Mouse Breeding Colony Management
Why do I Need A Breeding Colony and How Many Mice Do I Need

- To produce a new line, strain, or expand an existing colony?
- To maintain a line?
- To supply animals for research?
- To provide animals for experimental use
- To provide enough animals for replacement breeders
- To keep the colony viable
Things to Consider

- Number of mice needed per week or month to meet experimental needs
- Incremental production
- Can you use both sexes or only one sex?
- How long will the animals be maintained?
- What will happen to the mice when the project is completed?
- How often can you expect a litter?
- How many pups of the appropriate genotype can you expect per litter?
- How often will you have to replace your breeders?
- Is a Genetic Profile needed to ensure I have what I think I have?
General Breeding Information

- Sexually mature – 6–8 weeks of age
- Average estrous cycle – 4–5 days
- Estrous – approximately 20 hours
- Gestation – 19–21 days can be strain dependant
- Weaning age – 20–21 days but strain dependant some transgenic strain require up to 28 days. Longer than normal weaning age (21 days) requires approval from the IACUC
- Post-partum estrus – approximately 20 hours after parturition
- Reproductive life – approximately 6 litters
## Reproduction Performance For Common Strains

<table>
<thead>
<tr>
<th>Strain</th>
<th>Breeding Performance</th>
<th>Average Litter Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD-1 (outbred)</td>
<td>Excellent</td>
<td>7+</td>
</tr>
<tr>
<td>B6C3F1 (hybrid)</td>
<td>Excellent</td>
<td>7+</td>
</tr>
<tr>
<td>FVB/N</td>
<td>Excellent</td>
<td>7+</td>
</tr>
<tr>
<td>C57BL/6</td>
<td>Average</td>
<td>5-6</td>
</tr>
<tr>
<td>DBA/2</td>
<td>Poor</td>
<td>3-4</td>
</tr>
<tr>
<td>129/Sv</td>
<td>Poor</td>
<td>3-4</td>
</tr>
<tr>
<td>Tg/KO</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>
Breeding Systems

- Random Breeding
- Hybrid
- Inbred
  - Recombination
  - Congenic/Coisogenic—generated by mating two inbred strains, and backcrossing the descendants 5–10 generations with one of the original strains they can then be compared to the pure recipient strain to determine whether they are phenotypically different if selection was for a genotypic region, or to identify the critical genetic locus, if selection was for a phenotype.
Types of Mating Cages

- Monogamous Pairing (1:1)
- Trio (2 females to 1 male)
- Harem (3–4 females to 1 male)

(In cages with over 2 females, they must be removed from the breeder cage when they become pregnant. Anticipate extra caging for pregnant females.)
How many pups of the appropriate genotype can you expect?

- Depends on parental genotype
- Ranges between 25% and 100%
- Male : Female ~ 50:50
- In cases of double or triple knockouts it can be significantly less. Perhaps only 1 to 10%
Types of Genetic Matings

Like homozygotes \((-/-) \times (-/-)\)
produces 100% homozygotes

Heterozygote x Homozygote \((+/-) \times (-/-)\)
produces 50% heterozygotes
50% homozygotes
Types of Genetic Matings

Heterozygote x Heterozygote (+/-) x (+/-)

produces 50% heterozygotes (+/-)
25% homozygote (+/+)
25% homozygote (-/-)
How Many Females Will Be Needed?

- That depends on the project
- It can vary greatly with how productive the colony or strain is.
- You can start out with a moderate number and then increase or decrease if necessary.
- Remember though that you will need to put the number of mice in your approved animal use protocol for the IACUC. Plan your study groups and breed according to your needs.
How Many Pups ...?

- **IF** each female has a litter every 3 weeks
- **IF** each litter has 6 pups
- **IF** all pups survive to be weaned
- 6 pups/3 weeks times the number of females bred
- Is this possible ... Yes  Probable.....??
To estimate and track production, calculate a **weaning index** for each breeding pair and for each strain.

A weaning index incorporates all unfavorable factors to give you the average numbers weaned per month per female.

This number can vary considerably depending on the strain that you are working with.

