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Abstract

Characterization of glial response during retinal degeneration / regeneration in experimental laser models†

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Abstract: In order to characterize the glial response during retinal remodeling, a laser model was used to compare the degenerative changes in the mouse with the regenerative character of the response in zebrafish. These data were validated with human retinal samples. C57BL/6J mice and AB zebrafish underwent laser photocoagulation with a 532 nm diode laser in the outer nuclear layer (mouse: 300 µm; ZF: 50 µm). At different time points post injury induction, the kinetics of retinal changes were assessed by H&E. The gliotic response was observed with confocal microscopy for Müller cell markers (GS, CRALBP) in combination with gliotic markers (vimentin, nestin, S100β, GFAP) in the late stage of wound repair. In parallel, human donor retina section with hard drusen formation were used to investigate gliotic response. Focal laser treatment elevated the expression of glia markers in the area of the damage. This was associated with increased expression of S100β, GFAP, vimentin and nestin in mouse and human. In zebrafish, we could detect S100β at the first time point but no GFAP nor nestin positivity was found. However, in zebrafish no double positive GFAP/GS was found on days 10 and 17 as were no S100β/GS double positive cells on day 12. In all models, macroglia have the ability to undergo the same gliotic response, but zebrafish do not show expression of all detected gliotic markers. The data demonstrate upregulation of S100β in mice eyes that are comparable to human retinal tissue with early onset of retinal degeneration (drusen). No distinct staining of S100β could be found in zebrafish retinas. An interplay between astrocytes and Müller cells might also be involved in this process. The results offer new insight into the gliotic mechanism in retinal degeneration / regeneration.

Keywords: Retinal degeneration; Laser injury; Müller cells; Astrocytes; Endogenous regeneration

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