

# JAX | NOTES™

MAY 2000, No. 480

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Web Site: [www.jax.org/jaxmice](http://www.jax.org/jaxmice)  
Tel: 1-800-422-MICE or 207-288-5845

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*A Progress Report from Robin Weir, Director of Customer Relations*

## OUR COMMITMENT TO BETTER SERVICE

**A**s a premier research institution dedicated to sharing knowledge and resources to help advance

biomedical research, The Jackson Laboratory strives to provide the best service possible to the worldwide research community. In response to your needs and to the recent growth in mouse-based research, we have invested in expanding our service capability. I would like to take this opportunity to quickly update you on our progress.

### *More JAX® GEMM™ Strains Shipped*

One major area of improvement includes the formation of a product management group. Our product managers work with the scientific community to optimize JAX® Mice inventory levels to best meet current and anticipated user needs. As a result, we have been able to fill many more orders for JAX® GEMM™ (Genetically Engineered & Mutant Mice) strains.

### JAX® GEMM™ Strains Growth Statistics January to May 2000

Number of new strains made available: 52  
Number of new strains received: 19

We have also developed "Standard Supply Level" designations for strains. Standard Supply Level designations indicate typical quantities of mice that can be shipped to help researchers schedule experiments. Additionally, this group analyzes strain interest information submitted by customers, especially on our continual influx of new strains under development (i.e. we add an average of over 100 new strains per year). This analysis supports our efforts to produce breeding colonies sized to best meet anticipated demand for new strains.

### *New Ground Transportation Service to California*

In response to the needs of and in conjunction with the West Coast research community, we have recently added the capability to ship JAX® Mice by climate controlled truck to our California customers.

*(Better Service continued on page 2)*



*Above: Bar Harbor, Maine- April 28, 2000, the first truck of JAX® Mice headed for California.*

## WEST COAST FACILITY UPDATE

In July 1999, The Jackson Laboratory and the University of California at Davis (U.C. Davis) established a research collaboration in the area of mouse genomics and biology. As part of this agreement, a shared facility, to be used for breeding laboratory mice, is being renovated on the U.C. Davis campus.

This moderately sized facility is managed by The Jackson Laboratory and is scheduled to receive initial nucleus support colonies by early summer and to be ready for importing mice by autumn 2000. Half of the facility will serve as one of four national Mutant Mouse Regional Resource Centers and is sponsored by the NIH through a grant awarded to U.C. Davis. This Center will import, breed, distribute, and cryopreserve scientifically significant mouse models.

The other half of the facility, called JAX West, will be used by The Jackson Laboratory to provide custom mouse breeding services to West Coast researchers. JAX West provides a significant opportunity to work more closely with the scientific community on the West Coast. We look forward to the continued expansion of our relationship with West Coast researchers. ●

## JAX® MICE UPDATE

### **New Name: JAX® GEMM™ Strains**

To help you find strains related to a gene of interest, we have consolidated all strains containing transgenes or gene mutations into one category called: JAX® GEMM™ Strains (Genetically Engineered & Mutant Mice). This new name reflects the rare, precious nature of these specialty mutant strains and is now used in all of our JAX® Mice communications.

### **New Prices, Effective June 1**

For new 2000 JAX® Mice prices, please refer to our *JAX® Mice Price List 2000*, to our Web site at [www.jax.org](http://www.jax.org) or call 800-422-MICE or 207-288-5845.

### **Available Now: Catalog 2000**

Our new 488 page catalog provides a comprehensive information resource on JAX® Mice strains. It can be used to help you select the strains and controls that best support your research needs. As this catalog does *not* include prices, please refer to sources listed above for price information.

### **Standard Supply Levels**

To help you better plan for experiments involving JAX® Mice, we have designated each strain with a "Standard Supply Level". This designation indicates the quantities of mice that we can typically ship to you from existing distribution colonies during a fixed period of time. The "Standard Supply Level" for each strain is indicated in our catalog, price list and on our Web site.



(Better Service continued from page 1)

### **More Communications**

In order to meet the user community's growing needs, our Customer Service Department has tripled in size over the past two years and has extended service hours from 8:00 AM-6:00 PM (EST). We are now able to communicate more regularly with customers, especially concerning the availability of JAX® Mice strains. Also, we have doubled the number of our field representatives to serve customers at their home institutions.

