# Managing A Mouse Colony

**Mouse gestation and breeding**

1. Mouse gestation is 19-21 days. Animals are weaned at 21-28 days of age, are reproductively mature at 5-6 weeks of age, and may live to be three years old. Breeding efficiency is strain-dependent, but in general, breeders should be retired and replaced when they are 9-11 months of age. Inbred strains generally give birth to smaller sized litters than outbred; average litter size for a mouse on a C57BL/6 background is 5-7 pups, but the average litter size for an outbred CD1 is 10-12 pups.
2. Many substrains of inbred mice have been characterized. Each strain obtained from one provider or breeder may be different from the same strain from a different breeder. Transgenic mice are either inbred to litter mates for 5-10 generations to produce a congenic line, or back crossed to wild type animals of a given strain for > 5 generations to produce an isogenic line carrying the transgene. In the case of a congenic line, the best controls are wild type litter mates from matings between heterozygous males and females. Any wild type animal from the parent strain can serve as a control for animals back-crossed to isogenicity.

**Breeding**

1. The estrous cycle of a mouse is 4-5 days, but there are factors that can alter estrous cycles. Females housed together at a density of 5/cage may only cycle every 5-7 days. Exposing females to dirty bedding from the cage of a male mouse can induce estrous more quickly.
2. For inbred strains, setting up mice 1:1 is the preferred breeding scheme. Sperm count is not as high as one would find in outbred strains, and while an inbred mouse can impregnate multiple females, litter sizes for each female will not be as large as if they were mated 1:1. Outbred mice (CD1) have no issues impregnating 2 females on the same day, with little to no effect on litter sizes for either female.
3. If you plan to use P0-P3 pups, you may set up one male with two females (1:2) if you are responsible for removing new pups from the cage or separating adults before the litter reaches 4 days of age to avoid an overcrowded cage charge from DLAR.
4. If your mice tend to be small, or you see a phenotype in KO/ KI mice that may need extra attention, different breeding schemes can be implemented to ensure that dams are removed from males before delivery and/ or pair-housed with a nanny mom or another nursing female.

**Timed pregnancies:**

When it is necessary to know the exact stage of the pregnancy, e.g. for isolation of primary cells at a specific stage of prenatal development, mice must be set up to breed and checked for copulation plugs. Check all available females for estrous stage, and mate those that are in estrous in the afternoon. Check for copulation plugs the next morning. While CD1 plugs tend to stay in longer, C57 plugs are smaller and more likely to fall out, so plugs should be checked as early as possible in the morning. Females should be removed from males after plugging, and date of mating and plug should be noted on cage. At the date of the plug, the female is considered E0.5 dpc. Pups should be expected at E19.5 for most strains. If the females do not plug, remove from the males and note the dates that the females and males were together.

**Nesting and delivery:**

* + 1. Strains differ in their nesting habits, litter size and sensitivity to environment. All breeding cages must have a hut and extra nesting material in the cage at all times.
    2. Most mice will deliver and nurture their pups with no issues. However, in some cases, pups can become stuck in the birth canal, or the mother may cannibalize her young or abandon the nest. Milk can be seen in the stomachs of pups if they are nursing. If the pups are not receiving milk, or are otherwise not being nurtured, or if there is evidence of the dam destroying her pups, the litter may need to be fostered to another female that has recently delivered her own pups. If you foster a litter to a different dam, you must make sure to mark fostered pups if they are a different strain. You can toe clip one toe on each pup or clip the last 1 mm from the end of the fostered pups’ tails to show which mice came from which pair. Place the new pups into the foster mother’s cage and mix them into the nest with her own pups. Dock the cage back on the rack and observe to make sure that the foster mother is caring for the pups.

**Maintaining infrequently-used lines:**

To ensure the continuation of mouse lines, a new litter should be produced approximately once every six months. Maintain at least one cage of males and one cage of females for each line, and monitor to make sure that they are bred before they are too old.

**Considerations for expanding a line for experiments**

When you determine how many mice you will need for each genotype/ study group, communicate with the lab manager to allow for enough time to produce these mice. Keep in mind that from the day you set up a breeding pair, it will take approximately six to eight weeks before their first litter weans. If you need a large study group, consider holding back mice in advance so you have enough breeders to generate your study group. For example, if you need 80 mice born within a week, you need several breeding males and multiple breeding females (anywhere from 10-20 females for that size study group) available. Plan ahead, and communicate your needs with the lab manager so your study goes smoothly!

**Computer Database:**

We currently use the mouse colony database program mLIMS <http://bioinforx.com/lims/online-transgenic-mouse-colony-management-software-system/mlims> . Data including cage information,date of birth, genotype, strain, sex, and other notes are entered for each mouse. New animals are entered into the database by the colony manager when the animals are individually numbered.

Each lab member is responsible for genotyping their own mice. Genotyping should be reported to the colony manager and entered into mLIMS. Please communicate with the colony manager regarding what mice to keep/ sac, and future plans for your lines.

If you euthanize or transfer mice, please adjust the mouse status in mLIMS.