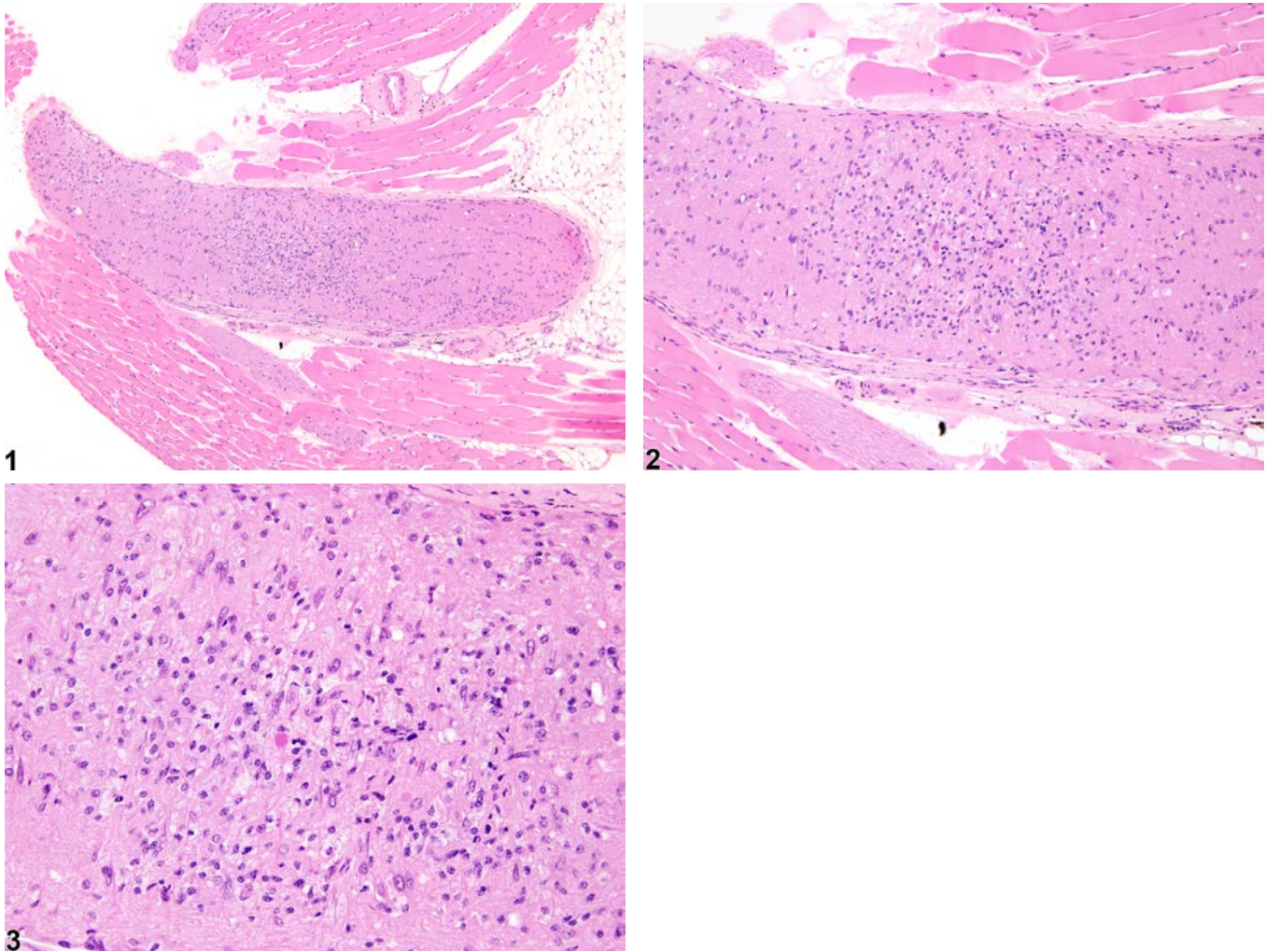


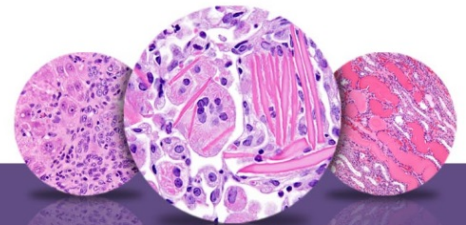
# NTP Nonneoplastic Lesion Atlas

## Eye, Optic Nerve – Gliosis



**Figure Legend:** **Figure 1** Eye, Optic nerve - Gliosis in a male B6C3F1 mouse from a chronic study. There is a diffuse increase in number of glial cells in the optic nerve. **Figure 2** Eye, Optic nerve - Gliosis in a male B6C3F1 mouse from a chronic study (higher magnification of Figure 1). The optic nerve contains increased numbers of glial cells. **Figure 3** Eye, Optic nerve - Gliosis in a male B6C3F1 mouse from a chronic study (higher magnification of Figure 1). There are increased numbers of glial cells in the optic nerve.