### **Expanded Technical Help Staff**

Our Technical Information Services staff has more than doubled in size. These scientific professionals, from a variety of research and bioinformatics backgrounds, help customers with technical questions. They can provide technical assistance by telephone, fax, email and in person at several national scientific meetings.

### **New Educational Opportunities**

Since the late 1950's, The Jackson Laboratory has organized courses and conferences, especially related to understanding genetic influences on health and disease. Traditionally, these conferences have been held in Bar Harbor, Maine at The Laboratory

(see page 10 for 2000 Schedule).

In response to your needs for training opportunities closer to your home institutions, we have formed a new group to organize additional conferences, conducted outside of Bar Harbor.

### **More Comprehensive Strain Information**

Selecting the most appropriate mouse model and controls for your experimental needs from over 2500 strains of JAX® Mice can be complicated. We continue in our efforts to provide more comprehensive information, especially on strain applications and phenotypes, both on the JAX®

Mice Web site and in our printed literature. To help scientists more easily find strains of interest, we have recently introduced a common name search capability to our Web-accessible JAX® Mice Database (see page 6).

### **On-going Commitment to Service**

We remain committed to providing responsive, personalized, and helpful service to enable worldwide research. In the months ahead, we will continue to focus on improving our service to you, especially in terms of providing new JAX® GEMM™ strains and additional technical information to support mouse-based research.

To address the growing data management needs of The Jackson Laboratory (now at over 1000 employees) and the ever-expanding number of JAX® Mice users, we are implementing an Enterprise Resource Planning (ERP) system. This ERP system will enable us to provide researchers with more timely and accurate estimates of strain availability.

As the number of new JAX® Mice strains continues to increase, so do our efforts to provide more comprehensive information regarding mouse model selection and usage. These efforts include more published literature, presentations, tutorials, and ongoing enhancements in the ease-of-use of the JAX® Mice Web site.

### **Send Us Your Suggestions**

Please share your ideas for improving or adding new products or services by calling us at 800-422-MICE or 207-288-5845 or by completing our Customer Feedback Form (go to [www.jax.org/jaxmice](http://www.jax.org/jaxmice); select submit forms from the home page; select "Customer Feedback & Ideas"). ●

## The Jackson Laboratory's First Outreach Conference

### **Comprehensive Approaches to Obesity-Induced Diabetes**

Date: October 2-3, 2000

Location: Roche Biosciences, Palo Alto, CA

For more information, contact Merlene McIntire at [mgm@jax.org](mailto:mgm@jax.org) or 207-288-6567  
[www.jax.org/industrial/documents/westconf2000.html](http://www.jax.org/industrial/documents/westconf2000.html)

Mouse Models News

**IMMUNODEFICIENT MODEL SELECTION: CHOOSING A NUDE, SCID OR RAG1 STRAIN**

The Jackson Laboratory distributes a number of immunodeficient mouse models that are useful as hosts for propagation of malignant cells and tissues (Table 1 below). Many of these models have been used for both allogeneic (within species) and xenogeneic (across species) transplantation studies. Choosing the most suitable model for a study can be difficult. This article outlines the many factors to be considered during strain selection and specific differences among the various models.

The three most widely used mouse models are the result of single gene spontaneous or targeted mutations that cause severe immunodeficiency: nude (new gene symbol, *Foxn1<sup>nu</sup>*, formerly *Hfh11<sup>nu</sup>*, see *New Gene Name for Nude Mice*, page 7), severe combined immune deficiency (gene symbol, *Prkdc<sup>scid</sup>*, commonly referred to as *scid*), and *Rag1* (*Rag1<sup>tm1Mom</sup>*). In addition to specific differences in phenotype due to the genetic mutation, there are also differences due to the genetic background on which the mutation is maintained.

Table 2 (page 4) lists factors to consider prior to selection of an appropriate model. Table 3 (page 4) outlines inherent characteristics of the background strains carrying these mutations. Table 4 (page 5) compares and contrasts the characteristics of nude, *scid*, and *Rag1* mutations.

It is important to note that this article highlights a subset of JAX® GEMM™ strains causing severe immunodeficiency that are typically used for growing malignant cells and tissues. Many other strains with genetic mutations and combinations of mutations that cause specific immunodeficiencies are also available. For more information, visit our Web site or request a copy of *Mouse Models for Immunology and Inflammation Research* using the enclosed business reply card.

