

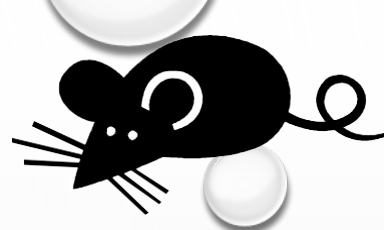
Mouse Breeding and Colony Management

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Research Manager

Colony Management Core

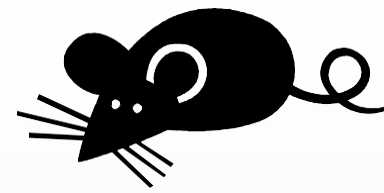




THE PLAN

- General mouse information
 - Basics
 - Reproduction
 - Basic genetic considerations
- Colony management:
 - Breeding schemes/strategies
 - Breeding performance factors
 - Weaning, ID and Tissue sampling options
 - Documentation
 - Breeding troubleshooting
- Common Health issues
- Long term colony management considerations
- resources

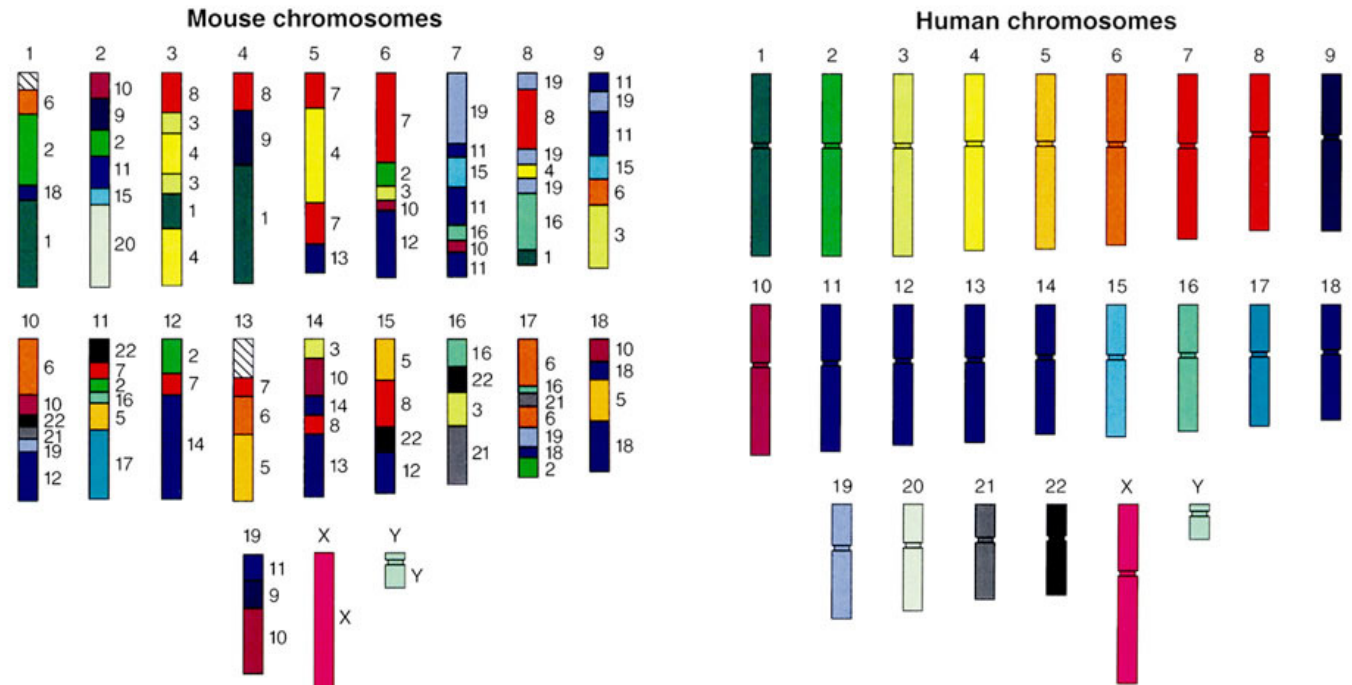




Why Use Mice as a Model

- Biologically very similar to humans: 95% shared genes, very similar immune systems, get similar diseases for many of the same genetic reasons
- Can manipulate the genome directly and model specific human diseases
- Inbred mice are available that are genetically identical to each other. Increases accuracy and reproducibility in experiments
- Have been used in research for more than 100 years. Very well understood and described
- Cost effective- small, reproduce quickly, easy to handle and transport

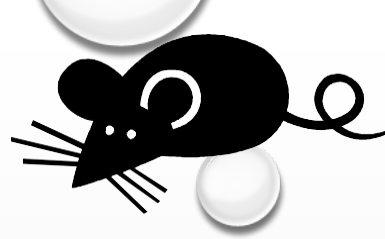
Mouse and Human Genetic Similarities



YGA 98-075R2

Courtesy Lisa Stubbs
Oak Ridge National Laboratory

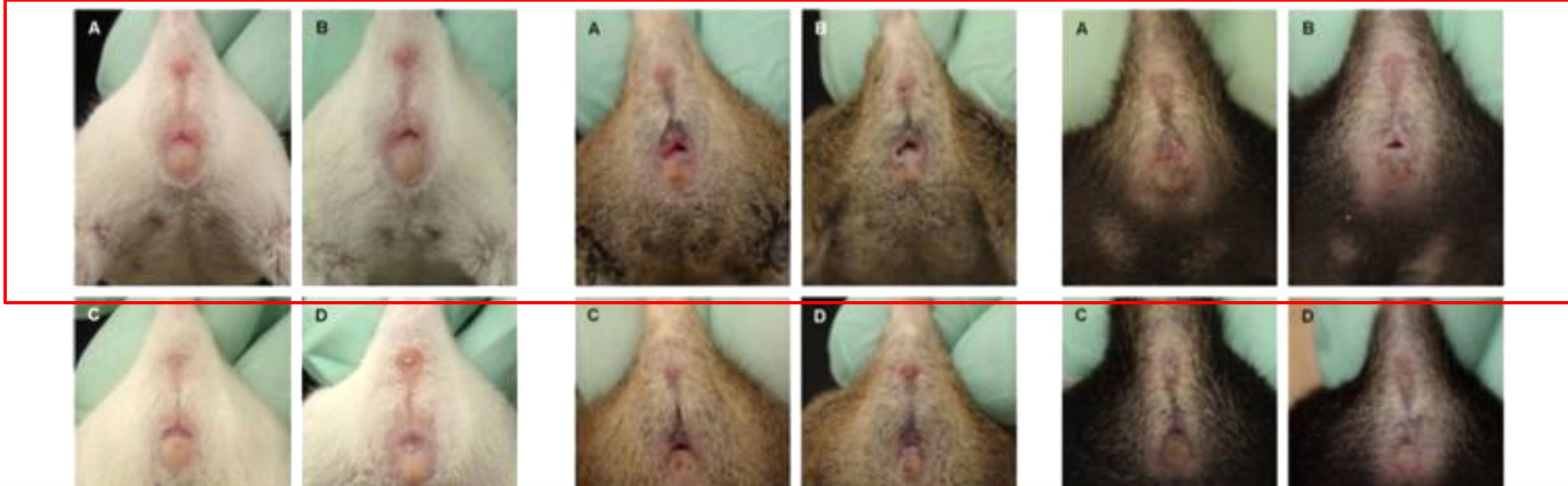
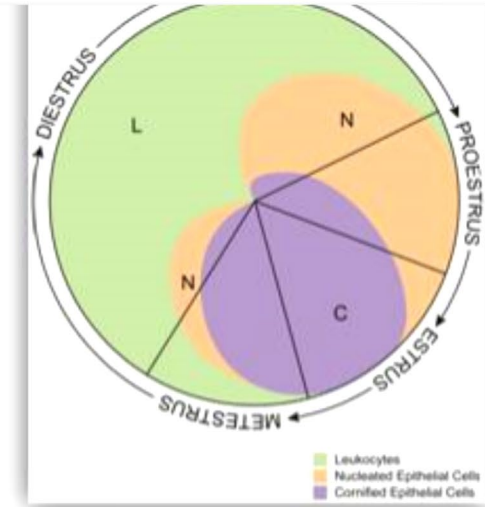
Mouse Basics



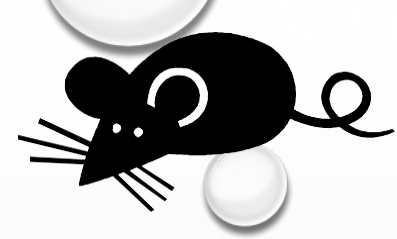
Lifespan	1.5 to 2.5 years
Weight	20 to 40 grams
Length (including tail)	6 to 7 inches (15 to 18 centimeters)
Mating Age	6-8 weeks of age
Estrous cycle	4 to 5 days
Duration of pregnancy	19 to 21 days
Litter size	2 to 12 young
Weaning age	21 to 28 days
Generation Time	12 weeks

Estrous Cycle Phases

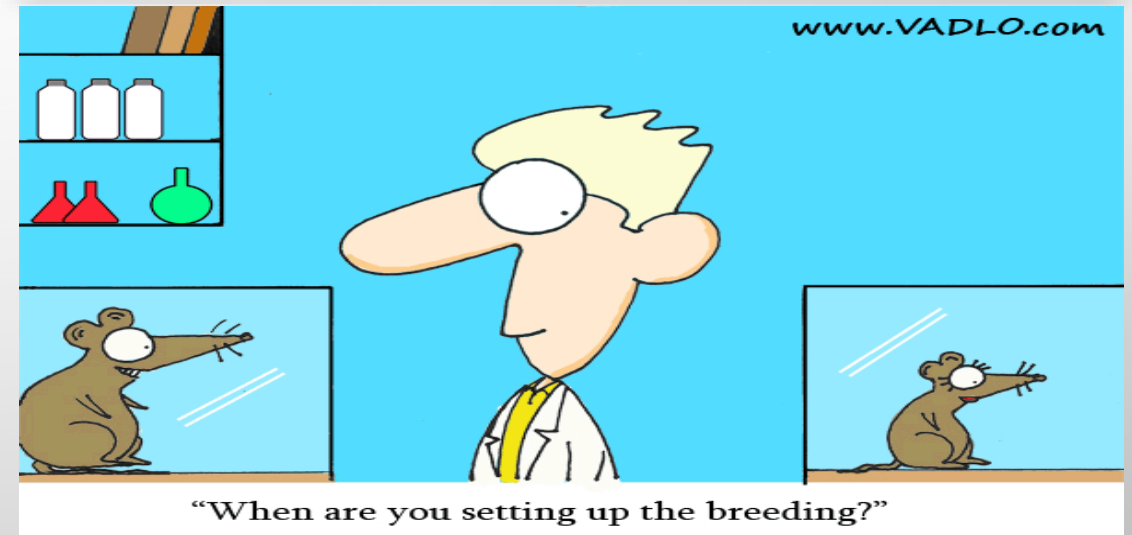
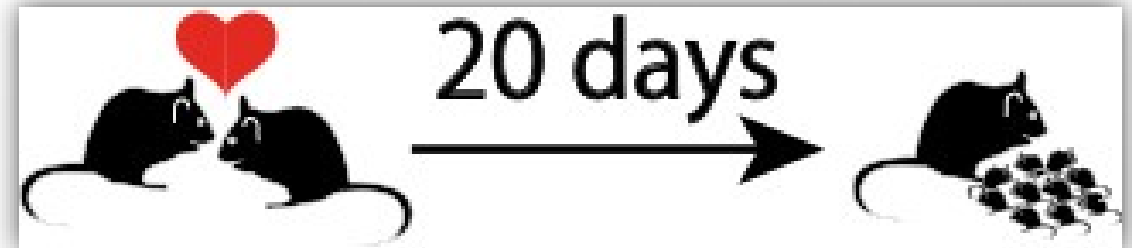
Proestrus (A)	<ul style="list-style-type: none">• Ovarian follicular development phase
Estrus (B)	<ul style="list-style-type: none">• Sexually receptive• Ovulation
Metestrus (C)	<ul style="list-style-type: none">• CL formation, eggs in oviduct
Diestrus (D)	<ul style="list-style-type: none">• New wave of follicular development if not pregnant

