University at Buffalo The State University of New York Lab Animal Facilities	STANDARD OPERATING PROCEDURE Microphthalmia in Mice	Quality Form SOP # **2.D.1** Revision: **00** Last Reviewed: **1/28/2026**

1.0 **PURPOSE**:
To describe the condition of microphthalmia in mice, the associated ocular conditions, and basic treatment plans for the associated ocular conditions.

2.0 **SCOPE**:
This applies to LAF staff.

3.0 **DEFINITIONS**:
Microphthalmia: A congenital condition related to issues during fetal development that causes one (unilateral) or both (bilateral) eyes to be abnormally small, underdeveloped, and disorganized.

Anophthalmia: One or both eyes fails to develop at all during gestation. True anophthalmia is difficult to diagnosis without histology, as remnants of ocular tissue can be present.

Glaucoma: An ocular disease characterized by visual impairment and blindness from damage to the retina and optic nerve due to increased intraocular pressure (IOP). Often, the eye will have a bulging appearance due to abnormal accumulation of ocular fluid or congenital anomalies in the anterior chamber (chamber of the eye between the lens and cornea).

4.0 **PROCEDURES**:

4.1 Appearance of the microphthalmic eye – these abnormalities develop before birth

4.1.1 One or both eyeballs are noticeably smaller than usual. The eyelids may be partially closed due to lack of support from the small eyeball. The eyeball may appear to be nonexistent.

a. Viewing the mouse from the front will make a unilaterally microphthalmic eye easier to see.

b. Comparing the mouse to another mouse of the same strain and approximate age will help diagnose bilateral microphthalmia.

4.1.2 Ocular discharge can be present due to infection consequent to poor drainage of tears and debris because of the small eyeball size.

4.1.3 Cataracts will appear as variable sized opacity deep in the eye. The opacity may be indistinct.

4.1.4 A corneal opacity less than one millimeter in diameter, distinctly marginated, and centrally located is frequently observed. The lens is attached to the inner surface of the cornea in one spot.

4.1.5 Iridocorneal adhesion can occur where the iris forms attachments with inner surface of the cornea. This can occur in multiple locations, causing the pupil and/or iris to look abnormal.

4.2 Appearance of the glaucomatous eye – microphthalmia can cause secondary glaucoma

4.2.1 Bulging eye due to accumulation of fluid in the anterior chamber of the eye.

4.2.2 Corneal ulceration due to self-trauma or inability of the eyelids to close over a bulging eyelid properly.

4.2.3 Periorbital alopecia or lesions due to the mouse rubbing or scratching at the eye.

4.2.4 Swollen eyelids (blepharitis) due to rubbing or scratching at the eye.

4.2.5 Increased intraocular pressures (IOP)

a. This should be measured with a tonometer calibrated to mice. High normal IOP is 25 mmHg.

b. Interpret with caution. Scruffing, mouse movement, proximity of the probe to the eye, residual fluorescein stain or eye ointments, or an incompletely opened eyelid can affect the reading of the tonometer.

c. Never check the pressure on an ulcerated cornea. This will cause pain to the mouse and will lead to an erroneous reading.

4.3 Diagnostic and Treatment Plans Based on Mouse Condition

4.3.1 The nonpainful mouse

a. A nonpainful mouse will have a smooth coat, normal posture, be active in the cage, and will not have any other ocular issues other than a small and/or cloudy eye(s).

b. Animal reports submitted for small or cloudy eye(s) should be evaluated by an LAF veterinary technician as per SOP 2D10. If there are no signs of pain or glaucoma, the mouse can be monitored daily until the next vet check. There is no need to check IOPs at this time.

c. Treatment and measurement of IOPs is at the discretion of the veterinarian examining the mouse at the next vet check.

i. If the mouse has no signs of pain, corneal ulceration, glaucoma, or other health issues, it is acceptable to note that the mouse has microphthalmia in one or both eyes on the cage card. The mouse does not need to remain on report.

ii. The diagnosis of microphthalmia should be communicated to the PI and associated lab staff.

