

# Animal Source

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## PSU Animal Resource Program

### Choosing a Biological Safety Cabinet

Investigators whose research requires the use of potentially hazardous biological materials are responsible for protecting themselves, their students, employees, other persons and the outside environment from exposure to these materials. The biological safety cabinet (BSC) is the principal device used to provide containment of infectious splashes or aerosols generated by many microbiological procedures. To make appropriate decisions about which BSC to use, research personnel must be aware of the various types of BSC and how they work.

There are three main types of BSC. The Class I BSC protects personnel and the environment from exposure to the hazardous material (product) being used within the cabinet but does not protect the product from exposure to unfiltered room air. The Class I BSC is similar in air movement to a chemical fume hood but has a HEPA filter in the exhaust system to protect the environment.

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Volume 1, Issue 4

Fall 2003

*Visit the ARP  
website at  
[www.research.psu.edu/arp](http://www.research.psu.edu/arp)  
for answers to your  
animal use questions*

### Decoding Inbred Mouse Strain Names

The following examples of inbred mouse strain names conform to the current rules for strain nomenclature established by the International Committee on Standardized Genetic Nomenclature for Mice. Can you decode the meaning behind each one?

1. NZB, C3H, FVB
2. DBA/2, DBA/1, BALB/c
3. C3H/He, C57BL6/J, 129/Sv
4. B6.AK-H2<sup>k</sup>



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*Choosing a Biological Safety Cabinet, continued from page 1.*

A Class II BSC provides protection to personnel, the environment and the product being used within the hood. Because of this, Class II BSC are useful for work with animals, tissue and cell culture systems that must be protected from contamination. Class II BSC are classified into two types (A and B) based on construction, air flow velocities and patterns and exhaust systems. Type A cabinets are suitable for work *in the absence* of volatile or toxic chemical and radionuclides since air is recirculated within the work area. Type B cabinets exhaust air to the outside of the building and have additional safety features that may allow work to be done with volatile or toxic chemical or radionuclides.

The Class III BSC is a totally enclosed, ventilated cabinet of gas-tight construction and offers the highest degree of personnel and environmental protection from infectious aerosols, as well as protection of research materials from microbiological contaminants. Class III BSC are intended for use with infectious agents that require Biosafety level 4 containment.

When choosing a BSC consider all features of the cabinet design that are important in work with animals. For instance, front sash heights vary with different models. To allow work with mice the sash height must be high enough to accommodate a mouse cage with a filter top. For more information on using a BSC in research animal work please contact the ARP.

(Note: Horizontal and vertical laminar flow “clean benches” are not BSC. They discharge HEPA filtered air across the work surface and toward the user, providing only product protection. This equipment must never be used for handling toxic, infectious, radioactive or sensitizing materials.)

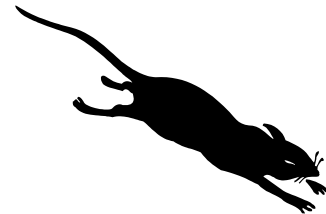
References:

Biosafety in Microbiological and Biomedical Laboratories, 3<sup>rd</sup> edition. U.S.

Department of Health and Human Services, May 1993.

Primary Containment for Biohazards: Selection, Use and Installation of Biological

Safety Cabinets, 2<sup>nd</sup> edition. U.S. Department of Health and Human



## Injectable Carprofen Now Available for Analgesic Use

Carprofen is a non-steroidal anti-inflammatory drug (NSAID) used for the control of postoperative pain in animals. It has previously been available only in oral dose form in the United States. Pfizer Animal Health is now marketing an injectable preparation under the trade name Rimadyl that will make its use in laboratory animals in this country more convenient and effective.

The mechanism of action of carprofen, like other NSAIDs, is believed to be associated with the inhibition of cyclooxygenase activity. Research has suggested that carprofen inhibits the activity of the cyclooxygenase COX-2 that is associated with inflammation. Due to this specificity, carprofen is thought to be less likely to result in the gastrointestinal and renal toxicity that may be associated with NSAIDs.