The lower the index, the more time and resources will be needed to reach your goal.
Calculating A Weaning Index

For each female you take:

- Total number of pups **weaned**
- Divided by the number of months she has been mated
- Example:
  
  \[
  \frac{20 \text{ (pups weaned)}}{5 \text{ (months mated)}} = 4 \text{ pups per month}
  \]
Factors That Influence A Weaning Index

- Some induced mutations cause low production or poor viability (failure to thrive) or genetic lethality
- Poor breeder productivity, pre-weaning deaths, cannibalism, still-born pups
- Delayed implantation or environmental incidents
- Long gaps between litters
- Harem breeding requires separation from males eliminating post-partum breeding opportunity
- Age of males and females: The older they are, the less productive
Record Keeping

- Source (Vendor)
- Background Strain with Tg/KO symbol
- Genotype
- Strain of female/male and date of birth
- Date mated/separated
- Individual ID number
- Protocol number
- Investigator name
Breeding Records

- Breeder Cage Cards
- Breeder Ledger
- General Use Available List
- Weaning List
- Pedigree Chart
Wean List

- New births entered weekly
- Identify litters to be weaned each week
- Estimate how many litters to be weaned for a specific week or time frame

Offspring Inventory

- Inventories by parentage, of all offspring that are born and identified/genotyped
Nomenclature
(What’s in a Name?)

- Background strain
- Substrain information
- Transgenic information
- Gene insertion or deletion symbol

CBA/CaTgVB8 (+/-)

CBA/Ca = Strain
Tg = Transgenic/Knock out
VB8 = Symbol
(+/-) = genotype
Transgenic Lines

- It should be noted at this time that breeding some transgenic lines can present unique challenges.
- There can be fertility problems with both males and females that require you to use a heterozygote breeding system rather than homozygote.
- Some females will be able to carry to term but not be able to produce milk for their young.
- Some genes may be embryonic lethal and while the female becomes pregnant, she will abort or reabsorb the pups prior to birth.
- Each line is different, so research into the potential problems is important.
Identification

- Individual Ear Tags
- Ear Notching or punches
- Tattoo
- Microchip
Tissue Collection For Genotyping

- Tail biopsy or blood, other
- Can be done pre-weaning or post weaning
- May need to collect tissues earlier if pups die before weaning
- Requires anesthesia for pups over 21 days old
- Local anesthesia to the tail is strongly recommended for pups 10–21 days of age
Good vs Poor Breeder Female

**Good Breeder**
- Produces many pups
- Takes care of young
- All appear healthy with normal growth rate
- Easily rebred no long gaps between litters

**Poor Breeder**
- Produces few pups
- Cannibalizes or scatters pups about cage
- Pups appear thin or runty
- Long gaps between litters
After she has given birth, the mother will remain on the nest to care for her young. Females that are first-time mothers are sometimes very careless with their young and mortality can be very high.
Mouse Reproduction

- It is not unusual for a first time mother to cannibalize her litter. In many cases, future litters are successful. However, if the female continues to be a poor mother, it is best if she can be removed from the breeding program.
- Females with a strong maternal instinct seem to pass this trait on to their offspring. The opposite tends to be true as well.
Breeder Pairs

- Set up breeding pairs at or near sexual maturity (plus or minus 6–10 weeks of age)
- The older the animals are when paired the increased chance of reduced production
- Monitor production and replace non-productive pairs
Rotation of Production Stock

- Breeder productivity
  - Age
  - Weaning index
- Monitor production
  - non-productive pairs / no pups for 2 months
  - decreasing litter size
- Plan to replace breeders
Reproductive Life

- The reproductive life of any particular mouse strain will vary. There are many factors that go into the equation. Litters from Transgenic mouse strains can vary from as few as one or two to as many as six to eight. Carefully kept breeding records are essential in the success of any colony.
Replacement of non-productive animals, good record keeping, including production indices, timely weaning of litters and close observation will aid in the overall success of the colony. Remember to enter your weaning dates and the other data in the weaning book. Contact the main DLAR office for additional weaning cards if you need them. PLEASE DO NOT REUSE CAGECARDS.
Consistency and commitment are critical to success in colony management.