- ♦ If the mouse is a breeder, it should be culled from the breeding colony as there is a genetic link to the development of microphthalmia.
- ♦ The lab should be warned that glaucoma or other eye issues may develop, so long term studies are not recommended.

4.3.2 The painful mouse

a. A painful mouse will have an unkempt or ruffled coat, hunched posture, and/or facial grimace, often accompanied by a decrease in activity and dehydration.

b. Assuming the pain is related to an eye issue, the veterinary technician initiating the report should check both eyes closely for signs of glaucoma and corneal ulceration.

c. Follow-up diagnostics and treatment plans
    i. If the cornea is roughened, dull, or has an obvious spot where the surface is not intact, contact a veterinarian for further diagnostics and a treatment plan. This is indicative of a corneal ulceration.
        - Fluorescein staining will confirm a corneal ulcer.
        - IOPs should not be measured on an ulcerated cornea.
        - Carprofen, 5 mg/kg, SQ can be given q 24 hours for pain.
        - SQ fluids, 1-2 mL, should be given as needed for dehydration.
        - Choice of topical ophthalmic ointment/solution is at the discretion of the veterinarian. 2-3 times per day treatment is often beneficial.
    ii. If there are signs of glaucoma, as described in section 4.2, contact a veterinarian for further diagnostics and a treatment plan.
        - IOPs can be measured, unless there is a corneal ulceration. Rechecks of IOP are at the discretion of the veterinarian (daily, every other day, weekly, etc.).
        - Carprofen, 5 mg/kg, SQ can be given q 24 hours for pain.
        - SQ fluids, 1-2 mL, should be given as needed for dehydration.
        - An ophthalmic solution for the treatment of glaucoma should be started (latanoprost, timolol, etc.).
        - If a corneal ulcer is also present, topical treatment for this condition should also be incorporated.
    iii. Communication with the PI and relevant lab staff
        - The mouse may heal and be able to come off report in the case of a corneal ulcer only, as long as response to therapy is good.
        - Mice with glaucoma will need lifelong treatment, and prognosis is poor if the mouse is painful. Euthanasia is often recommended.
        - Mice with glaucoma and corneal ulceration have a grave prognosis and euthanasia is recommended.

4.3.3 The nonpainful glaucoma mouse

a. This mouse will appear comfortable with normal posture, coat condition, and activity, but will have a slightly enlarged or diffusely cloudy eye consistent with glaucoma. The cornea will be intact and smooth.
    i. Follow-up diagnostics and treatment plan
        - Measure the IOP in both eyes. >25 mmHg is consistent with glaucoma. Three accurate readings should be averaged from each eye to determine the IOP.
        - Because the mouse is non-painful, carprofen is not required unless ordered by the veterinarian. It is more important to reduce the intraocular pressure.

- The affected eye(s) should be treated 2-3 times per day with latanoprost or timolol (or other ophthalmic products at the discretion of the veterinarian). Topical NSAIDs are not recommended as they may increase IOP.
- IOPs should be rechecked 2-3 days after initiating treatment to assess response to treatment.
- Mice with an IOP >60 mmHg, an IOP that is chronically increasing, or an IOP that does not decrease with regular treatment should be euthanized.

ii. Communication with the PI and relevant lab staff

- Treatment is lifelong and prognosis is guarded for long term survival.
- Glaucoma is likely to worsen, and the mice are prone to developing concurrent ocular issues and chronic pain.
- If the mouse is near end point, it can finish the study as long as it remains comfortable. Otherwise, euthanasia is strongly encouraged.

References:

1. Etienne Côté. *Clinical Veterinary Advisor. Dogs and Cats*. St. Louis, Missouri, Mosby Elsevier, 2007, pp. 440–442.
2. *Laboratory Animal Medicine.* Third Edition ed., Elsevier Science Publishing Co, 2015, pp. 134–135.
3. "Microphthalmia and Ocular Infections in Inbred C57 Black Mice." *The Jackson Laboratory*, 2 Oct. 1995, www.jax.org/news-and-insights/1995/october/microphthalmia-and-ocular-infections-in-inbred-c57-black-mice.

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Change History:

Revision #	Description of Change	Effective Date
00	New SOP	1/29/2026