<0.0001$). The VD increase in IRBP KO mice was accompanied by an increase in total axial length (P30: 3354 ± 35.44 in KO, 3068 ± 56.52 in WT, $p<0.0001$; P55: 3396 ± 36.34 µm in KO, 3130 ± 9.91 in WT, $p<0.0001$). Conversely, ACD was significantly decreased in IRBP KO (P30: 259.4 ± 14.14 µm in KO, 289.6 ±12.49 in WT, $p<0.01$; P55: 294.7 ± 10.92 µm in KO, 314.5 ± 4.48 in WT, $p<0.05$). At P30, RT was

significantly reduced in KO mice (172.5 ± 16.39 in KO, 210.5 ± 24.94 in WT, $p<0.01$). No significant differences in CCT or lens thickness were observed in IRBP KO versus WT mice at P30 or P55.

Conclusions : Our data support selective axial length growth as the primary contributor to profound myopic shift in IRBP KO mice, similar to clinical myopia. It may be that an increase in VD is the primary contributor to profound myopic shift in IRBP KO mice and that this increase also resulting results in compensatory compression of other compartments of the eye. Our data indicate an importance of IRBP in normal eye development and emmetropization.

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