**References**

*Authors in bold indicate Jackson Laboratory scientists*

**nude references**

- Committee on Immunologically Compromised Rodents. 1989. Hereditary immunodeficiencies. In: *Immunodeficient Rodents. a Guide to their Immunobiology, Husbandry, and Use*, Natl Academy Press, pp 69-71.
- Flanagan SP. 1966. "Nude," a new hairless gene with pleiotropic effects in the mouse. *Genet Res* 8:295-309.
- Kaestner KH, Knöchel W, Martinez, DE. 2000. Unified nomenclature for the winged helix/forkhead transcription factors. *Genes & Devel* 4:142-146.
- Kaushik A, Kelsoe G, Jatou JC. 1995. The nude mutation results in impaired primary antibody repertoire. *Eur J Immunol* 25:631-634.
- Nehls M, Pfeifer D, Schorpp M, Hedrich H, Boehm T. 1994. New member of the winged-helix protein family disrupted in mouse and rat nude mutations. *Nature* 372:103-107.
- Wortis HH, Nehlsen, S, Owen JJ. 1971. Abnormal development of the thymus in "nude" mice. *J Exp Med* 134:681-692.

**scid references**

- Bosma GC, Custer RP, Bosma MJ. 1993. A severe combined immunodeficiency mutation in the mouse. *Nature* 301:527-530.
- Blunt T, Finnie NH, Taccioli GE, Smith GC, Demengeot J, Gottlieb TM, Mizuta R, Varghese AJ, Alt FW, Jeffo PA, Jackson SP. 1995. Defective DNA-dependent protein kinase activity is linked to V(D)J recombination and DNA repair defects associated with the murine *scid* mutation. *Cell* 80:813-823.
- Shultz LD, Schweitzer PA, Christianson SW, Gott B, Schweitzer IB, Tennent B, McKenna S, Mobraaten L, Rajan TV, Greiner DL and Leiter EH. 1995. Multiple Defects of Innate and Adaptive Immunologic Function in NOD/LtSz-*scid* Mice. *J Immunol* 154:180-191.

**Rag1 references**

- Mombaerts P, Iacomini J, Johnson RS, Herrup K, Tonegawa S, Papaioannou VE. 1992. RAG-1 deficient mice have no mature B and T lymphocytes. *Cell* 68:869-877.

TABLE 1: JAX® GEMM™ STRAINS CARRYING MUTATIONS THAT CAUSE IMMUNODEFICIENCY

Mutation	Strain Name (Former Name)	Stock No.	Standard Supply Level
<b>nude</b>	B6.Cg-Foxn1 <sup>nu</sup> (C57BL/6J-Hfh11 <sup>nu</sup> )	000819	Level 2*
	CBy.Cg-Foxn1 <sup>nu</sup> (BALB/cByJ-Hfh11 <sup>nu</sup> )	000711	Level 1*
	CByB6F1/J-Foxn1 <sup>nu</sup> (CByB6F1/J-Hfh11 <sup>nu</sup> )	100402	Level 3*
	NU/J Foxn1 <sup>nu</sup> (NU/J Hfh11 <sup>nu</sup> )	002019	Level 2*
<b>scid</b>	CBySmn.CB17-Prkdc <sup>scid</sup> /J (BALB/cBySmn-Prkdc <sup>scid</sup> /J)	001803	Level 1*
	C3Smn.CB17-Prkdc <sup>scid</sup> /J (C3HSmn.C-Prkdc <sup>scid</sup> /J)	001131	Level 2*
	B6.CB17-Prkdc <sup>scid</sup> /SzJ (C57BL/6J-Prkdc <sup>scid</sup> /SzJ)	001913	Level 1*
	NOD.CB17-Prkdc <sup>scid</sup> /J (NOD/LtSz-Prkdc <sup>scid</sup> /J)	001303	Level 1*
<b>Rag1</b>	C.129S7-Rag1 <sup>tm1Mom</sup> (BALB/c-Rag1 <sup>tm1Mom</sup> )	003145	Level 4*
	B6;129-Rag1 <sup>tm1Mom</sup> (B6,129-Rag1 <sup>tm1Mom</sup> )	002096	Level 1*
	B6.129S7-Rag1 <sup>tm1Mom</sup> (C57BL/6J-Rag1 <sup>tm1Mom</sup> )	002216	Level 1*
	NOD.129S7(B6)-Rag1 <sup>tm1Mom</sup> (NOD/LtSz-Rag1 <sup>tm1Mom</sup> )	003629	Research Strain*

**\*Standard Supply Levels**

Level 1: Greater than 25 mice of each sex can be shipped per order per month.