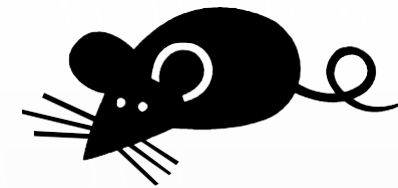


Postpartum Estrus



- Females come into estrus within **24 hours** of parturation
- Can be impregnated if male is present
- Ideally first litter will be ready to wean when second litter is due
- Take into consideration when determining suitable breeding scheme





Laboratory Mouse

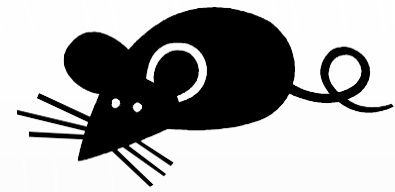
Strain: is a group of animals that is genetically uniform



Substrain: colonies of same strain that have been separated for at least 20 generations

Ex: C57BL, SW, BALB/c, FVB etc

Ex: C57BL/6J vs C57BL/6N

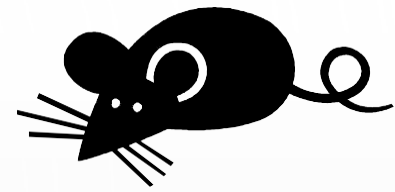


Mouse Genetic Background

Genetic Background:

- Inbred: nearly genetically identical to each other due to at least 20 generations of brother/sister breeding (F1, F2...,F20)
 - Smaller litters, smaller pups at weaning, higher illness/birth defects, lower fertility, higher pup mortality
 - Ex: C57BL/6, DBA, BALB/c
- Outbred: genetically undefined; produced by random matings of breeding-age unrelated members of mouse colony
 - Long life spans, high disease resistance, early fertility, large and frequent litters, low pup mortality, rapid growth, large size
 - Ex: CD-1, Swiss Webster, ICR
- Hybrid: A mouse that is first generation (F1) crosses between 2 different inbred strains
 - Ex: B6129SF1/J



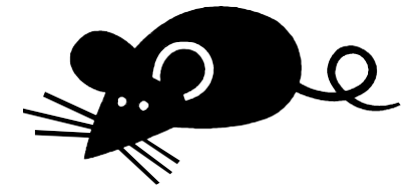


Mouse Mutants



Mutants (single gene):

- Transgenic: A mouse that contains stably inherited DNA which has been inserted randomly into the genome
 - Ex: tissue-specific, inducible Tg
- Targeted Mutations: A mouse that has a particular gene silenced
 - Ex: knockout, knock-in, conditional knockout



Inbred Strain Nomenclature

- Strains indicated by all capitalized letters
 - AKR, CBA, DBA, FVB etc.
- Many exceptions to this rule since many strains named before standardized nomenclature rules
 - 129, C3H, BALB/c (the /c is part of the strain designation)
- C57BL/6J vs C57BL/6N
 - C57BL = strain designation (black offspring of female C57)
 - /6 = substrain designation
 - J = source (The Jackson Laboratory) vs N=NIH, subline designation also
 - microbiological status sometimes included in brackets
 - [BR] = barrier reared, [GF] = germ free, [GN] = gnotobiotite, etc.



Inbred Strain Abbreviations

AKR = AK

BALB/c = C

CBA = CB

C3H = C3

C57BL = B

C57BL/6 = B6

C57BL/10 =
B10

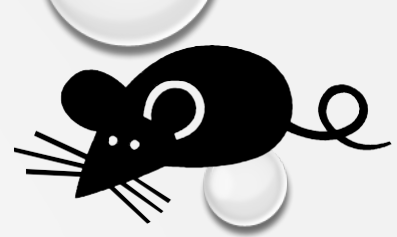
DBA/1 = D1

DBA/2 = D2

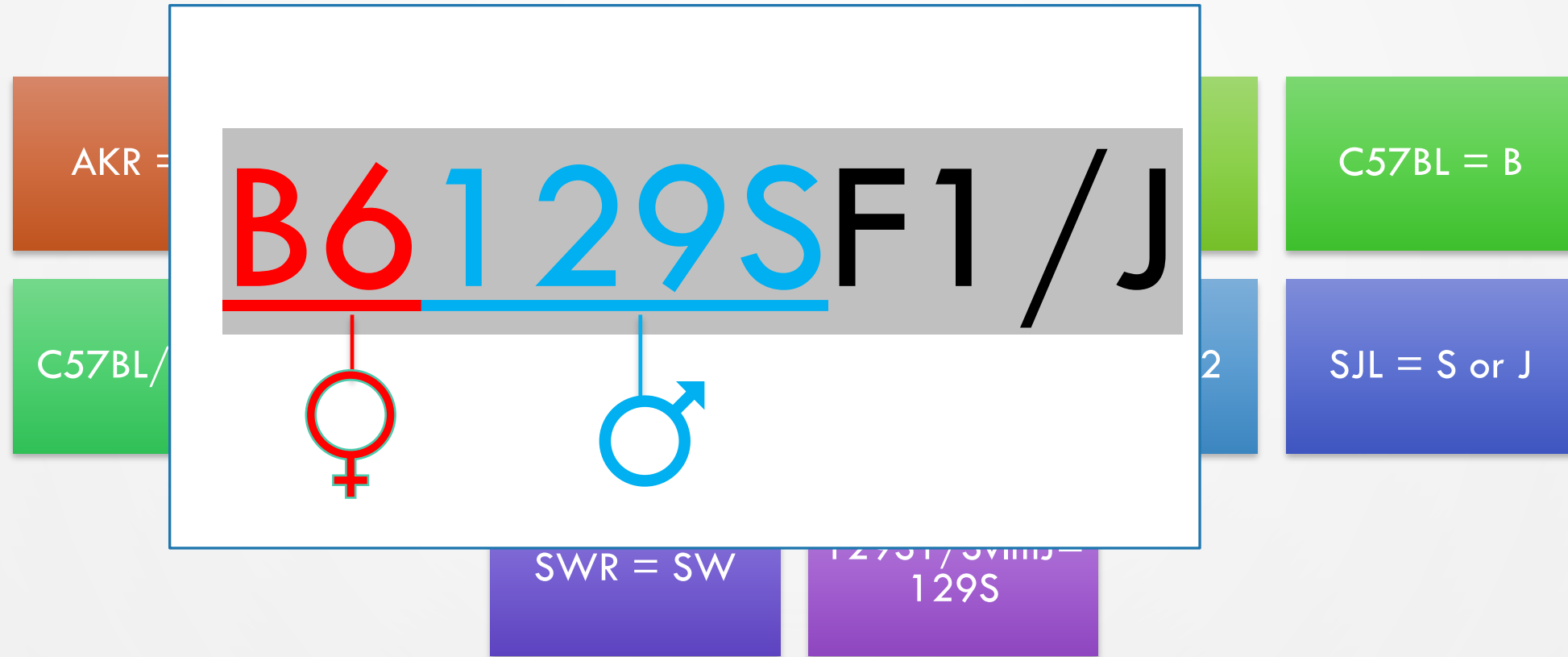
SJL = S or J

SWR = SW

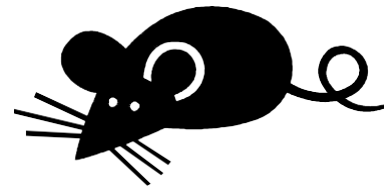
129S1/SvImJ =
129S



Inbred Strain Abbreviations

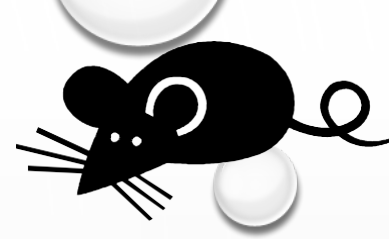


Choosing a Breeding Scheme



- WHAT GENOTYPES DO I NEED?
 - How can I identify them?
- WHAT CONTROLS ARE AVAILABLE?
- LINKAGE CONSIDERATIONS
 - X-linked or autosomal?
- MULTIPLE GENES
 - Linked or segregating independently?
- REPRODUCTIVE CONSIDERATIONS (STERILITY OR SUBFERTILITY?)
- EMBRYONIC OR POSTNATAL LETHALITY?





