Retinal microglia in the mouse model of oxygen-induced retinopathy

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Background

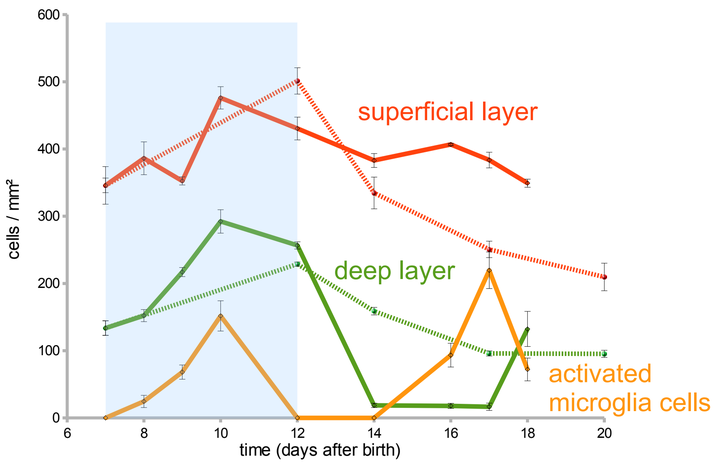
Retinal neovascularization has been intensively investigated in the mouse model of oxygen-induced retinopathy (OIR). Here, we studied the contribution of microglial cells to cell loss and reactive angiogenesis in mice expressing green fluorescent protein (GFP) under the microglial cell-specific promotor Cx3cr1.

Conclusion

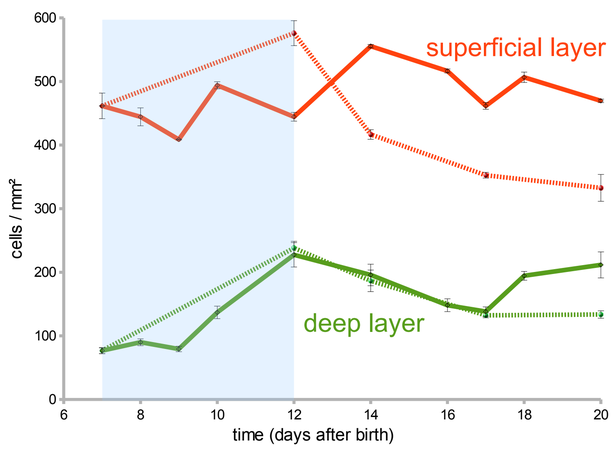
- Microglial cell density is always higher in the superficial than in the deep retinal layer.
- Hyalocytes density decreases with retinal vascularisation.
- The density of microglial cells in the deep layer decreases significantly after return to normal room air.
- **It is unclear if microglial cells move from the deep to the superficial layer.**
- Activated microglial cells are observed in the superficial retinal layer from P8 to P10 and from P16 to P18.
- **Thus, microglial cells may be involved in the formation of the central avascular zone as well as in retinal revascularisation.**

