



The Effects of Genetic Drift on Populations

Genetic drift is an inevitable evolutionary process that occurs in populations over time. It is a stochastic process that alters the frequency of alleles and the predominance of traits amongst members of a population. The effects of genetic drift can be especially significant in small populations such as colonies of research rodents.

In a population with a high degree of heterozygosity (outbred) the frequency of specific alleles in the population will change slightly from one generation to the next due to the chance inheritance of alleles amongst offspring. Eventually, after many generations, the frequency of a specific allele may drift to either zero, in which case it disappears from the population, or to a frequency of 1 where it becomes the only allele in the population. In a large population this would occur very slowly. However, in a small population, such as a rodent colony, genetic drift may cause significant changes in allele frequency over a relatively short time.

Genetic drift also occurs in essentially homozygous (inbred) populations. Genetic mutations occur at a low level in all populations and may cause phenotypic changes if coding or regulatory sequences are affected. If such phenotypic variants are allowed to remain in the population the mutations may become fixed over time and alter strain characteristics. Variations in

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Lymphocytic Choriomeningitis Virus in Transplant Patients

In July 2005 the U.S. Centers for Disease Control (CDC) reported the infection of four organ-transplant recipients with lymphocytic choriomeningitis virus (LCMV) via a common organ donor. Although LCMV infection usually is either asymptomatic or causes mild self-limited illness in healthy people, three of the four organ-transplant recipients died from the infection. The source of the virus was traced to a pet hamster the organ donor purchased from a Rhode Island pet store.

LCMV is a rodent-borne arenavirus endemic in house mouse (*Mus musculus*) populations worldwide. Hamsters and guinea pigs are also known to carry and transmit the disease to humans. It is suspected that pet rodents become infected with LCMV after contact with wild mice at breeding facilities, pet stores or private homes. The CDC has issued [recommendations to the public](#) for preventing LCMV infection from pet rodents and controlling wild rodents around the home.

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[Animal Source](#) are
available at
[http://www.research.
psu.edu/arp/animal
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Protecting Laboratory Rodents From Infectious Disease

1. Whenever possible, obtain new animals from approved vendors with colonies of known health status.
 - a. All animals obtained from [non-approved sources](#) are required to undergo a period of quarantine in a protected area of the animal facility. During the quarantine period the animal(s) are screened for clinical health problems and infection with pathogenic organisms.
 - b. Animals obtained from approved vendors may directly enter the animal rooms.
2. Train employees and students to use correct techniques for handling animals and equipment. Emphasize to your staff and students the importance of using correct procedures and the consequences of microbial contamination.
3. Limit the number of people entering the animal rooms to those absolutely necessary.
4. Do not move animals from room to room or cage to cage unless necessary for breeding or experimental purposes.
5. Do not bring animals from other investigator colonies into your animal room.
6. Wear clean protective clothing (i.e., room-dedicated lab coat, booties, gloves) each time you enter a room.
7. Disinfect equipment such as animal restrainers between animals and/or rooms.
8. Open rodent cages in laminar flow cabinets such as biosafety hoods when available. Never set cages on the floor or leave them in the hallways.
9. Do not enter breeding colony rooms after working in experimental animal rooms that day.
10. If you must enter multiple animal rooms with varying health status, enter known infected rooms only after you are finished working in clean (uninfected) rooms and do not reenter clean rooms on that day



Using Gas Anesthesia in Rodents

1. Filling the vaporizer

- Unscrew the cap on the vaporizer fill basin.
- Attach an adapter to the bottle top to avoid spills.
- Carefully pour the isoflurane into the vaporizer and replace the cap on the fill basin.



2. Setting the oxygen level.

- Turn on the oxygen by turning the knob on the top of the tank counterclockwise.
- Set the oxygen flow at 0.3 –0.4 liters per minute.



3. Adjusting the vaporizer during anesthesia.

- Press the side button down to turn the dial.
- Set the dial at 5 to start (anesthetic induction).
- When the animal relaxes under anesthesia, adjust the setting to 3 or lower as needed to maintain the appropriate anesthetic level for the procedure.



4. Anesthetizing an animal.

- Always work within the hood and make sure the hood exhaust fan is turned on.
- Make sure the waste gas scavenging canister is correctly attached.



5. Machine shut down.

- Turn off the oxygen tank and the vaporizer.
- The vaporizer may be emptied after shut down to conserve anesthetic.
- Disinfect the rodent face mask to prevent disease transmission.



Animal Resource Program

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Mouse Biomethodology Seminar
September 16, 2005
1-4 pm in the CBL

Call the ARP office at 865-1495
to register to attend.

The Animal Resource Program (ARP) is committed to providing PSU faculty, staff and students with high quality, cost-effective research animal resources. In addition to suitable housing facilities and animal husbandry services for animals used in biomedical research, ARP provides veterinary and diagnostic services, personnel training and expertise in laboratory animal technology and medicine. ARP veterinarians are also available to participate in collaborative research projects with PSU investigators. Areas of interest include animal behavior and welfare, infectious disease, and pathology.

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allelic frequency may also occur due to residual heterozygosity or incomplete inbreeding prior to separation of a colony from its progenitors.

The most common cause of genetic drift in rodent colonies is the separation of a sub-colony from a parent colony for more than 10 generations in each colony. Examples of this are the more than 40 C57BL substrains generated between 1930 and 1970. Investigators must realize that substrains from different suppliers are not genetically identical. This genetic variation has in some instances been sufficient to confound and potentially invalidate research results. It is important to identify strain source when publishing by using accurate substrain designations (i.e., C57BL/6J, C57BL/6ByJ).

The effects of genetic drift may also be limited by obtaining mice only from reliable breeding sources and periodically introducing new breeding stock from the original source if you are maintaining a breeding colony of these mice.

References:

- Genetic Drift. 2004. <http://jaxmice.jax.org/geneticquality/drift.html>
Laboratory Animal Medicine, 2nd ed. 2002. Academic Press.
Random Genetic Drift. 1993. Moran, L. <http://talkorigins.org/faqs/genetic-drift.html>

ARP Laboratory Coordinator

ARP is pleased to announce that Donalee McElrath has joined our staff as Laboratory Coordinator. She was previously employed as a lab technician in the PSU Biochemistry and Molecular Biology department. Her duties at ARP will include assisting Donna Carey in animal housing and equipment management, coordinating rodent imports and exports, and assisting Dr. Dodds and Meg Potter in animal health surveillance and monitoring.