**Comment:** Glial cell proliferation and/or activation (gliosis) in the optic nerve usually occurs as a reactive change associated with optic nerve degeneration. It has various causes, such as trauma or increased intraocular pressure, and is characterized by focal to diffuse increases in the numbers of glial



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cells (Figure 1, Figure 2, and Figure 3). The increased glial cell populations can consist of astrocytes, oligodendrocytes, and/or microglia. Proliferating astrocytes can exhibit a reactive phenotype, with increased cytoplasmic volume, thicker cell processes, and larger, more vesicular nuclei. They also become more metabolically active. Reactive oligodendrocytes and microglia also undergo morphologic and metabolic changes. Focal accumulations of reactive astrocytes, connective tissues elements, and other glial cells are sometimes referred to as “glial scars.”

**Recommendation:** Optic nerve gliosis should be diagnosed and assigned a severity grade. The presence of optic nerve gliosis should prompt careful examination of the retina (especially the ganglion cell and nerve fiber layers) for concurrent pathology. Associated lesions, such as optic nerve degeneration, should be diagnosed separately.

### References:

Fitch MT, Silver J. 2008. CNS injury, glial scars, and inflammation: Inhibitory extracellular matrices and regeneration failure. *Exp Neurol* 209:294-301.

Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/17617407>

Lee EW, Render JA, Garner CD, Brady AN, Li LC. 1990. Unilateral degeneration of retina and optic nerve in Fischer-344 rats. *Vet Pathol* 27:439-444.

Abstract: <http://vet.sagepub.com/content/27/6/439.short>

Maeda K, Sawada A, Matsuhara M, Nakai Y, Hara A, Yamamoto T. 2004. A novel neuroprotectant against retinal ganglion cell damage in a glaucoma model and an optic nerve crush model in the rat. *Invest Ophthalmol Vis Res* 45:851-855.

Full-text: <http://www.iovs.org/content/45/3/851.full>

National Toxicology Program. 2010. NTP TR-557. Toxicology and Carcinogenesis Studies of  $\beta$ -Myrcene (CAS No. 123-35-3) in F344/N Rats and B6C3F1 Mice (Gavage Studies). NTP, Research Triangle Park, NC.

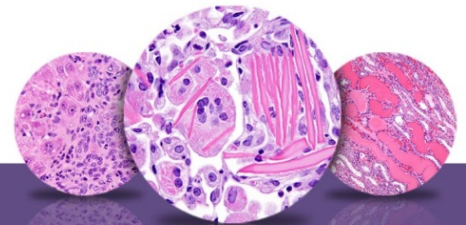
Abstract: <http://ntp.niehs.nih.gov/go/33584>

Nitzan A, Kermer P, Shirvan A, Bähr M, Barzilai A, Solomon AS. 2006. Examination of cellular and molecular events associated with optic nerve axotomy. *Glia* 54:545-566.

Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/16906543>

Ramos M, Reilly CM, Bolon B. 2011. Toxicological pathology of the retina and optic nerve. In: *Fundamental Neuropathology for Pathologists and Toxicologists* (Bolon B, Butt MT, eds). Wiley, Hoboken, NJ, 385-412.

Abstract: <http://onlinelibrary.wiley.com/doi/10.1002/9780470939956.ch24.summary>



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### **References:**

Schlamp CL, Li Y, Dietz JA, Janssen KT, Nickells RW. 2006. Progressive ganglion cell loss and optic nerve degeneration in DBA/2J mice is variable and asymmetric. *BMC Neurosci* 7:66-80.

Full-text: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1621073/>

Smith RS, John SWM, Sundberg JP. 2002. Optic nerve and orbit. In: *Systematic Evaluation of the Mouse Eye: Anatomy, Pathology, and Biomethods* (Smith RS, John SWM, Nishina PM, Sundberg JP, eds). CRC Press, Boca Raton, FL, 227-247.

Son JL, Soto I, Oglesby E, Lopez-Roca T, Pease ME, Quigley HA, Marsh-Armstrong N. 2010. Glaucomatous optic nerve injury involves early astrocyte reactivity and late oligodendrocyte loss. *Glia* 58:780-789.

Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/20091782>

Trimmer PA, Wunderlich RE. 1990. Changes in astroglial scar formation in rat optic nerve as a function of development. *J Comp Neurol* 296:359-378.

Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/2358542>

Yoshitomi K, Boorman GA. 1990. Eye and associated glands. In: *Pathology of the Fischer Rat: Reference and Atlas* (Boorman GA, Eustis SL, Elwell MR, Montgomery CA, MacKenzie WF, eds). Academic Press, San Diego, CA, 239-260.

Abstract: <http://www.ncbi.nlm.nih.gov/nlmcatalog/9002563>

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