Results

Microglial cells in central zone

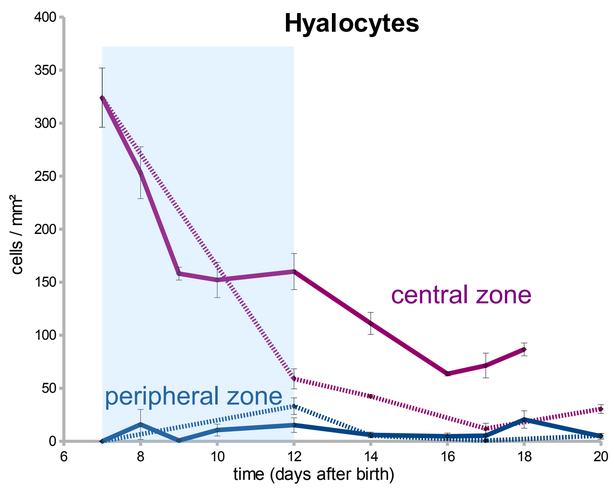


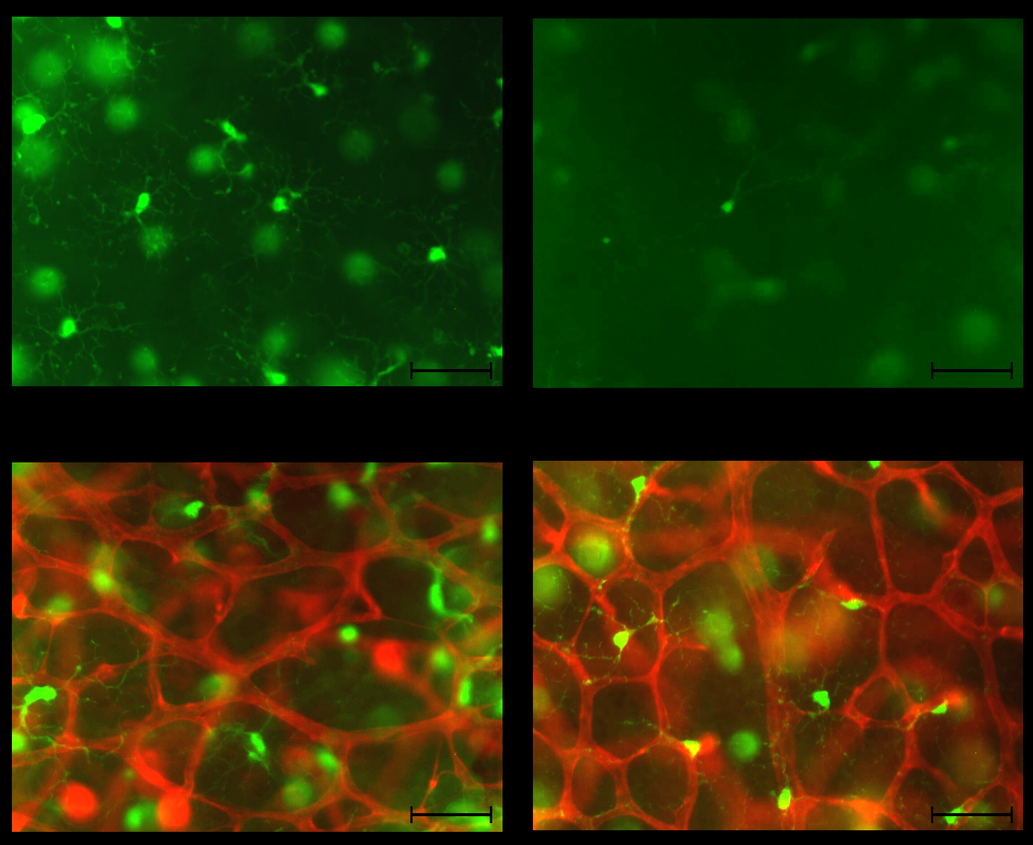
Microglial cells in peripheral zone



OIR-model
control group without oxygen treatment
Error bars indicate standard error