Mating Combinations

<Always only one male per cage>

PAIR



1 ♂ 1 ♀

TRIO

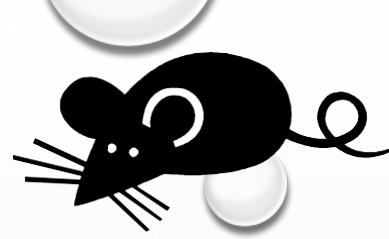


1 ♂ 2 ♀

HAREM



1 ♂ 3-4 ♀



Monogamous Pair

PROS

- Ease of accurate record keeping
- Continuous breeding, i.e., male and female always together – takes advantage of postpartum estrus
- Parents are known
- Don't have to separate parents
- Reduces male burnout from excessive breeding
- Exact date of birth for each litter
- Continuous breeding allows for the generation of a max amt of litters per female during her breeding life span

CONS

- Higher number of males required
- Higher number of cages required
- If the male is aggressive, he may cannibalize pups and/or injure the female – not common
- If one of the breeding pair dies, it can be difficult to replace

Polygamous Trio or Harem

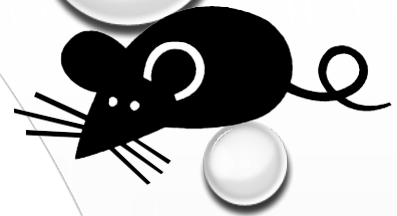


• PROS

- Requires fewer male mice
- Fewer numbers of cages needed
- Can reduce exposure of pups and females to aggressive males
- Allows to produce a large number of litters quickly

• CONS

- Labor intensive
- Accurate record keeping is more difficult
- IACUC cage density only allows 9 pups total between 2 litters when 3 adults are present
- Most times Male must be removed, and females separated because pups total between 2 litters exceeds 11
- Females must be removed from harems when obviously pregnant
- In both situations, Unable to take advantage of postpartum estrus and therefore fewer litters per female
- Higher incidence of male burnout



QUALITY

- Compliance to ideal cohort (e.g. sex, age, etc.)
- Health profile
- Frequency between cohorts
- Proper control animals

Triple Constraint of a Breeding Project

SPEED

- Assisted reproductive technology
- Cryopreservation to cohorts
- Peak vs. continuous breeding

COST

- Genotyping
- Animal husbandry
- Microbiological monitoring



Homozygous mutant (-/-) x Homozygous mutant (-/-)

- Can be used if both genders are viable and fertile as homozygotes
- Offspring: 100% homozygous; genotyping not required
- Recommend re-genotyping breeders before pairing or 1st offspring litter
- mutants should be backcrossed to the parental inbred strain every 10 generations to avoid genetic drift (i.e. random mutations effecting phenotype)
- If do not backcross, eventually will create mutants with a divergent inbred background (new substrain)
- Controls: wild type congenic strain or inbred strain mice

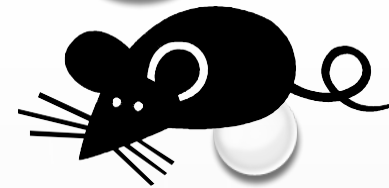
Ex 1: KO, Congenic Controls

- Experimental Mice, Homozygous *Apoe* knockout



Punnett Square		
	-	-
-	-/-	-/-
-	-/-	-/-

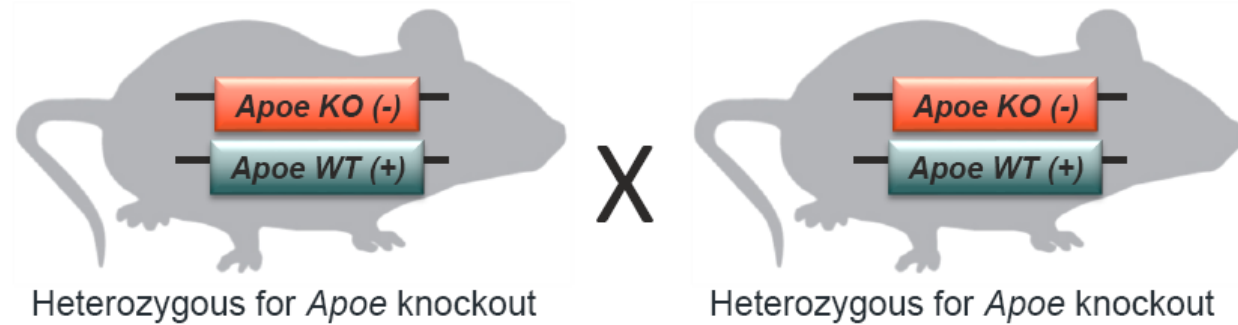
100% Homozygous
Apoe knockouts



Heterozygous mutant (+/-) x Heterozygous mutant (+/-)

- Must be used if neither gender is viable or fertile as homozygotes
- Offspring: 25% homozygous; 50% heterozygous; 25% wildtype; genotyping required
- mutants should be backcrossed to the parental inbred strain every 10 generations to avoid genetic drift (EX: backcross a mutant on a C57BL/6J background to the standard C57BL/6J strain for 2 generations)
- Controls: +/+ or +/- siblings or inbred strain mice

What percentage of the offspring will be homozygous for *Apoe* KO?



	Punnett Square	
	+	-
+	+/+	+/-
-	+/-	-/-



Heterozygous mutant (+/-) x Homozygous mutant (-/-)

- Can be used if only one gender is viable and fertile as a homozygote
- Offspring: 50% homozygous; 50% heterozygous; genotyping needed
- mutants should be backcrossed to the parental inbred strain every 10 generations to avoid genetic drift (EX: backcross a mutant on a C57BL/6J background to the standard C57BL/6J strain for 2 generations)
- Controls: +/+ congenic strain, normal phenotype +/- siblings, or inbred strain mice



Heterozygous



Homozygous



Homozygous

50%



Heterozygous

50%



















































Wild Type

0%

-/-: Knockout
+/: Wildtype

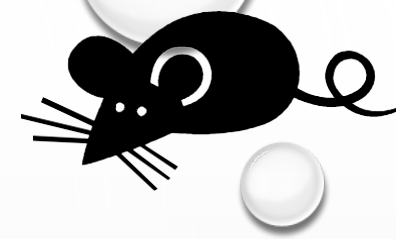
JAX[®] Mice Pup Appearance by Age

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
BALB/cj Stock #000651 Coat Color: albino																
C3H/Hej Stock #000659 Coat Color: agouti																
C57BL/6j Stock #000664 Coat Color: black																
		<ul style="list-style-type: none"> • Blood red • Possible milk spot 	<ul style="list-style-type: none"> • Lighter color red • Milk spot present 	<ul style="list-style-type: none"> • Ears appear as nubs • Pigment may start to appear in some strains 	<ul style="list-style-type: none"> • Ear flap starting to come away from head (one or both) 	<ul style="list-style-type: none"> • Ears fully developed, completely off head, some starting to go towards back • Increasing skin color 	<ul style="list-style-type: none"> • Ears are fully back • Skin appears much thicker with more color density to skin 	<ul style="list-style-type: none"> • Milk spot disappearing or gone • Colored fuzz appears behind ears or on neck 	<ul style="list-style-type: none"> • Colored fuzz starting to cover pup 	<ul style="list-style-type: none"> • Belly begins to show fur 	<ul style="list-style-type: none"> • Fur is now thicker • Females may show nipples (there are five pairs of mammarye) 	<ul style="list-style-type: none"> • Fur growth is complete • Pups are more active 	<ul style="list-style-type: none"> • Teeth are beginning to erupt • Eyes start to open 	<ul style="list-style-type: none"> • Eyes are open • Pups begin to nibble solid food 	<ul style="list-style-type: none"> • Pups increase solid food intake 	<ul style="list-style-type: none"> • Pups increase in weight and size, eating more solid food
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

The approximate age of mouse pups can be determined by their physical attributes during the first two weeks of life.

Examples of the developmental stages of albino, agouti, and black pups are shown.

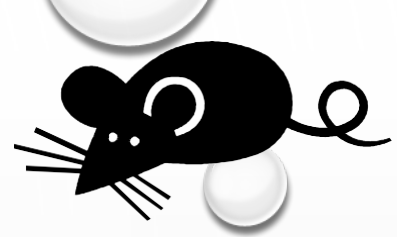
IACUC Requirements for Breeding Cards



CMC-DCM	PI:	Protocol #:			
RFID:	Sample:				
Strain:	Mating Date:				
Male ID:	DOB:	Genotype:			
Female ID:	DOB:	Genotype:			
DOB	# Born	Date Weaned	Weaned		Comments
			M	F	

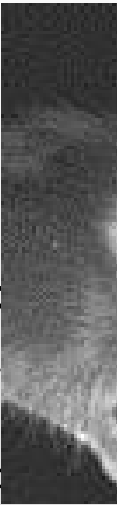
CMC-DCM	PI:	Protocol #:			
RFID:	Sample:				
Strain:	Mating Date:				
Male ID:	DOB:	Genotype:			
Female ID:	DOB:	Genotype:			
DOB	# Born	Date Weaned	Weaned		Comments
			M	F	

- PI Name and protocol #
- Birthdate of pups if breeding cage (required within 3 days of birth) and a pink DCM card with litter DOB and DOW inserted
- Pre-printed cage card with IACUC protocol number (DCM RFID card)
- Note: temporary cards allowed, but must include all above, plus date the RFID card was ordered
- Cards should also include mouse strain name, genotype, DOB of the breeders, mouse IDs, sexes



Breeding Performance Factors

1. Birth
2. Outb
3. Strai
4. Mutc
5. Temperatu
6. Light inten
7. Noise and



A

B

C

D

E

F

G

1

2

3

www.VADLO.com

Asterisk (*)

C

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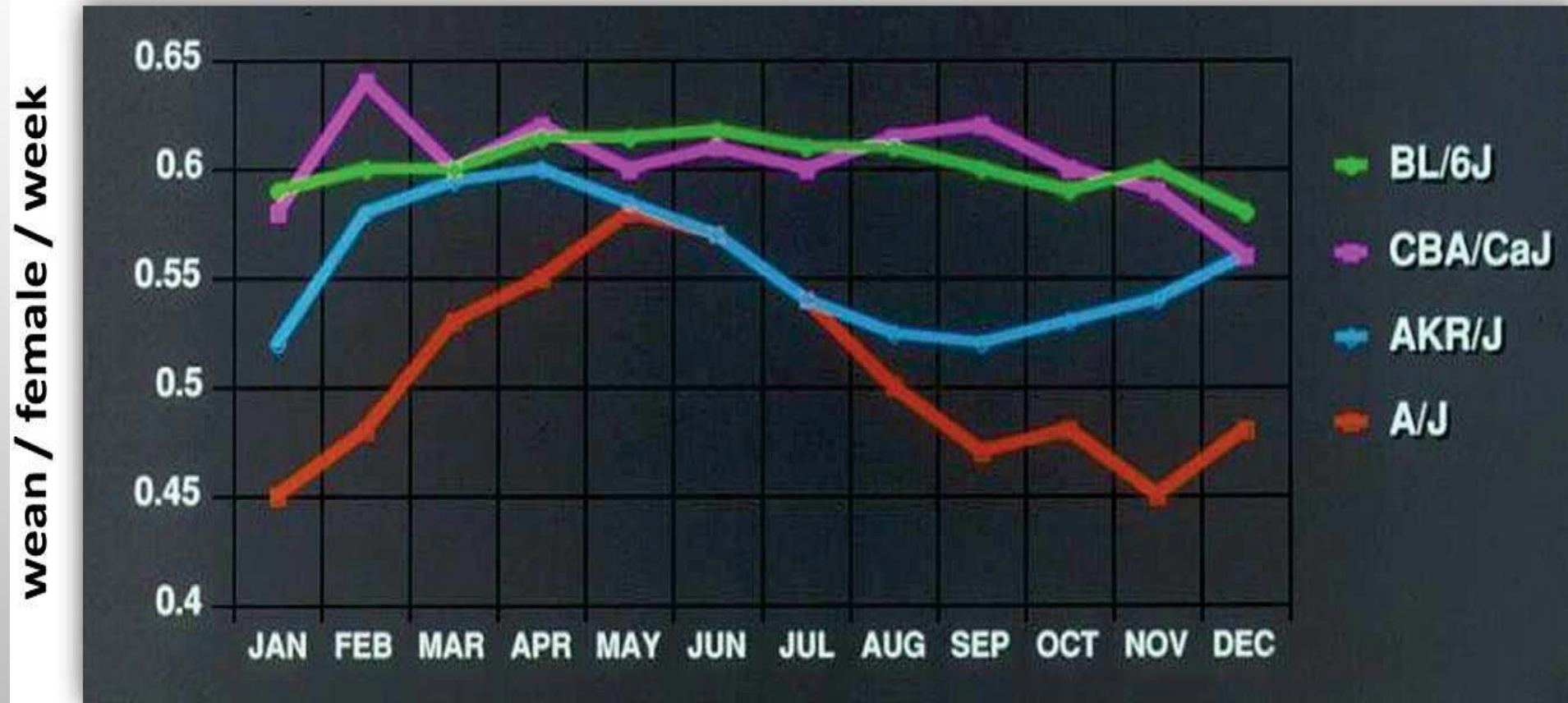
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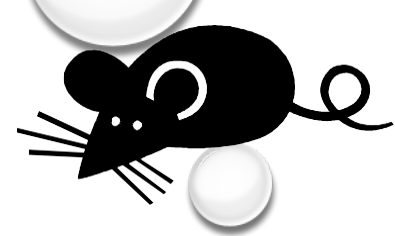
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22