Schedule enough time for proper management of colony; it will take longer than you think but it is worth it in the end.
Daily Tasks

- Check animals for signs of illness or distress
- In some cases, newly paired animals will fight and injure each other
- Females close to delivery may have birthing difficulty and require intervention
- If the females are group housed and close to delivery then they must be separated
- Newly weaned pups may need extra attention especially if they are small
- Checking for plugs in timed mating cages
Weekly Tasks

- Sexing and weaning (Depending on colony size this could be several times a week)
- Individual identification of weanlings
- Tail biopsy and other sampling for genotyping
- Timely replacement of breeder pairs
- Accurate record keeping
- Removal of undesirable offspring and adults
Sex Determination in Mice
Sexing Mice

In the adult mouse, male and female are easily differentiated. The mouse on the left is male. The mouse on the right is female.
With some degree of experience, very young mice can be sexed by comparing them side by side and noting the difference in the distance in the anogenital area.
Newborn, or 1 day old mice are very red, helpless and hairless. The ears and eyes are shut. If they are nursing, milk can easily be seen in the stomach.
Aging Mouse Pups

- At day 2 the pups are less red, more pink
- Milk can still be seen in the stomach
Aging Mouse Pups

- By day 3, the ear flaps will begin to open
- If the pups are going to be black or agouti, the skin pigment begins to develop
On day 4 the ears are erect and milk is no longer visible in the stomach.
Aging Mouse Pups

- By day 5, the pups will begin to develop light, fuzzy dorsal fur
At day 6 the fur is thicker across the shoulders and the coat color may be evident
On day 9 the fur is thicker.

Females will have five pairs of conspicuous nipples while the males will be much less obvious.
By day 11 the teeth are beginning to erupt and the eyes start to open.
Aging Mouse Pups

- At days 12, 13 and 14, the eyes are mostly open and they begin to nibble of solid food. Even though they may be nibbling at solid food, they are still almost totally dependant on their mother.
Aging Mouse Pups

This is a comparison of a four week old mouse and an adult mouse. Note the difference in the shape of the head.
When To Wean

- Usually done at 3–4 weeks of age
  - some strains require more time to mature
  - You may need permission from the IACUC to extend your weaning age
- Separate by sex
- Opportunity to genotype and ID at weaning
When You Wean Your Litters

- It is **extremely important** that you provide food and a water source to newly weaned pups to help ensure their survival.
- Food must be placed in the bottom of the cage or dough diet provided on cage floor.
- A WATER BOTTLE must be placed on the cage, including those cages hooked up to automated watering, or gel pack placed on the floor of the cage. Using an automated watering source is not second nature to weanlings, they must LEARN to use it!
- DO NOT UNDER ESTIMATE THE IMPORTANCE OF THESE ACTIONS. It could mean life or death for your weanlings.
Placing Food in Weanling Cages

- The best way to place regular rodent chow in the bottom of weanling cages is to moisten it with water from a clean water bottle NOT TAP WATER. While many weanling mice are able to gnaw on dry rodent chow on the cage floor, moistening the food increases their ability to eat it thereby increasing the chance for survival.

- Place a small amount of pellets (5–10 depending on the number of weanlings) in a dish and pour a small amount of water from a clean water bottle over them.

- You want the food moistened and somewhat soft but not soaked. Too much water will cause the food to spoil.

- You will have to repeat this process for several days until the mice grow stronger and be able to eat the food without the extra moisture.
Preparing Moistened Food

- Place small pieces of dry food into a small dish.
- Add about ¼ inch or so of water (depending on the number of pellets) from a clean water bottle, autoclaved water or RO water is fine.
- DO NOT USE TAP WATER or a water bottle that has been used by other animals.
- Allow water to be absorbed by food, this takes about 3–5 minutes or so.
- Moistened food can now be placed in the bottom of the weanling cage.
These Could Save Your Weanlings Lives

- Food and Nestlet on cage floor
- Dough Diet on cage floor
- Moistened food pellets
- Dough Diet and gel pack
- Water bottle within reach of weanlings, food and Nestlet on cage floor
How Many Mice Can I Put in a Cage?

