

1. **Purpose:** To provide instructions for the management of dystocia in laboratory mice. To meet or exceed the standards as set out in the CCAC Guide to the Care and Use of Experimental Animals.
2. **Responsibility:** Animal care staff, veterinarians, and trained individuals listed on an approved Animal Utilization Protocols (AUPs). All animal users handling and treating animals must have successfully completed Mouse A/B training courses.
3. **Introduction:** Dystocia is defined as difficult, abnormal, or dysfunctional parturition (labour). Mice typically give birth during the night or early morning (corresponding with the dark phase in the animal room), and hence dystocia is often observed on an early morning check. Rapid identification and response are key to protecting the welfare of the dam and maximizing the chances of survival for the litter.

While this SOP refers specifically to mice, the same general principles apply to the management of dystocia in rats.

Any breeding of rodents and euthanasia methods must be outlined in an approved Animal Utilization Protocol (AUP).

4. *Procedures:*

PREVENTING DYSTOCIA:

Risk factors for dystocia include nutritional deficiency, pregnancy in older animals (> 20 weeks in mice), animals that did not first become pregnant at a young age, and animals with extended time periods between litters (strain dependent). External sources of stress around parturition also increase the likelihood of dystocia or fetal resorption, with the latter generally occurring during the first two weeks of gestation.

Best practices for preventing dystocia:

- Begin breeding females at a young age (~6-8 weeks, but strain dependent)
- Retire female breeders at 6-8 months of age, or after 6 litters, whichever comes first
- Do not allow extended time periods (i.e., 1-2 months) between litters
- Feed breeding mice an 18% protein rodent chow (e.g., Teklad Global 18% protein); a prenatal supplement is also recommended (e.g., Clear H₂O Diet Gel Prenatal)
- Minimizing external sources of stress (handling, noise, activity), especially during late gestation and during labour

IDENTIFYING DYSTOCIA:

The two main presentations of dystocia are a pup visibly stuck in the vaginal canal or cervix, or extended parturition that is not progressing. Pups should normally be delivered approximately every 15-30 minutes during the active (dark) phase.

Clinical signs that can be used to diagnose dystocia include:

- Poor muscle tone with a distended abdomen, which can appear “lumpy” when pups are still in the uterus
- Blood present in the cage and around the vulva
- Hard contractions with no pups being delivered within 60 minutes or no progression of a pup in the vaginal canal with each contraction
- Prolonged cessation of contractions before all pups are delivered

The dam may also display nonspecific signs of pain, distress, or poor health, such as:

- Rough/ruffled hair coat

- Hunched posture
- Orbital tightening (aka squinty eyes), or other positive grimace scale indicators (nose/cheek bulge, ear/whisker position)
- Laboured or rapid respiration
- Signs of dehydration: sunken eyes, low skin elasticity

MANAGING DYSTOCIA

It is essential that the initial assessment be performed quietly with as little disruption to the dam as possible. If the room is in the dark phase of the light cycle, assessments should be performed with red light only. The key points of the assessment are:

- Condition of the dam: hydration, posture, contractions (productive vs. unproductive), pup visible in the birth canal
- Pups in the cage: dead pups are often scattered around the cage, away from the nest. Live pups are usually in the nest.
 - Do not manipulate or disturb the nest: carefully check the underside of the cage for live pups in the nest
 - If the dam is still in active labour, do not remove dead pups to minimize disruption
- Blood in the cage
 - If the dam is not at endpoint, do not remove bloody bedding/paper towel to minimize disruption

If a pup is visibly stuck in the vaginal canal:

- Gently lift and support the dam to cage lid and confirm that she has not reached endpoint due to signs of pain, distress, or poor health.
- Apply a lubricant (e.g., saline, KY lube – preferably warmed) to the visible portion of the pup and around the vaginal opening.
- Attempt to gently remove pup with forceps padded with gauze/a cotton swab or a moistened piece of gauze between your fingers.
- Provide supportive therapy: mash/prenatal gel, heat +/- warm subcutaneous fluids (0.5 – 1.0 mL sterile saline) if the dam is demonstrating signs of distress or poor health.
- If successful, return the dam to the cage and the pup to the nest (if unsuccessful, proceed with euthanasia) .
- Recheck within 60 minutes to see if parturition is progressing (if pups are still in the uterus) and/or that the dam's condition has not deteriorated.