“Don't play with him, he is Wild Type.”

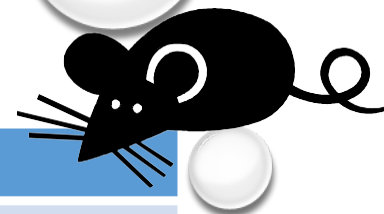
MOUSE REPRODUCTION CAN CHANGE WITH THE SEASONS



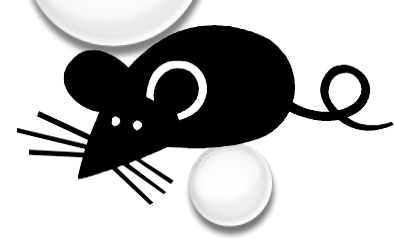


Strategies for Maximizing Productivity of a Breeding Colony

Factors	Action to promote successful breeding	Comments
When to set up breeding	<ul style="list-style-type: none">• Mate mice when they are 6-8 weeks old.	<ul style="list-style-type: none">• Note that it is not unusual for the first litter to be smaller than the second or third, which are typically the largest.
When to foster pups	<ul style="list-style-type: none">• Foster pups<ul style="list-style-type: none">– if the mother does not “nest” the pups right away but leaves them scattered around the cage.– if milk spots do not appear in the pups by the time they are 24-hours old.	<ul style="list-style-type: none">• If you need offspring from a female who is a poor mother, plan ahead to have foster mothers ready when she gives birth.• Housing 2 females together will often allow them to work together and successfully raise 2 litters.

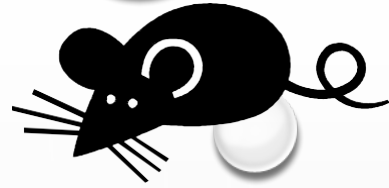


Factors	Action to promote successful breeding	Comments
When to replace breeding pairs for optimal performance	<ul style="list-style-type: none">• Replace breeding pairs as their reproductive performance declines (typically 6–8 months of age)• For a large colony, maintain a stable supply of breeding pairs at various ages by replacing a specific percentage on a weekly or monthly basis.	<ul style="list-style-type: none">• A colony of mixed-age breeders produces a more consistent quantity of pups than does a colony with mice of the same age.
When to replace individual female breeders	<ul style="list-style-type: none">• Replace female breeders when they<ul style="list-style-type: none">– produce no litter within 60 days of pairing (unless this delay is normal for the strain),– produce no litter within 60 days of their last litter, or– produce litters but wean no pups for 2–3 litters.	
When to replace individual male Breeders	<ul style="list-style-type: none">• Replace male breeders<ul style="list-style-type: none">– when they reach 1 year of age, or– if they are infertile with a young, fertile female.	

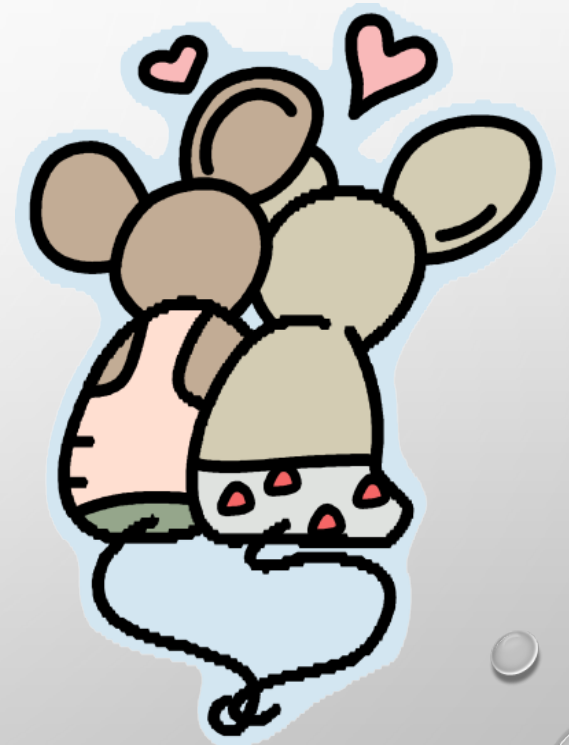


Factors	Action to promote successful breeding	Comments
When to cull a litter	<ul style="list-style-type: none">• Reduce the number of pups in a litter if the mother is having problems feeding the pups.	<ul style="list-style-type: none">• Some mothers may be unable to provide milk for more than a few pups.• For segregating strains, remove unwanted pups as soon as they can be phenotyped or genotyped.
How to improve breeding Behaviour	<ul style="list-style-type: none">• With young females, use experienced males.• Isolate males for 2 weeks before pairing.• Rotate males within a strain among cages.	<ul style="list-style-type: none">• Males mature later than females; therefore age at first litter for same-aged breeding pairs is often determined by the male.

Optimizing Breeding Performance



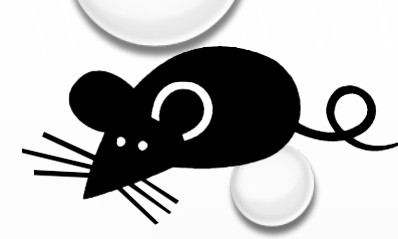
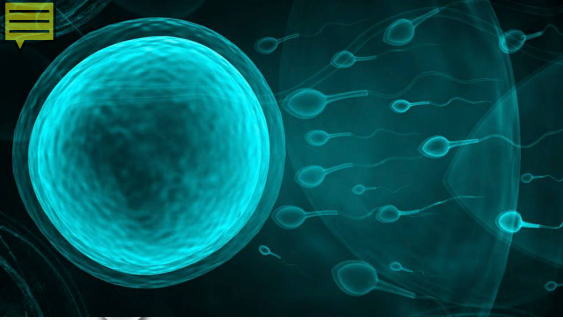
- Replace breeders before their reproductive performance declines
- Replace non-productive breeders
- Mate mice early
- Use experienced males
- Keep meticulous and accurate breeding records
 - Investigate deviations in breeding performance
 - Compare your colony breeding performance to known (supplier, other labs, etc.)
 - Keep environmental conditions suitable and stable
 - Periodically verify the genotypes of breeders/offspring
- Litter fostering
- Breeder diet vs regular
- Mating numerous females simultaneously
- Use ART (Assisted Reproductive Methods)
 - Ex: IVF, Superovulation, Embryo transfer, etc.





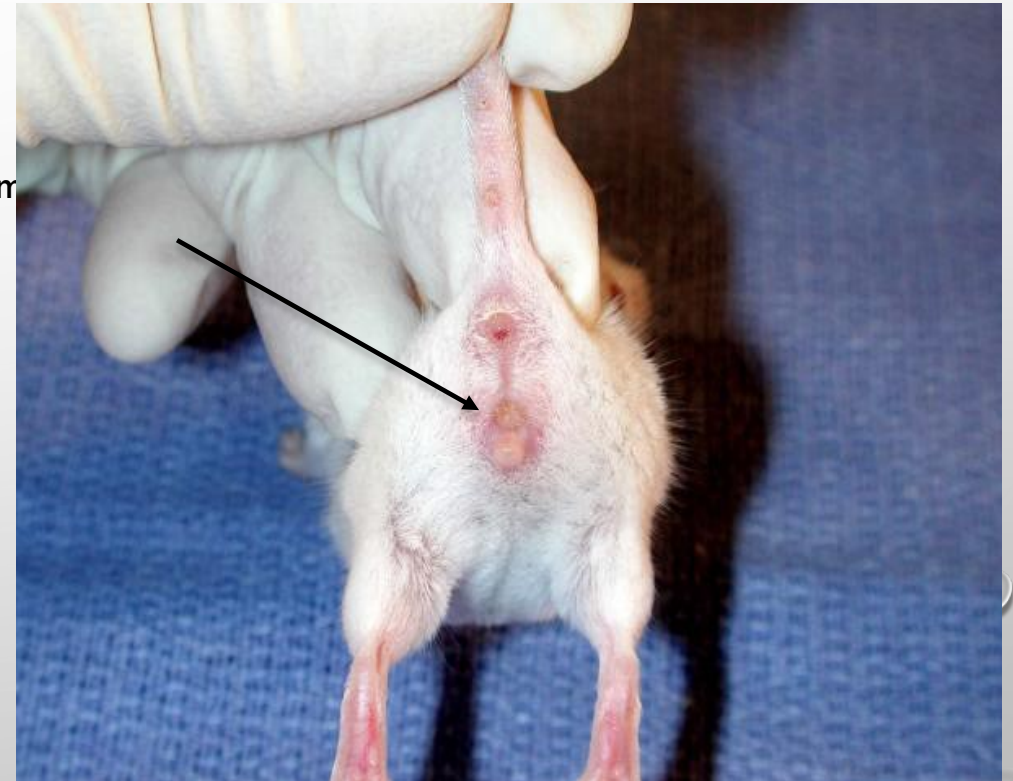
Successful Fostering

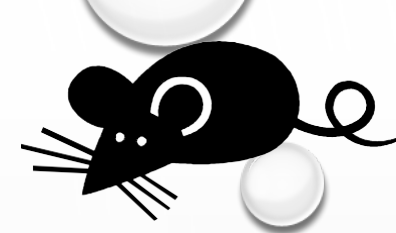
- Choose foster mother with different coat color and great maternal behavior
- Ideally natural pups are born within 2 days of the foster ones
- Keep the litter the same (cull down natural litter)
- Take the mother out during transfer
- Rub some urine, dirty bedding from foster cage on the pups and then mix them with bedding in the nest
- Return the female to the cage and return the cage to the rack to avoid any more stress
- She should start nursing within 6 hours