- The amount of floor space for a mouse is determined by *The Guide for the Care and Use of Laboratory Animals* published by The National Research Council.
- The new “Guide” has been published in December 2010 and there is a new space requirement for females with litter.
- Guidelines for cage populations under different circumstances are outlined by the institution based on these guidelines.
## Recommended Minimum Space for Commonly Used Laboratory Rodents Housed in Groups

<table>
<thead>
<tr>
<th>Animals</th>
<th>Weight in grams</th>
<th>Floor Area/Animal,^a^ in.² (cm²)</th>
<th>Height,^b^ in. (cm)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mice in Groups^c</td>
<td>&lt;10</td>
<td>6 (38.7)</td>
<td>5 (12.7)</td>
<td>Larger animals may require more space to meet performance standards</td>
</tr>
<tr>
<td>Up to 15</td>
<td></td>
<td>8 (51.6)</td>
<td>5 (12.7)</td>
<td></td>
</tr>
<tr>
<td>Up to 25</td>
<td></td>
<td>12 (77.4)</td>
<td>5 (12.7)</td>
<td></td>
</tr>
<tr>
<td>&gt;25</td>
<td></td>
<td>≥ (≥96.7)</td>
<td>5 (12.7)</td>
<td></td>
</tr>
<tr>
<td>Female + litter</td>
<td></td>
<td>51 (33) (Recommended space for the housing group)</td>
<td>5 (12.7)</td>
<td></td>
</tr>
</tbody>
</table>

*Guide for the Care and Use of Laboratory animals: 8th edition (2010)
Mouse Cage Density*

- No more than 4 adult mice or weanlings in a static Micro-isolator or small PIV cage (144 cages to a rack) or no more than 5 adult mice or weanlings in a large PIV cage (112 cages to a rack or the green line) are to be housed in the same cage.

*This may change subject to the new 8th edition of the Guide for the Care and Use of Laboratory Animals
Mouse Cages That Exceed Density Guidelines Must Be Separated *

- Cages with 2 adult mice and 1 (one) litter when the pups are **22** days of age or older must be weaned.
- The older pups must be weaned immediately upon the birth of a second litter into the cage (usually when older litter is in excess of 19 days of age if adults are a breeding pair).

*This may change subject to the new 8th edition of the Guide for the Care and Use of Laboratory Animals.*
Separating Pairs

- It is important to remember that when removing a male from the breeding cage, he should be housed separately from other males. Males that have been used for breeding will become very aggressive and fight with other males sometime injuring each other severely if returned to a group environment. Some strains of females can become aggressive as well, but this is the exception.
- The females have a tendency to be more compatible than males when returned to a group environment.
Mouse Cages That Exceed Density Guidelines Must Be Separated*

- Cages with two (2) **females** and 13 or more pups
- Cages with two or more females and **two** or more litters of different ages.
- **Of Special Note:** Cross fostering of pups, in most cases, results in litters of different ages in the same cage. These cages must be clearly labeled indicating that cross fostering is occurring. Be sure to check to see if IACUC approval is needed **BEFORE** you cross foster.

*This may change subject to the new 8th edition of the Guide for the Care and Use of Laboratory Animals*
Mouse Cages That Exceed Density Guidelines Must Be Separated *

- Cages with a singly-housed female and her litter when the pups are 29 days of age or older and/or immediately upon the birth of a second litter into the cage.

*This may change subject to the new 8th edition of the Guide for the Care and Use of Laboratory Animals
Timed Pregnancy Programs
# Timed Pregnancies

## ADVANTAGES
- Necessary for embryology studies
- Accurate aging of litters
- Helpful in planning age dependent projects

## DISADVANTAGES
- MUST be checked daily, including weekends
- Requires more females
- Can be complicated by “Bruce” effect if plugs are not found and breeding has taken place
The Bruce Effect

If female is exposed to the pheromones of a strange male (urine) 1–2 days after successful mating, it can prevent implantation of the blastocysts.
Estrus vs Non-Estrus

- Swollen vaginal tissue
- Gaping vaginal opening
- Moist tissue
- Bright pink or purplish mucous membranes

- Closed vaginal opening
- Dry tissues
- No swelling evident
- Pale mucus membranes
Different Stages:
Subtle differences are evident between these mice. Both mice would be suitable for pairing with a male if you are setting up timed pregnancies. However, the mouse on the Right has a higher probability of plugging.
The plug is opaque, whitish, and has a waxy consistency. It can vary in color from snow white to yellow. It is generally easy to identify while still within the vaginal opening. It may also be identified in the bedding as a large waxy “chunk,” if one checks closely. Generally, plugs are expelled close to the nest/sleep area.
Vaginal plugs are NOT a guarantee of pregnancy. They are only an indication that copulation has taken place.