If parturition is not progressing (unproductive contractions, >60 minutes without a pup or cessation of contractions before all pups are born):

- Provide supportive therapy: mash/prenatal gel, heat, and warm subcutaneous fluids (0.5 – 1.0 mL sterile saline)
- Recheck quietly within 2-3 hours, or within 60 minutes if the dam was demonstrating signs of distress or poor health on assessment
- If the dam has deteriorated or, no pups have been born at the 3-hour mark, proceed with euthanasia +/- cross fostering (see below)
- If new pups have been born, recheck again within 60 minutes to confirm parturition is still progression (if pups are still in the uterus) and/or that the dam's condition has not deteriorated

The dam has reached endpoint and should be euthanized (+/- cross-fostering) if:

- Parturition does not progress within 3 hours.
- The dam is demonstrating signs of distress or poor health (see above) that do not respond to supportive care within 60 minutes and/or the dam's condition deteriorates further from the initial assessment.
- A pup stuck in the vaginal canal cannot be manually removed.

CROSS-FOSTERING

Cross-fostering is when pups are removed from one dam and transferred to another lactating dam with pups of the same approximate age. To maximize the chances of success, the receiving dam should be:

- In good health.
- Have healthy, thriving pups born within the last 7 days, and ideally within the last 3 days for best outcomes.
- Ideally of a different strain for easy identification of the new litter.

Cross-fostering is accomplished as follows:

- Euthanize the dam in dystocia: isoflurane followed either CO₂ or cervical dislocation
- Upon confirmation of death, surgically enter the abdomen and uterus and remove pups
 - Consult with ACS veterinarian if you do not have experience with this procedure and/or have not received surgical training, as there is a risk of hurting the pups

Title:
Mouse Dystocia

SOP.ACS.816.Mouse Dystocia

Approval Date: September 15, 2023 Revision Date:

- Place pups on a clean gauze and stimulate them to breathe by rubbing them with more clean gauze
- Identify live pups that respond to stimulation and are breathing
- Take nesting material with a bit of dirty bedding (with some urine and feces) from the recipient dam's nest and gently rub on the litter to be cross-fostered to transfer scent
 - Alternatively, the nest + litter from the recipient dam may be removed from the cage for cross-fostered pups to be mixed, and then replace the entire nest with all pups in the cage
- Mix cross-foster pups with biological pups in the nest – do not exceed the natural litter size of the strain of the recipient dam (i.e., max 8-10 pups/litter)
 - If cross-foster pups need to be distinguished from biological pups, euthanize the biological pups, or choose a dam of a different strain/coat colour
- Re-check quietly in 1-2 hours to see if the foster dam has accepted the pups
 - If pups are in the nest, DO NOT disturb them
 - Any cold pups scattered outside the nest should be euthanized via decapitation
- Provide heat for 24 hours

Title:
Mouse Dystocia**SOP.ACS.816.Mouse Dystocia****Approval Date: September 15, 2023 Revision Date:**

5. References

Clear H₂O: Best Practices for Rodent Colony Planning, Breeding Support, and Pup Health

<https://www.clearh2o.com/2019/04/29/breeding-laboratory-mice-tips-for-improving-pup-survivability-growth-and-performance/>

The Jackson Laboratory: Breeding and Husbandry Support – General Husbandry Tips

<https://www.jax.org/jax-mice-and-services/customer-support/technical-support/breeding-and-husbandry-support/general-husbandry-tips>