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CME Session

Presentation Abstract

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| Program#/Poster#: | 5870 |
| Abstract Title: | **Adaptive Optics Multiphoton Microscopy of Retinal Structures In The Chick** |
| Presentation Start/End Time: | Thursday, May 05, 2011, 11:30 AM -11:45 AM |
| Session Number: | 529 |
| Session Title: | Retinal Imaging: New Approaches/New Targets / CME |
| Location: | Palm A |
| Reviewing Code: | 103 adaptive optics: imaging and visual performance - VI |
| Author Block: | *Juan M. Bueno*[1], *Anastasia Giakoumaki*[1], *Emilio J. Gualda*[1], *Frank Schaeffel*[2], *Pablo Artal*[1]. [1]Laboratorio de Optica, Universidad de Murcia, Murcia, Spain; [2]Section Neurobiology of Eye, Centre for Ophthalmology, Tubingen, Germany. |
| Keywords: | 550 imaging/image analysis: non-clinical; 645 photoreceptors; 685 retina |
| Abstract Body: | **Purpose:** Histological analyses of shapes, sizes and distributions of retinal cells usually require labeling procedures which may also cause artifacts. We have used multiphoton microscopy to study the structure and cellular organization in fixated, but unstained retinal tissue of the chicken, avoiding potential alterations related to staining procedures.<br>**Methods:** A custom-developed multiphoton microscope equipped with adaptive optics (Bueno et al., J. Biomed. Opt. 2010) was used to record two-photon excitation fluorescence (TPEF) images originating from the chick retinal structures. The instrument operates in backward (reflection) configuration and uses a femtosecond laser (Ti:Saphire) as excitation source, a pair of galvanometric mirrors as scanning unit and a photon-counting unit as detection device. A Z-scan motor coupled to the microscope objective allowed optical sectioning across the entire retina. It also includes an adaptive optics module for correction of the aberrations of the laser and system. Non-stained chick retinas (30 day-old) were fully in-depth imaged at different retinal locations. The images of the photoreceptors (PR) layer (oil droplets) were analyzed to determine the cell density as a function of retinal eccentricity.<br>**Results:** All the specimens were imaged from the retinal nerve fiber |

layer to the outer segment by detecting the TPEF signal. Volume renderings of the entire retina revealed that the PR mosaic provided the maximum TPEF signal. Moreover the ganglion cells also provided enough signal for direct counting. The average density of PR and ganglion cells reduced from the area centralis to the periphery. From the PR density, the maximum potential anatomical resolving power was about 6-7 c/deg at the central retina, with a decrease with eccentricity by a factor of about 2.
**Conclusions:** Multiphoton microscopy combined with adaptive optics provided a clear representation of the multilayered structure of the chick retina. Observations confirmed a change in retinal cell density with retinal eccentricity that matched published data. This technique will lead to a better characterization of retinal alterations during myopia induction in the chick model, or in toxicity studies. It appears very useful also for the visualization of retinal pathologies.

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