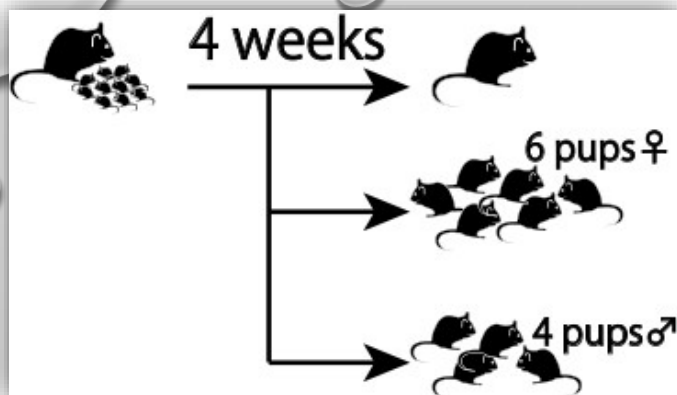
Timed Pregnancies

1. House males individually for 1-2 weeks prior to mating
 - Pick experienced, proven males if possible or use older (3-4 months old) over younger males
2. Use 8-15-week-old females
 - Typically sexually mature by 6-8 weeks
 - Avoid using virgin females older than 15 weeks, often mate less reliably
3. Group-house females and synchronize their estrous cycles prior to mating
 - Lee-boot and Whitten effect
4. Verify estrous state of females prior to mating
 - Should be in proestrus or estrus
 - Inspect visually
 - Can confirm with cell morphology following vaginal swab
5. Add only 1-2 female(s) in each male cage in the afternoon
6. Check for vaginal plugs each the next morning
7. The date a plug is observed is gestational day 0 to 0.5





Weaning



- Pups are to be weaned on day 23 if they are 10 grams
- Male and female pups are separated at weaning into separate cages with NO more than 5 mice per cage.
- If a litter contains a single animal of one sex, then place a gel cup in the cage with the pup



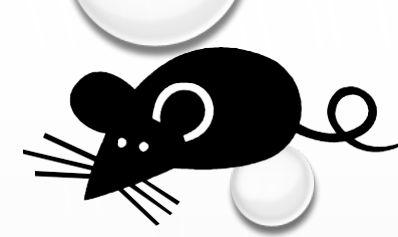
Record Keeping Methods

1. **Paper/pen in facility:** update online later

2. **Laptop/tablet**

1. **Databases** – many software options available for free/purchase
2. **Excel-** can be difficult with multiple users
3. **Google sheets:** shareable secure excel with editing capabilities and ability to restore changed information
4. Keep database current





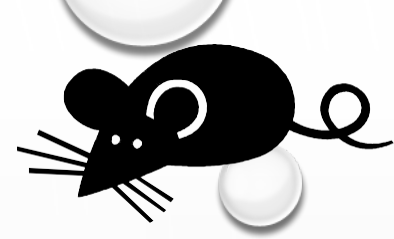
Identification Methods

It is important to select the appropriate identification method for each individual lab and research

This should be based upon the age of the animal, the number of characters one wishes to include, and the duration of the experiment

ID information needs to be recorded on the cage card in the event that clarification of the numbers or characters becomes necessary for any reason

Some ID methods can be combined with tissue collection for genotyping to minimize stress to the animal



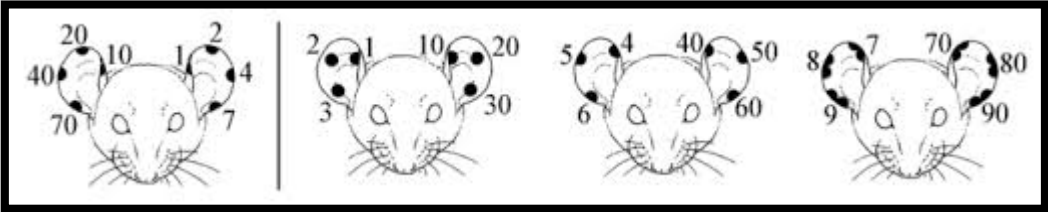
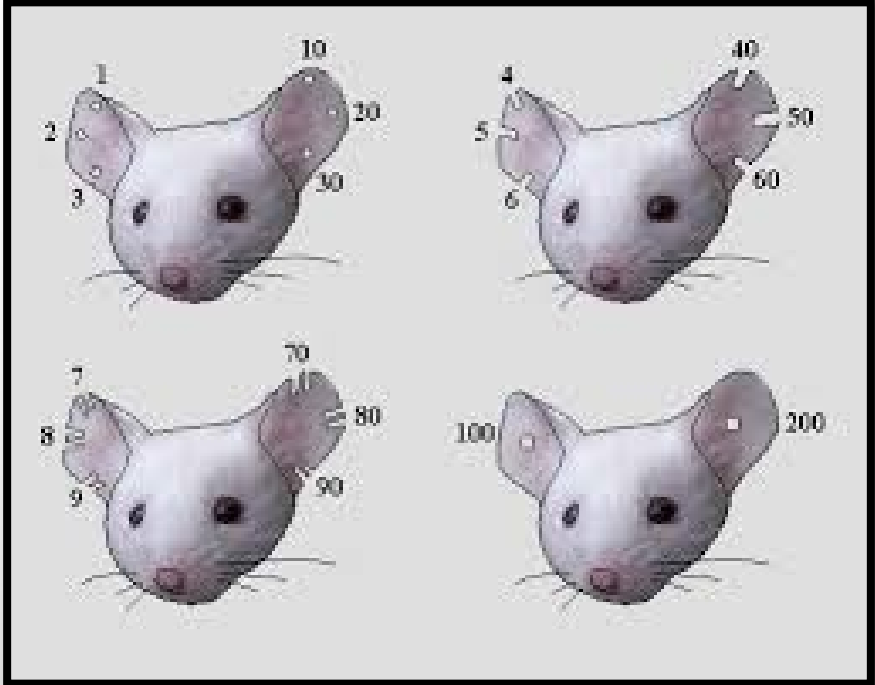
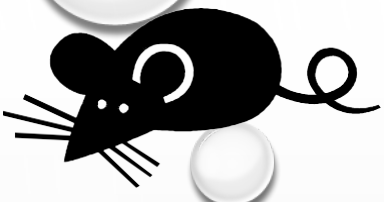
Identification Methods Temporary

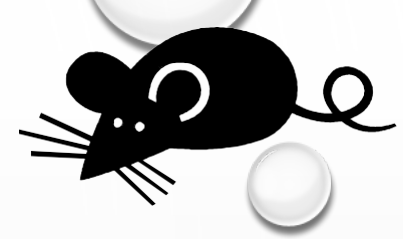
- Non-toxic, permanent markers can be used to temporarily mark the fur, tail, or skin of the animal
- This ink usually lasts 3-4 days without the need to remark



Identification Methods

Ear Notch/Punch





Identification Methods

Most Common Ear Notch System

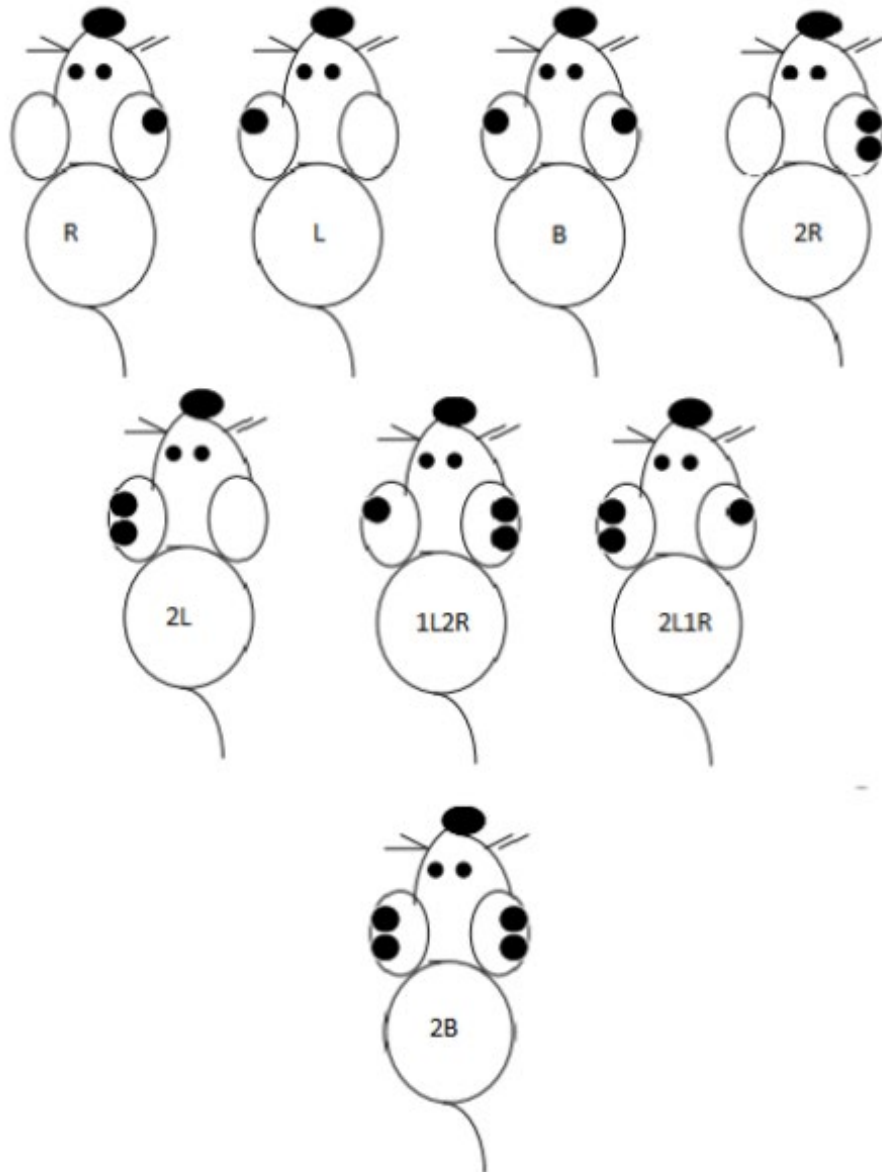
- Easy to Read
- Inexpensive
- Can use tissue for genotyping

However:

- Some strains of mice are known for ear mutilation

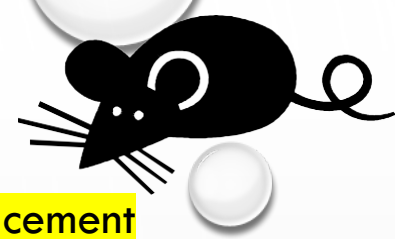
Alternative Mouse Numbering System (within one litter)

Ear punch used to make notches. Option: to repeat these notches and discriminate by sex.