Studies have shown that carprofen has significant analgesic effects in rats following subcutaneous injection. The duration of action in rodents is uncertain but published dosages based on clinical experience recommend once daily administration. Unlike buprenorphine, carprofen appears not to cause alterations in normal behavior (when given to rats not subjected to surgical procedures). The suggested carprofen dosage for rats and mice is 5.0 mg/kg body weight given subcutaneously.

For more information on the use of carprofen for analgesia in rodents please contact an ARP veterinarian.

*Decoding Inbred Mouse Strain Names, continued from page 1.*

Answers:

1. These are the names of three of the many inbred mouse strains used in research. To be classified as inbred, members of a strain must have been mated brother x sister for 20 or more consecutive generations. The ancestry of individuals of the strain can be traced to a single mating pair of mice. The strain name should consist of a unique brief symbol made up of upper case, roman letters or a combination of letters and numbers beginning with a letter.
2. These are also separate inbred strains as in question 1, however, because they were created long before the nomenclature was standardized their names do not follow the established rules.
3. These are designations for three substrains. An established inbred strain that has genetically diverged over time will result in genetically different substrains. The strain name is followed by a forward slash and a substrain designation (usually the laboratory code). Example: C57BL6/J (J stands for Jackson Laboratory). Historical exceptions to the rule include DBA/1, DBA/2, and BALB/c, which are all separate inbred strains.
4. This is the designation for a congenic strain produced by repeated backcrosses to an inbred (background) strain, with selection for a particular marker from the donor strain. A congenic strain differs from the background strain in a small segment of the genome. The congenic mouse strain in this example has a C57BL/6 genetic background that differs from that strain by the introduction of a differential allele ( $H2^k$ ) derived from strain AKR.



The information above has been adapted from the Rules for Nomenclature of Mouse and Rat Strains (revised May 2003) available at <http://www.informatics.jax.org/mgihome/nomen/strains.shtml>.

## Immunodeficient Model Selection: Should I use a nude, scid or *Rag1* mouse?

Selecting the most suitable immunodeficient mouse model for a study can be challenging. An investigator must choose from a confusing array of mouse strains that show varying types and degrees of immunodeficiency. The three most widely used models are nude ( $Foxn1^{nu}$ ), severe combined immunodeficiency (*scid*) and *Rag1* ( $Rag1^{tm1Mom}$ ). All three models suffer from severe immunodeficiency, but there are differences in phenotype due to the underlying genetic mutation and the genetic background on which the mutation is maintained.

Important factors that must be considered for model selection include characteristics of the mutation itself (e.g., cell types affected), characteristics of the background strain (e.g., strain-related spontaneous disease) and any mutation-strain interactions that may have phenotypic effects (e.g., strain-dependent *scid* “leakiness”). To help investigators sort out these details, the Jackson Laboratory has published a brochure outlining many factors to be considered during strain selection and specific differences among these three immunodeficient mouse models. The brochure can be viewed at <http://jaxmice.jax.org/library/communication/communication02.pdf>.

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*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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## Public Attitudes Towards the Use of Animals in Scientific Research

The use of animals in research continues to be a controversial issue for the American public. Every two years the National Science Foundation surveys people in the United States about various science issues, including the use of animals. The surveys have consistently shown that, compared with the citizens of other industrialized nations, Americans are more supportive of animal research. However, there is a significant division in American attitudes toward this issue.

In the 2001 survey 44% of all adults surveyed agreed that scientists should be allowed to do research that causes pain and injury to animals like dogs and chimpanzees if it produces new information about human health problems. This is down from a high of 53% in the late 1980's and early 1990's. Changing the species named in the question to mice resulted in 68% of the respondents agreeing with the statement.

In general, public attitudes toward using research animals are shaped by

- **The purpose of the research.** Using animals in research to fight diseases draws less opposition than using animals to test cosmetics.
- **The type of animal used.** Rodent use is tolerated to a greater degree than the use of dogs and chimpanzees.
- **The existence of alternatives.** When research goals can be met without using animals, the public opposes the use of animals.

The full text of the 2001 NSF *Science and Engineering Indicators* report may be found at <http://www.nsf.gov/sbe/srs/seind02/start.htm>.