Level 2: Up to 25 mice of each sex can be shipped per order per month.

Level 3: Up to 10 mice of each sex can be shipped per order per month.

Level 4: Up to 3 breeder pairs or 6 individual mice can be shipped per order during a 6 month period.

Research Strain: Availability determined by The Jackson Laboratory scientist holding the strain. This strain is also in development as a JAX® GEMM™ strain (Stock No. 003729). For more information, see [www.jax.org/jaxmice/pricelist](http://www.jax.org/jaxmice/pricelist)

NOTE: We have adopted new congenic nomenclature for most of our JAX® GEMM™ strains. The former names are listed within this table for your convenience. See *New Names for Congenic Mutant Strains*, page 6, for more information.

(References continued on page 4)

- **Shultz LD, Lang PA, Christianson SW, Gott B, Lyons B, Umeda S, Leiter E, Hesselton R, Wagar EJ, Leif JH, Kollet O, Lapidot T, Greiner DL.** 2000. NOD/LtSz-*Rag1<sup>tm1.1</sup>* mice: an immunodeficient and radioresistant model for engraftment of human hematolymphoid cells, HIV infection, and adoptive transfer of NOD mouse diabetogenic T cells. *J Immunol* 164:2496-2507.

**scid leakiness in inbred strains**

- Nonoyama S, Smith FO, Bernstein ID, Ochs HD. 1993. Strain-dependent leakiness of mice with severe combined immune deficiency. *J Immunol* 150:3817-3824.

**Comparison of immunodeficient models for xenotransplantation**

- **Christianson SW, Greiner DL, Schweitzer IB, Gott B, Beamer GL, Schweitzer PA, Hesselton RM, Shultz LD.** 1996. Role of natural killer cells on engraftment of human lymphoid cells and on metastasis of human T-lymphoblastoid leukemia cells in C57BL/6J-*scid* mice and in C57BL/6J-*scid bg* mice. *Cell Immunol* 171:186-199.

- Greiner DL, Shultz LD, Yates J, Appel MC, Perdrietz G, Hesselton RM, Schweitzer I, Beamer WG, Shultz KL, Pelsue SC, Leif J, Rajan TV. 1995. Improved engraftment of human spleen cells in NOD/LtSz-*scid/scid* mice as compared with C.B-17-*scid/scid* mice. *Am J Path* 146: 888-902.

- Hudson WA, Li Q, Kersey, JH. 1998. Xenotransplantation of human lymphoid malignancies is optimized in mice with multiple immunologic deficits. *Leukemia* 12:2029-2033.

**Reviews**

- Greiner DL, Hesselton RA, Shultz LD. 1998. SCID Mouse Models of Human Stem Cell Engraftment. *Stem Cells* 16: 166-177.

- Greiner, DL, Shultz LD. 1998. The Use of NOD/LtSz-*scid/scid* Mice in Biomedical Research. In: *NOD Mice and Related Strains: Research Applications in Diabetes, AIDS, Cancer and Other Diseases.* (eds. E. Leiter and M. Atkinson) R. G. Landes Company. pp. 173-203.

- Poole TW. Discovery, development, and history of the SCID mouse. 1996. *Lab Animal* 25:29-32. ●

**TABLE 2: IMPORTANT FACTORS FOR MODEL SELECTION**

**Characteristics of Mutation**

- Mechanism of action
- Cell types affected
- Immune defects secondary to mutation of interest
- Effects of mutation on breeding and lifespan (e.g., thymic lymphomas in *scid*)
- Associated phenotype effects (e.g., radiosensitivity of *scid*)
- Related research studies

**Characteristics of Background Strain**

- Related research studies (e.g., reproducibility)
- Type of research (e.g., transplantation, xenograft vs. allograft; allospecificity of cells, tumors etc.)
- Other biologicals to be used
- Strain-specific characteristics (e.g., MHC *H2* haplotype; disease resistance/susceptibility; innate immune responses: NK cell activity, macrophages, complement, etc.; radioresistance; lifespan; breeding performance; strain-related spontaneous disease: diabetes in NOD/LtJ mice, etc.; behavior)
- Availability