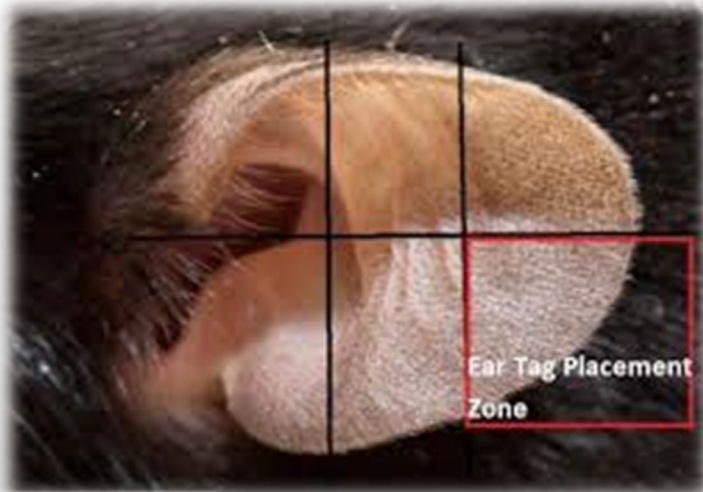


Identification Methods

Ear Tag



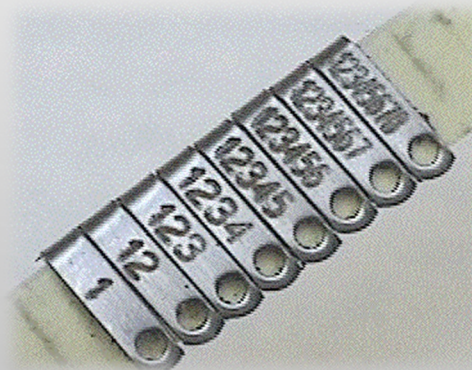
Improper Tag Placement



- Easy to administer
- Can use long numbers

However:

- Tags are often lost
- May cause ear irritation
- Must restrain a mouse to read the tag



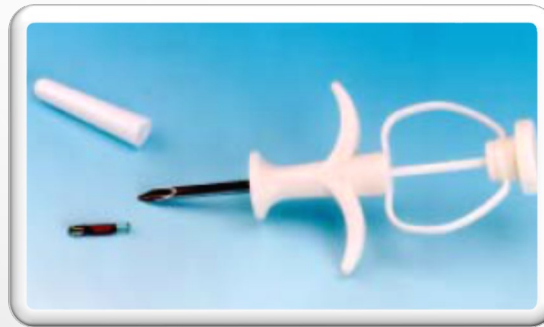
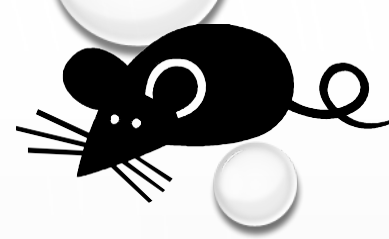
Before Application



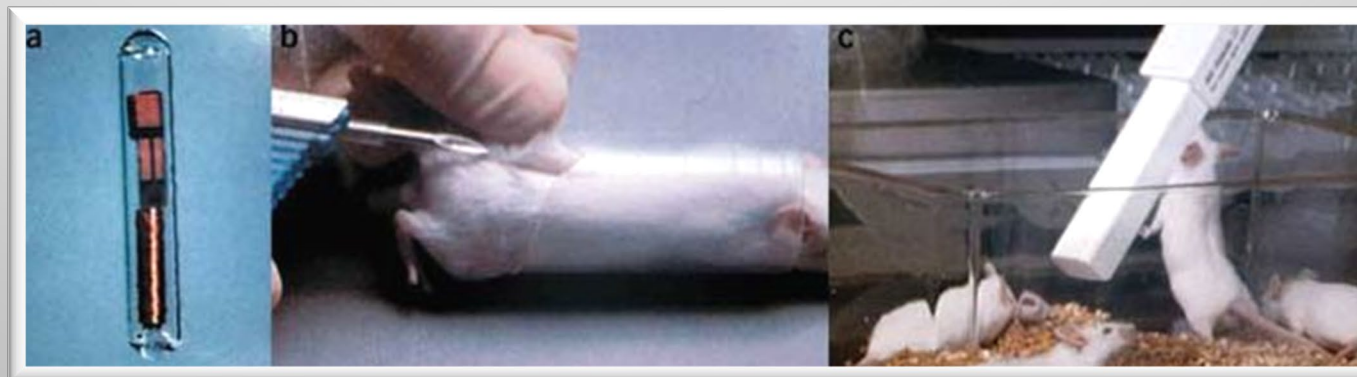
After Application

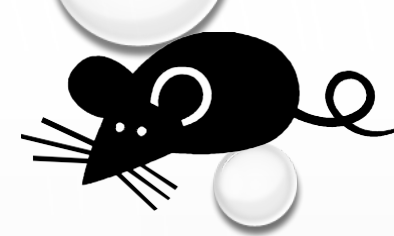


Identification Methods: Microchip Transponders



- Often called “Pit Tagging”, they are implanted subcutaneously between the scapulae or on the lower back
- Each microchip is encrypted with a unique, non-replicable number and are read with a portable, hand-held scanner





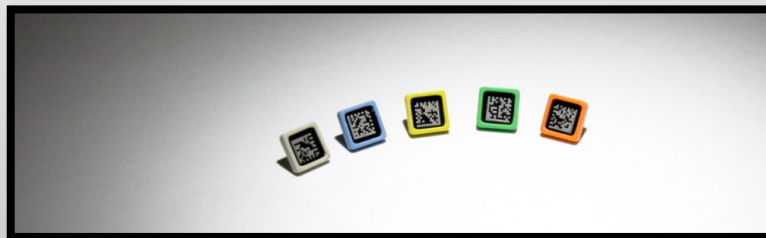
Identification Methods:

Ear RapID Tags

- Permanent ID method
- Easy to read
- Hypoallergenic
- Some systems are programmable and provide telemetry

However:

- Expensive!!!!



Scanner



Identification Methods:

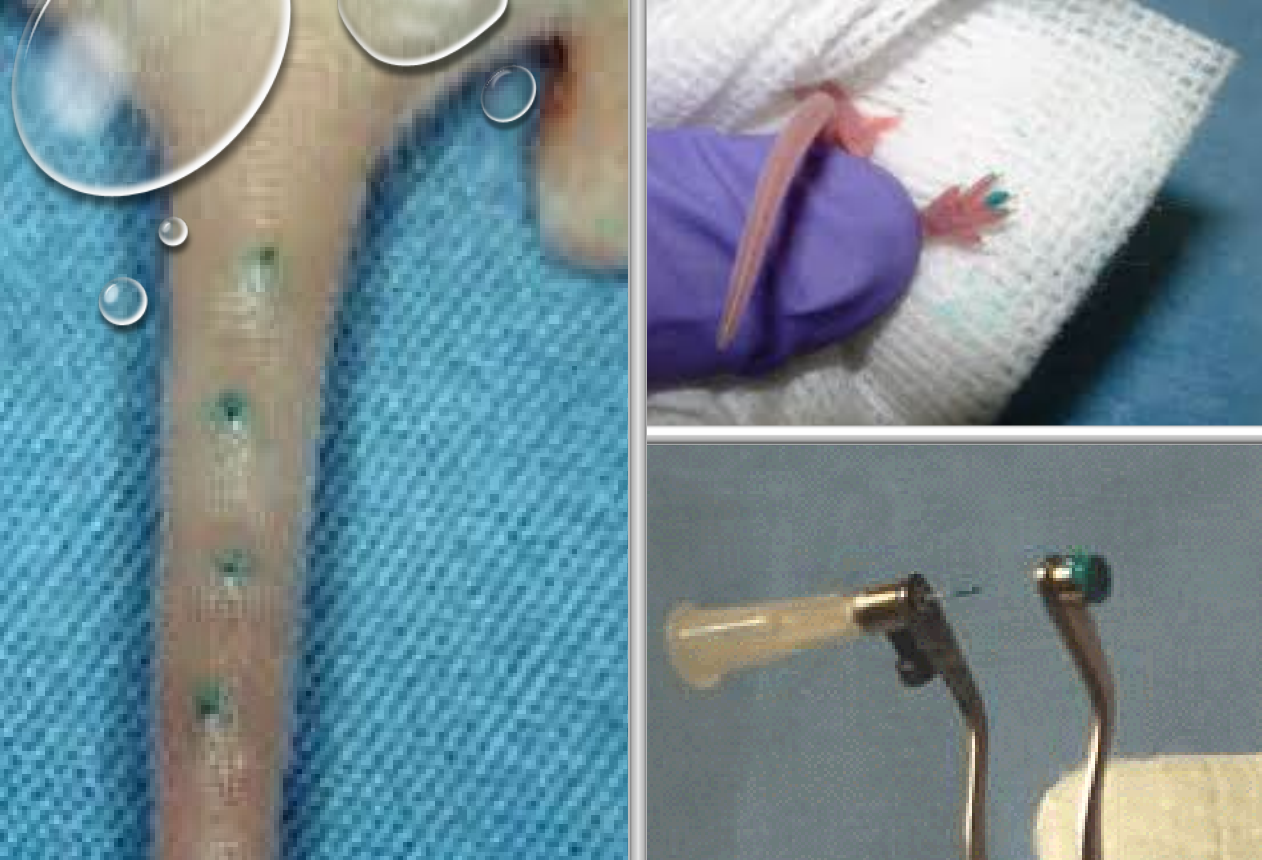
Tattooing

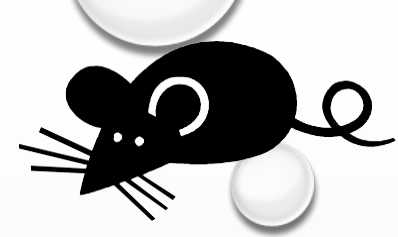
- Low health risk
- Can be used on adults (tails, footpads, toes) and neonates (toes, footpads)

- Versatile

However:

- Somewhat difficult/time consuming to administer
- Requires skill, equipment and money
- Ink fades over time
- Must immobilize animal