The best time to look for plugs is in the morning since mating usually occurs during the dark cycle and plugs only remain in place for 8 – 12 hours.
Separation of the Female

- Once a plug has been detected, the female should be removed from the male and placed in her own cage to ensure that the potential gestation period is as accurate as possible. Leaving her exposed to the male after the observation of the vaginal plug can result in subsequent breeding and inaccuracy of the expected birthing dates.
- Remember that the vaginal plug is only a sign that mating has occurred, it is NOT a guarantee of pregnancy.
The Whitten Effect
Whitten Effect
Advantages

- Accurate breeding date
- Can schedule around weekends
- Can schedule the exact gestation day
- Exact breeding date known even if plug not found
- Can schedule large groups
- Can schedule multiple groups with different mate days to coincide with specific needs
The Whitten Effect

1. House virgin females together until sexually mature.
2. Sprinkle soiled bedding from male’s cage is into females cage on two consecutive mornings.
3. Pair females 1:1 with males (female to male’s cage).
4. Remove females next morning.
   Success rate is generally about 50%.
Timed pregnancies should NEVER be performed on lactating females

- Exact gestation cannot be predicted due to possible delayed implantation
What If You Need A Foster Mom For a Litter?
Occasionally, for one reason or another, you will run into a problem where the mothers of the litters are unable to properly care for their young. Do you have an alternate means to care for them in mind?

Fostering can be a fairly simple task, but you will need to plan ahead for these times.

While not totally successful 100 percent of the time, fostering mice can be relatively successful if a few basic practices are followed.
Fostering a Litter

- The foster mom must have a healthy, well fed litter of her own.
- The litter to be fostered should be within one or two days of the age of the foster moms own litter.
- If attempting to cross foster, make sure these cages are clearly marked and check to see if IACUC approval is needed.
- It helps if the pups are a different color then the litter to be fostered, especially when you have to mix the litter. If they are not, you may have to remove all of the foster moms pups. This could cause rejection.
- The foster litter should be no larger than the natural litter, and here is where it gets a little tricky. If you have a large litter of pups that need to be fostered, you should split them between several foster moms. You need to be careful to record all of the information including the color and sex as well as the original genetic information about the fostered litter when you place them with the foster mom.
Steps for Fostering a Litter

- Once a foster mom is identified, she should be removed from her home cage and placed in a new cage.
- If you will be placing the fosterlings with her existing litter, you should put them in the nesting material with their foster siblings and cover them with some of the soiled bedding to transfer the foster litter and moms scent to them.
- Do not place the joined litter and foster mom in a clean cage. This greatly increases the chances of total rejection.
When returning the foster mom to the newly formed litter, you can allow her to urinate on the pups by holding her over them for a moment or two, or if she has urinated in the holding cage use a cotton swab to recover some of the scent and place it on her nose and the fostered pups. This is not a requirement.

- Some strains of mice make better foster moms than others. Many transgenic strains are not good candidates for accepting fostering litters. Some transgenic strains have their own rearing difficulties. Balb/c, FVB, and Swiss Websters are excellent foster moms.
Problems Encountered in Fostering Litters

- Not all foster moms will accept the fosterlings
  - The foster pups are too cold or lethargic and do not respond well to stimulation. They should be warm and wiggly. The foster mom will reject pups that are cold to the touch, are obviously weak and are unable to suckle.
  - She will be very confused and may reject pups that are either much larger or much smaller than her own litter, even if the natural litter is removed.
  - The birth cage or nursing cage for her own litter has been changed and there is not enough scent from her own litter to mask the foster pups odor.
  - The foster mom is a first time mom herself.
Problems Encountered in Fostering Litters

- You should monitor the newly formed litters very carefully and very often by observation from outside the cage to be certain the pups are being accepted and are being fed. This is usually evident within the first hour or two.