**Mutation-Strain Interactions**

- Effects on strain-specific spontaneous disease (e.g., lack of diabetes in NOD/LtSz-*scid*)
- Associated phenotype effects (e.g. combination of radiosensitivity of *scid* mutation on radioresistant strain)
- Strain-dependent *scid* “leakiness” resulting in some functional B and T cells
- Thymic lymphoma development
- Other unknown interactions

**TABLE 3: CHARACTERISTICS OF BACKGROUND STRAINS**

Characteristic	Background Strains				
	C57BL/6J	BALB/c or C.B-17*	C3H/HeJ	NU/J	NOD/LtSz
B & T cell leakiness due to <i>scid</i>	++++	+++	++	n.a.	+
MHC <i>H2</i> Haplotype	<i>b</i>	<i>d</i>	<i>k</i>	<i>q</i>	<i>g7</i>
Innate Immunity	normal	normal	B cell deficit resulting in poor response to LPS	normal	Impaired NK cell, macrophage and APC function, and complement deficiency
Sensitivity to X-irradiation	radioresistant	radiosensitive	radioresistant	??	radioresistant
Mutations available	nude <i>scid</i> <i>Rag1</i>	nude <i>scid</i> <i>Rag1</i>	nude <i>scid</i>	nude	<i>scid</i> <i>Rag1</i>

\*BALB/c mice are *Igh-1<sup>a</sup>* while C.B-17 mice are *Igh-1<sup>b</sup>*

TABLE 4: CHARACTERISTICS OF MUTATIONS CAUSING IMMUNODEFICIENCY

Characteristic	Mutation		
	nude	<i>scid</i>	<i>Rag1</i>
Type of Mutation	spontaneous	spontaneous	targeted
Gene Disrupted	<i>Foxn1</i> , forkhead box N1 formerly <i>Hfh11</i> , HNF-3/forkhead homolog 11 (Chr 11)	<i>Prkdc</i> , protein kinase, DNA activated, catalytic polypeptide gene (Chr 16)	<i>Rag1</i> , recombination activating gene 1 (Chr 2)
Mechanism of Action	Thymic dysgenesis (athymic)	Defects in DNA repair leading to defects in late phases of VDJ (Variable, diversity, joining) recombination Increased susceptibility to radiation damage.	Absence of functional recombinases, leading to defects in initial phases of VDJ recombination Lymphocyte-specific
Primary Immune Defects	T cell deficiency, T cell precursors unaffected Some extrathymic functional T cells produced in adult Partial defects in B cell development	B and T cell deficiency, developmental arrest in B cells at B220 <sup>+</sup> , cytoplasmic $\mu$ <sup>-</sup> , surface $\mu$ <sup>-</sup> stage of differentiation and T cells arrest at CD4 <sup>-</sup> CD8 <sup>-</sup> stage Deficits in CD3 <sup>+</sup> cells and T cell receptor $\alpha\beta$ <sup>+</sup> cells	B and T cell deficiency; B and T cell arrest similar to <i>scid</i> Deficits in CD3 <sup>+</sup> cells and T cell receptor $\alpha\beta$ <sup>+</sup> cells
Secondary Immune Defects	Macrophages, antigen presenting cells (APC), natural killer (NK) cells, complement activity unaffected	Macrophages, APC, NK cells, complement activity unaffected Greatly increased susceptibility to murine pathogens	Macrophages, APC, NK cells, complement activity unaffected Greatly increased susceptibility to murine pathogens
Animal Breeding and Husbandry	Maintained by heterozygous matings or heterozygous female x homozygous male Increased susceptibility to certain murine pathogens SPF (specific pathogen free) facility recommended for breeding or housing of mice for longer than 7-10 days Additional husbandry or veterinary practices may be advised (consult institutional veterinarian)	Maintained by homozygous sibling matings High incidence of thymic lymphomas (strain dependent) limiting breeding period and lifespan Increased susceptibility to certain murine pathogens SPF facility required for breeding or housing of mice for longer than 7-10 days Additional husbandry or veterinary practices frequently advised (consult institutional veterinarian)	Maintained by homozygous sibling matings Increased susceptibility to certain murine pathogens SPF facility required for breeding or housing of mice for longer than 7-10 days Additional husbandry or veterinary practices frequently advised (consult institutional veterinarian)
Advantages	Very well characterized and widely used Lack of hair allows visualization of subcutaneously transplanted tumors Immunodeficiency severe enough to support growth of many types of cells and tumors especially those of mouse origin Available on several different genetic backgrounds	More severe immunodeficiency than nude allowing higher percentage of engraftment, enhanced tumor growth rate, and less tumor regression of mouse and human tumors Available on several different inbred backgrounds including NOD/LtSz (Note: NOD/LtSz- <i>scid</i> mice are diabetes free) HU-PBL-SCID model for HIV1 research	More severe immunodeficiency than nude allowing higher percentage of engraftment, enhanced tumor growth rate, and less tumor regression of mouse and human tumors No possibility of functional B and T cell "leakiness" in adult as seen in <i>scid</i> Longer reproductive period and life span than <i>scid</i> mice Available on several different genetic backgrounds Radioresistant
Disadvantages	Some extrathymic T cell function Significant B cell function Normal number of macrophages and NK cells, normal APC function, and normal complement activity	Strain and environment dependent "leakiness" leads to production of some functional B and T cells after ~12 wks of age Numbers of macrophages, NK cells, and APC function normal, complement activity elevated on certain backgrounds High incidence of thymic lymphomas shortens lifespan Radiosensitive due to defects in DNA repair	Not as well characterized as xenograft/transplant host for established cell lines or tumors Normal number of macrophages and elevated NK cell function, normal APC function, and elevated complement activity on certain inbred backgrounds