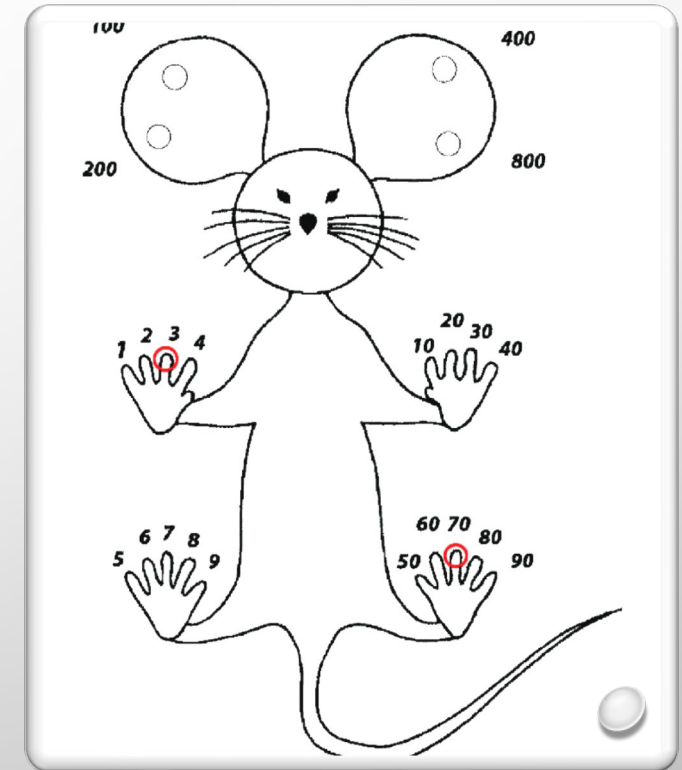
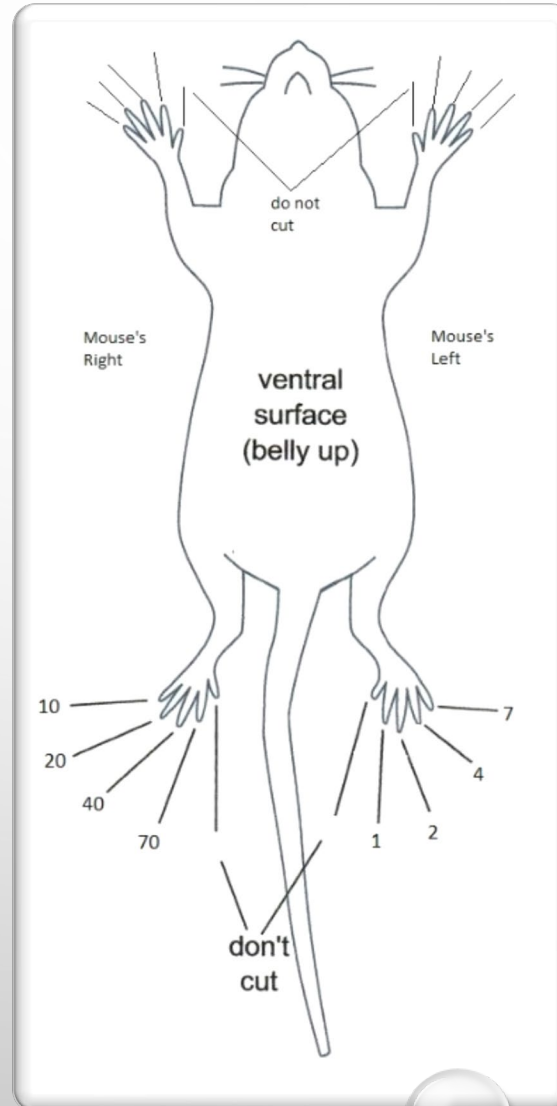
Identification Methods:

Toeing

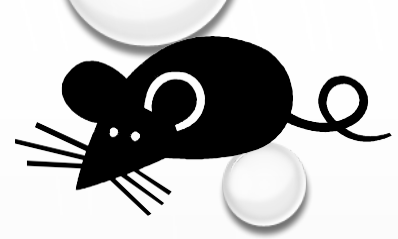
- Permanent
- Early combination of ID system and tissue sampling for genotyping(PD7-10)
- No more than 2 toes per foot or 4 toes total per animal

HOWEVER:.

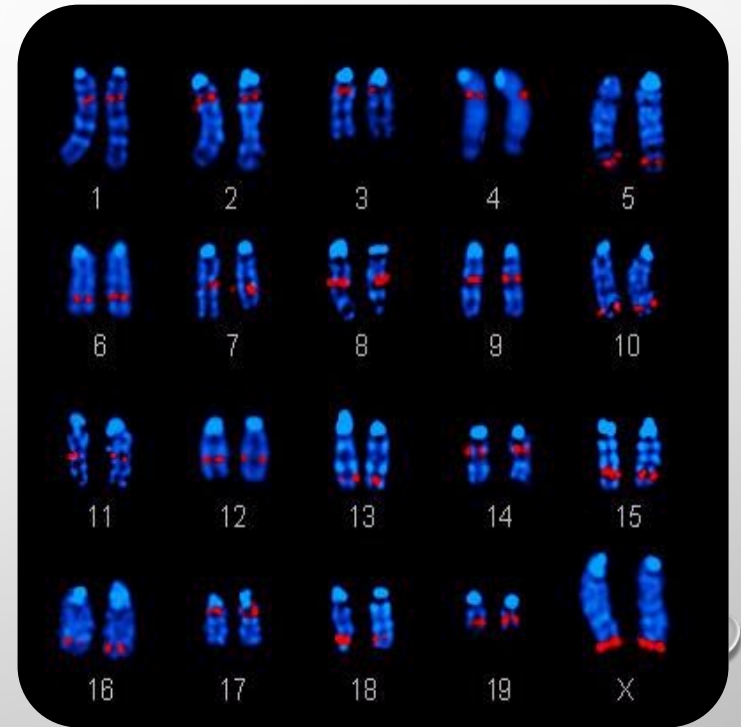
- Requires scientific justification and iacuc approval
- Must pick up mice to read



Genotyping

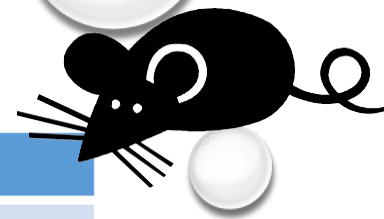


- Ear Notch/punch
- Toes
- Tail Snips
- Blood
- Hair
- Saliva
- Feces

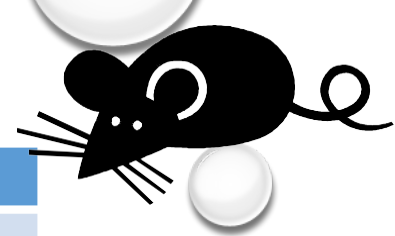


The slide features a light gray background with a gradient. In the top-left and bottom-right corners, there are clusters of realistic, 3D-rendered water droplets of various sizes, some overlapping. The main text is centered in a bold, black, sans-serif font.

Troubleshooting Breeding Problems(Breeding Problems and Possible Resolutions)



Problems	Possible Resolution
<ul style="list-style-type: none">• Mice are not breeding• Females are not getting pregnant	<ol style="list-style-type: none">A. Make sure you have male and female breeders.B. Add nesting material specifically designed for that purpose.C. Try a different diet, for example, one with more or less fat.D. Minimize stress-including human contact with the mice and activity and noise in the room. Construction-related vibrations, even outside the building, can disrupt breeding. If possible, move mice to a quieter area.E. Try a 14:10 light cycle.F. Make sure mice are healthy and able to breed (for example, not too obese or too old). Try healthier, younger animals.G. If you never see vaginal plugs, try a new male.H. Determine whether the problem is the male or female: pair a proven breeder female with the male and a proven breeder male with the female.I. Surgically evaluate the reproductive tract. If the female appears normal, try low dose gonadotrophins, ovarian transplant, IVF; if the male appears normal, try IVF.J. Research the strain reproductive characteristics. For a transgenic, check the effect of the transgene on breeding. For a strain carrying a mutation, check the effect of the mutation. Adjust the breeding strategy accordingly.

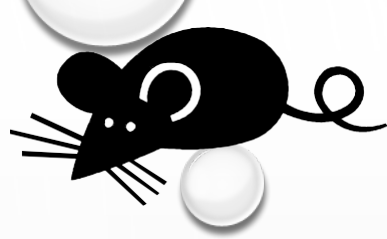


Problems	Possible Resolution
<ul style="list-style-type: none">• Mice get pregnant but you never see pups (females are resorbing fetuses)	<p>D. Minimize stress—including human contact with the mice and activity and noise in the room. Construction-related vibrations, even outside the building, can disrupt breeding. If possible, move mice to a quieter area.</p> <p>The most common cause of fetal resorption is stress.</p>
<ul style="list-style-type: none">• Individual breeders are not producing an expected number of pups	<p>B. Add nesting material specifically designed for that purpose.</p> <p>C. Try a different diet, for example, one with more or less fat.</p> <p>D. Minimize stress—including human contact with the mice and activity and noise in the room. Construction-related vibrations, even outside the building, can disrupt breeding. If possible, move mice to a quieter area.</p> <p>E. Try a 14:10 light cycle.</p> <p>F. Make sure mice are healthy and able to breed (for example, not too obese or too old). Try healthier, younger animals.</p> <p>H. Determine whether the problem is the male or female: pair a proven breeder female with the male and a proven breeder male with the female.</p> <p>J. Research the strain reproductive characteristics. For a transgenic, check the effect of the transgene on breeding. For a strain carrying a mutation, check the effect of the mutation. Adjust the breeding strategy accordingly.</p>



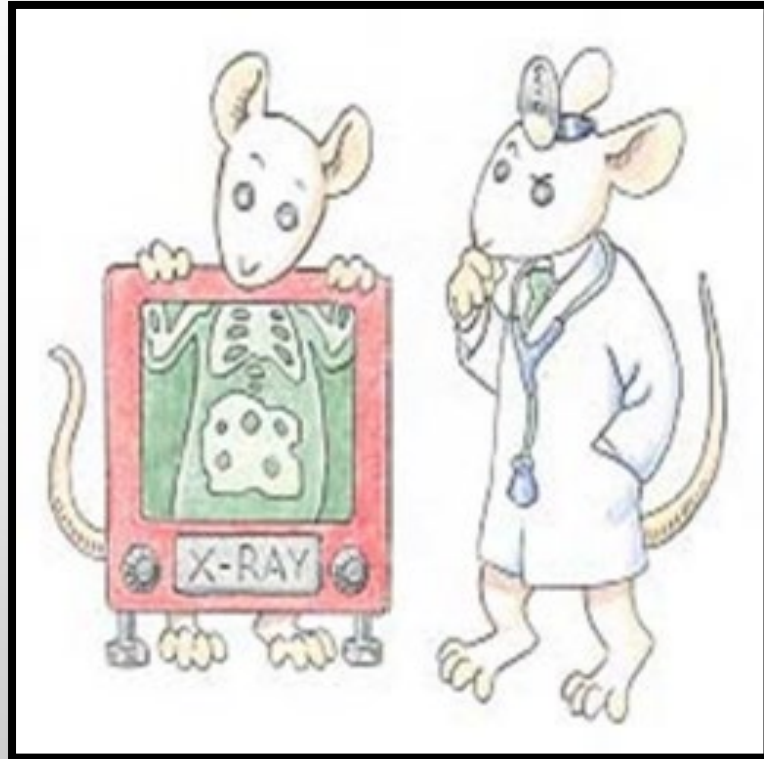
Problems	Possible Resolution
<ul style="list-style-type: none">• Females give birth, but don't raise their pups• Pups disappear or do not survive	<p>D. Minimize stress—including human contact with the mice and activity and noise in the room. Construction-related vibrations, even outside the building, can disrupt breeding. If possible, move mice to a quieter area.</p> <p>J. Research the strain reproductive characteristics. For a transgenic, check the effect of the transgene on breeding. For a strain carrying a mutation, check the effect of the mutation. Adjust the breeding strategy accordingly.</p> <p>K. If you introduced a male to a cage with pups, he may have killed them. Wait to add a male until all pups have been weaned and removed.</p>
<ul style="list-style-type: none">• Colony productivity has dropped	<p>L. Check for environmental factors that might have changed. Consider room conditions (temperature, vibrations, building construction, odours, etc.), caretaker, and diet. If more than one cage, area, or strain is affected, expand the search. If possible, restore environment to previous conditions.</p>