- AVOID HANDLING THE CAGE IF POSSIBLE. OVERHANDLING CAN CAUSE STRESS IN THE MOM AND COULD LEAD TO REJECTION

- **Of Great Importance**— If the foster mom is not taking care of the fosterling, do not just let them fade away. They should be humanely euthanized if it is obvious they are not being fed and cared for by the foster mom.
Where Can I Get Help If I Need It?
# Who To Call If You Need Assistance

<table>
<thead>
<tr>
<th>Name</th>
<th>Office</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Jeanie Kincer</td>
<td>323–5469</td>
<td><a href="mailto:jfkinc2@email.uky.edu">jfkinc2@email.uky.edu</a></td>
</tr>
<tr>
<td>Dr. Jeff Smiley</td>
<td>323–0289</td>
<td><a href="mailto:jsmil2@email.uky.edu">jsmil2@email.uky.edu</a></td>
</tr>
<tr>
<td>Peggy Hankes–Peña</td>
<td>323–6015</td>
<td><a href="mailto:ppena@email.uky.edu">ppena@email.uky.edu</a></td>
</tr>
<tr>
<td>Glenn Florence</td>
<td>257–1026</td>
<td><a href="mailto:gflor0@email.uky.edu">gflor0@email.uky.edu</a></td>
</tr>
<tr>
<td>April Davis</td>
<td>323–1547</td>
<td><a href="mailto:adba222@uky.edu">adba222@uky.edu</a></td>
</tr>
<tr>
<td>JoeAnn Croxford</td>
<td>323–3616</td>
<td><a href="mailto:ejcrox2@email.uky.edu">ejcrox2@email.uky.edu</a></td>
</tr>
</tbody>
</table>
Things To Think About...

- **Maintaining a rodent breeding colony requires a great deal of time and commitment.** Will you be able to devote the time and energy it takes to maintain the colony efficiently?
- Do you **really** need to establish the colony yourself or are the animals available from another source, often saving valuable time and resources.
- Remember that older animals, over 6–8 months of age, do not make good breeding prospects and will often delay your study because of their failure to reproduce.
- Over handling and disturbing the female shortly before she gives birth, or after she has had a litter, may increase the risk of problems developing.
More Things To Consider....

- What if you have to interrupt your study?
- Are there alternatives for your animal models?
- What if I can not longer get the strain I need from the same source?
- Nothing I do seems to work, I still can’t produce what I need?
- Do you need to outsource the colony?
- Am I going to have to keep the colony going for years and at what cost?
Some Pitfalls

- Transgenic expression may change dramatically if backcrossed into a different background strain
- Genetic drift or degradation of the original transgenic line
- Homozygous genotype may be lethal or otherwise impair normal reproduction. When maintaining inbred or in-house colonies, hereditary adverse consequences can occur, such as malocclusion, hydrocephalus, and ulcerative dermatitis. Malocclusion or hydrocephalus can be suspect when a mouse is smaller and thinner than its littermates, especially at or post-weaning. If these conditions are observed, DLAR veterinary services can be consulted for definitive diagnosis, management recommendations, or strategies to minimize genetic penetrance. See also:
  - Malocclusion: [http://jaxmice.jax.org/jaxnotes/archive/489h.html](http://jaxmice.jax.org/jaxnotes/archive/489h.html)
Malocclusion, Hydrocephalous, Ulcerative Dermatitis

Malocclusion

Normal Hydrocephalous

Hydrocephalous

Ulcerative Dermatitis
Potential adverse consequences of breeding include dystocia, cannibalism and maternal neglect. If a dam is found delivering during the day or is in bad condition (ruffled coat, dyspneic, prostrate, dilated vagina, dead pups in cage) DLAR veterinary services can be consulted, or the dam euthanized. Cannibalism and maternal neglect may be reduced by minimizing disturbances to the dam, especially during the first 72–96 hours of giving birth. Dams with a history of multiple neglected litters may also be considered for removal for breeding use.
Rational For Cryopreservation

- No immediate need for colony
- Stabilize colony to prevent genenic drift or degradation
- Back-up in the event of disaster
  - health problems
  - Fire
  - Flood
  - Tornado/hurricane
A Parting Word...Sometimes More Isn’t Better... It’s Just MORE!

There are many factors that determine how many animals you *really* need, and they should all be included in your breeding plan and the number of animals listed in your IACUC approved protocol. You should, also, include the space requirements and costs associated with maintaining them. Can you purchase the animals you need rather than maintaining a breeding colony?

Please remember that when you are managing a breeding colony, your goal is to meet the needs of your study as it relates to your protocol.
Remember...

☞ Be Nice to the Mice ☜