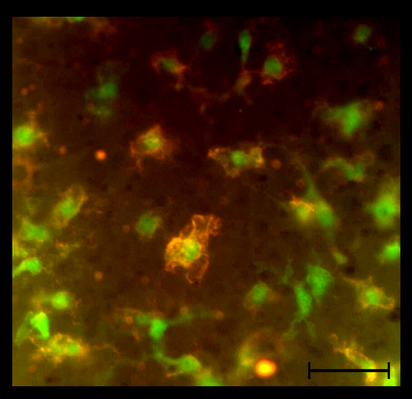
Hyalocytes





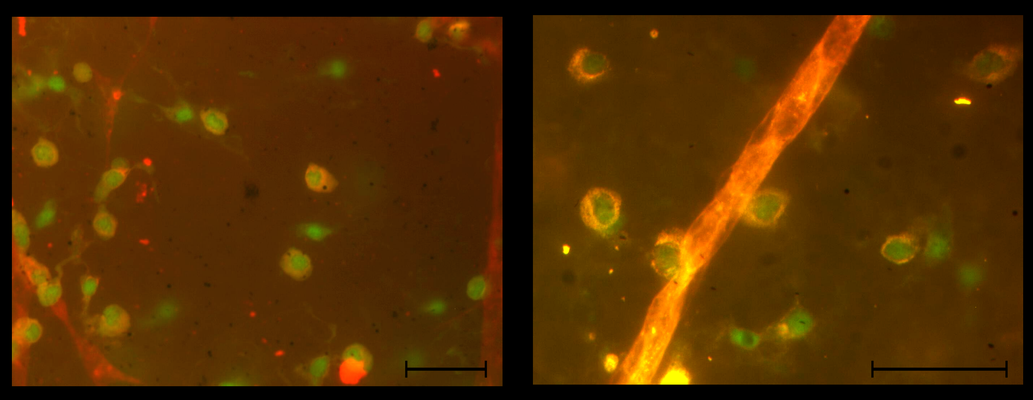
Microglial cells expressing GFP *(green)* in the deep retinal layer, vessels are stained with lectin *(red)*

bar = 50µm



Activated microglial cells
OIR P17

These cells are found in the superficial layer of the retinal avascular zone.
Activated microglial cells express GFP and are additionally positive for lectin. They undergo a morphological change from ramified cells to cells with short and broad processes.



Hyalocytes in the central avascular zone of the retina,
vessels stained with lectin

Hyalocytes are positive for GFP and lectin. In contrast to the microglial cells, they have a larger round cellular body and no processes.

bar = 50µm

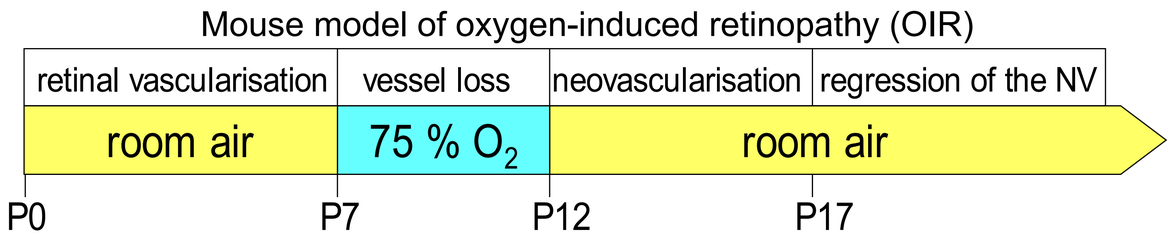
Methods

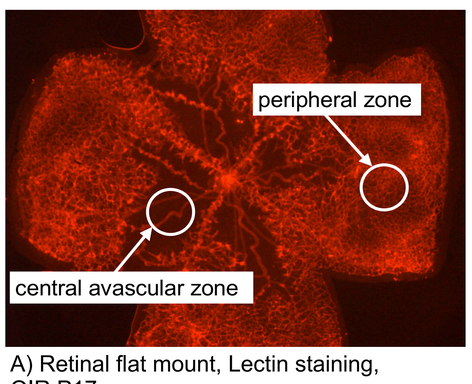
- Animals: heterozygous Cx3cr1-GFP mice (background: C57Bl/6)
- Retinal flat-mounts were stained with lectin and investigated by fluorescence microscopy
- Numbers of microglial cells and hyalocytes in 12 fields were determined from postnatal day 7 to day 20
- Cells were counted:

  A) in two zones of the retina (central and peripheral zone)

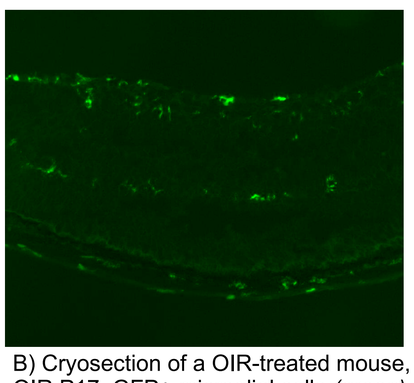
  B) in two layers of the retina (superficial and deep layer)

  C) hyalocytes in vitreous





A) Retinal flat mount, Lectin staining, OIR P17



B) Cryosection of a OIR-treated mouse, OIR P17, GFP+ microglial cells *(green)*