## CUSTOMER RELATIONS

In January 2000, The Jackson Laboratory created a *Customer Relations Team* to better support customers with communications, technical information and help, and educational training programs. This team consists of over 60 professionals dedicated to providing service and support. Our customer support staff and field representatives work with customers to ensure their overall satisfaction with orders, shipments, service, and communications. The technical members of the *Customer Relations Team* include scientific and veterinary staff who develop printed and Web-accessible information resources, give educational seminars and tutorials, and provide technical help on a variety of topics related to using mouse models in biomedical research.

### *Customer Relations Managers*

- Susan Bean  
*Marketing Communications Mgr.*
- Elizabeth Bunker  
*Acting Customer Service Mgr.*
- Ruth Calas  
*GEMM™ Product Mgr.*
- Craig Gladstone  
*Field & Market Development Mgr.*
- MaryEllen Joseph  
*Customer Relations & Program Mgr.*
- Carol Linder, PhD  
*Sr. New Models Scientist*
- Megan Macauley  
*e-Services Mgr.*
- Michael Sasner, PhD  
*Technical Information Services Mgr.*
- Alicia Valenzuela  
*Customized Breeding Services Mgr.*
- Raymond A. Vonder Haar, PhD  
*General Purpose Product Mgr.*
- Robin Weir  
*Customer Relations Director*
- Barbara Witham  
*Sr. Field Development Representative*

## **JAX® Mice Web Site Update**

### NEW COMMON NAME SEARCH CAPABILITY

You can now search our Web-accessible JAX® Mice Database for strains and genes of interest by many commonly used names or nicknames. Adding common names to our database is an ongoing effort. As a result, you will notice the common name search capability improving with time.

To conduct a common name search follow these steps:

1. Go to the "Quick Search Query Form" at [www.jax.org/jaxmice/pricelist](http://www.jax.org/jaxmice/pricelist)
2. Enter a common name for a gene or strain in the first field: "Gene/Symbol/ Gene or Strain Name/Common Name"
3. Select the appropriate search parameter: "begins", "contains", or "equals".  
*Note: use "contains" when searching for Transgenics.*
4. Select "Search Database". A "Query Results" page will be displayed and includes a list of JAX® Mice strains related to the common name used as the search term. The resultant list also contains basic strain information (e.g. stock number, genotype, price, and standard supply level) and hypertext links to strain data sheets.

## NEW NAMES FOR CONGENIC MUTANT STRAINS

A large number of JAX® GEMM™ strains (Genetically Engineered & Mutant Mice) are congenic strains. Congenic strains are produced by transferring a mutation from one genetic background to a specific inbred strain through repeated backcrossing.

The congenic strain and the inbred partner are expected to be identical at all loci except for the transferred locus and a linked segment of chromosome. The size of the segment and the possibility of transferred alleles on other chromosomes depend on the number of backcross generations.