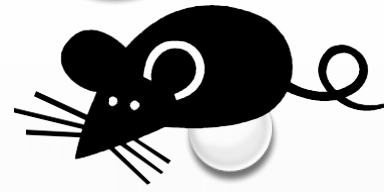
Unhealthy Mouse



- Signs that your mouse is sick:

- Scruffy coat
- Hunched, sunken at hips
- Weight loss, low activity
- Skin lesions
- Labored breathing
- Eye or nasal discharge
- Abnormal behavior
- Hypothermia/lethargy





Unhealthy Mouse=Bad for Breeding

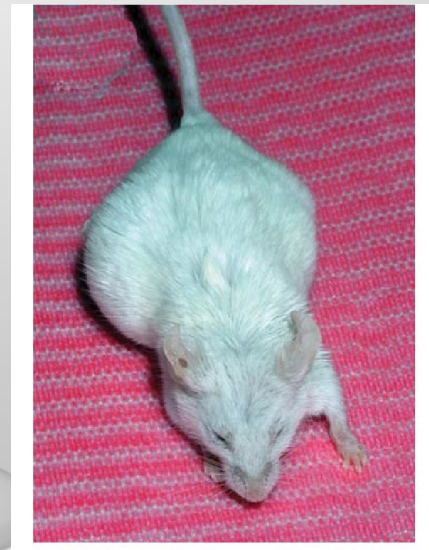
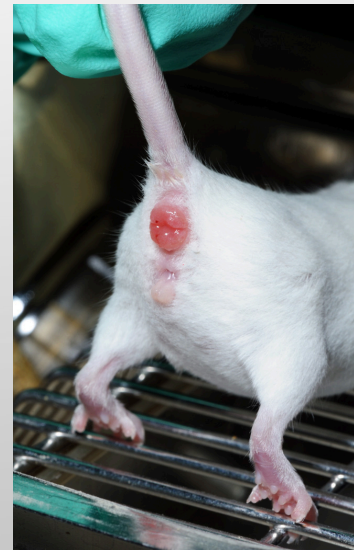
- Example: malocclusion

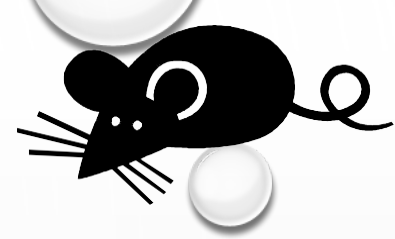
- Teeth overgrow chronically, have to trim weekly
- Genetic predisposition
- Do not use as breeders



- Common in pregnant dams:

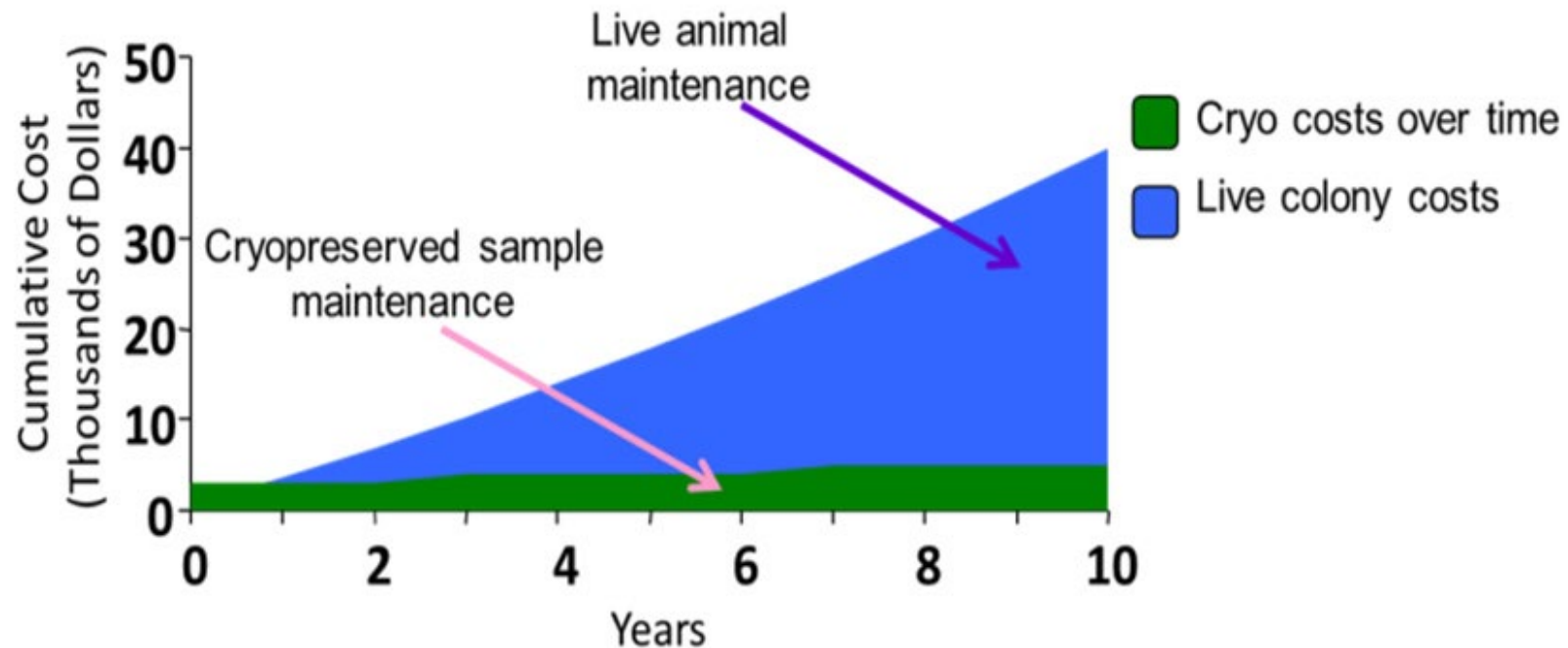
- Prolapsed uterus/vaginal tissue
- Dystocia (prolonged/difficult labor)
- Dehydration





Breeding Colony Long Term Considerations

Cost-benefit of freezing down low use strains



- **Maintain Focus**

- backcross
- purchase

- **Check for Genotypes**

- Consider
- Data

- **Consider Cryopreservation**

- Freeze e
- Saves \$
- Provides

- Contact MMRRC@UNC for more information

RESOURCES



- **FUNDAMENTALS OF BREEDING VIDEO:**

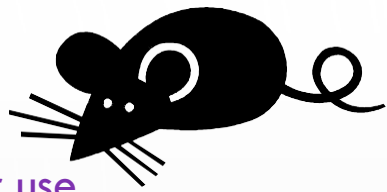
- [HTTPS://WWW.JOVE.COM/VIDEO/10293](https://www.jove.com/video/10293)

- **JACKSON LABORATORIES:**

- [HTTPS://WWW.JAX.ORG/NEWS-AND-INSIGHTS/JAX-BLOG/2014/DECEMBER/FIVE-REASONS-WHY-YOUR-MICE-ARE-NOT-BREEDING](https://www.jax.org/news-and-insights/jax-blog/2014/december/five-reasons-why-your-mice-are-not-breeding)
- [HTTPS://WWW.JAX.ORG/JAX-MICE-AND-SERVICES/CUSTOMER-SUPPORT/MANUALS-POSTERS-AND-GUIDES/JMCRS-MANUALS-GUIDES/MANUALS-GUIDES-GENETICALLY-STANDARDIZED-MICE](https://www.jax.org/jax-mice-and-services/customer-support/manuals-posters-and-guides/jmcrs-manuals-guides/manuals-guides-genetically-standardized-mice)
- [HTTPS://WWW.JAX.ORG/NEWS-AND-INSIGHTS/2011/SEPTEMBER/MOST-EFFICIENT-BREEDING-SCHEME-FOR-GENERATING-CRE-LOX-TISSUE-SPECIFIC-OR-IN](https://www.jax.org/news-and-insights/2011/september/most-efficient-breeding-scheme-for-generating-cre-lox-tissue-specific-or-in)
- [HTTPS://WWW.JAX.ORG/-/MEDIA/JAXWEB/FILES/JAX-MICE-AND-SERVICES/COLONYSIZEWKSHT.PDF?LA=EN&HASH=8C1CB11B342A9E8177B31DD2D7A7BFC6414628AC](https://www.jax.org/-/media/jaxweb/files/jax-mice-and-services/colony_size_wksht.pdf?la=en&hash=8c1cb11b342a9e8177b31dd2d7a7bfc6414628ac)
- [HTTPS://WWW.RESEARCH.UCI.EDU/FORMS/DOCS/IACUC/JAX-BREEDING-STRATEGIES.PDF](https://www.research.uci.edu/forms/docs/iacuc/jax-breeding-strategies.pdf)

Colony Management Core at UNC (CMC)

Focus on establishing, maintaining, and continuously managing research colonies for investigator use



- **Our services allow for research personnel to focus on science**
 - reduce excessive mouse production
 - assist in establishing new strain lines
 - minimize breeding disruptions and stress to the animals
- **Services are custom selected to suit each laboratory's need and budget**
 - Aid with maintenance and production colonies
 - Able to handle large colonies with multiple strains/genotypes
- **Skilled, dedicated breeding specialists perform daily tasks**
 - Years of experience with transgenic colonies
 - Hands on at UNC
- **Secure, shareable mouse database updated in real time**
 - Currently use google sheets (can be viewed/edited by all added individuals)
 - Updated between 2 to 5 times a week depending on the size and needs of colony

THANK YOU!

QUESTIONS?