A strain is considered fully congenic after ten generations of backcrossing (N10). However, strains carrying mutations that have been backcrossed onto the background strain for at least five, but fewer than ten generations are considered incipient congenic strains and may be useful in a variety of research areas.

Most strain names for congenic mice carrying spontaneous and targeted mutations, as well as for a few strains congenic for histocompatibility loci, have not followed standard congenic nomenclature for historical reasons. In response to concerns from the scientific

community about the origins of genetic mutations and differences in phenotype due to genetic background effects, the *International Committee on Standardized Genetic Nomenclature for Mice* and The Jackson Laboratory made a commitment to correct these inconsistencies.

Effective June 1, 2000, a large number of JAX® Mice strain names will change to indicate the mutation's strain of origin. Strains are listed by their new names, with former names indicated below the new name, in the *JAX® Mice 2000 Catalog* and in the JAX® Mice Database ([www.jax.org/jaxmice/pricelist](http://www.jax.org/jaxmice/pricelist)). Examples of these name changes are given on page 7.

Congenic nomenclature is adopted once a strain has reached the fifth generation of backcrossing (N5) although a strain is not considered fully congenic until N10. The decision was made *not* to change the nomenclature of some strains that carry multiple alleles derived from different origins, either because of the way the strain was generated or because the nomenclature would cause additional confusion. Additional information on the origins of transgenes and genetic mutations may be found through the JAX® Mice Database by conducting a search using the gene symbol or stock number of interest.

*(Examples of New Names on page 7)*

For more information about congenic nomenclature please refer to the nomenclature guidelines on the JAX® Mice Web site ([www.jax.org/jaxmice](http://www.jax.org/jaxmice)). For assistance with these nomenclature changes, contact Technical Information Services at tel: 800-422-6423 or 207-288-5845, fax: 207-288-6150 or email: [micetech@jax.org](mailto:micetech@jax.org).

### Congenic strain names

#### Example 1.

STRAIN NAME **B6.129P2-Tcrb<sup>tm1Mom</sup>**  
FORMER NAME: C57BL/6J-Tcrb<sup>tm1Mom</sup>  
STOCK NUMBER 002118  
TYPE Targeted Mutation Congenic  
CONTROL C57BL/6J 000664  
BACKGROUND STRAIN C57BL/6J  
DONOR STRAIN 129P2 via E14TG2a ES cell line  
GENERATION N12F15

Note: This strain name should not be confused with that of a mutation maintained on a mixed B6;129P genetic background, where the strain abbreviations in the name are separated by a semicolon rather than a period (see Example 5). We have included additional information (strain type, control information, background and donor strains, and generation number) in the congenic strain detail both in our printed literature and on our Web site to more clearly delineate the genetic background.

#### Example 2.

STRAIN NAME **B6Ei.Cg-Atp7a<sup>Mo-blo</sup>**  
FORMER NAME: C57BL/6JEi-Atp7a<sup>Mo-blo</sup>  
STOCK NUMBER 002044  
TYPE Spontaneous Mutation Congenic  
CONTROL Wildtype from the colony  
BACKGROUND STRAIN C57BL/6JEi  
DONOR STRAIN Oak Ridge stock  
GENERATION N69F1

Note: The Cg (for congenic) is used when there are multiple donor strains or the donor strain is of mixed genetic background.

#### Example 3.

STRAIN NAME **BKS.Cg-m +/+ Lepr<sup>db</sup>**  
FORMER NAME: C57BLKS/J-m +/+ Lepr<sup>db</sup>  
STOCK NUMBER 000642  
TYPE Spontaneous Mutation Congenic  
CONTROL C57BLKS/J 000662  
BACKGROUND STRAIN C57BLKS/J  
DONOR STRAIN Lepr<sup>db</sup>, C57BLKS; m, DBA/J  
GENERATION N?F82

Note: In this example, the Cg is used to avoid suggesting that both mutations arose on DBA/J while showing that the misty (m) coat color marker and the diabetes (Lepr<sup>db</sup>) mutation are maintained in repulsion.

#### Example 4.

STRAIN NAME **C.129P2(B6)-Il2<sup>tm1Hor</sup>**  
FORMER NAME: BALB/c-Il2<sup>tm1Hor</sup>  
STOCK NUMBER 002229  
TYPE Targeted Mutation Congenic  
CONTROL BALB/cJ 000651; Wildtype from the colony  
BACKGROUND STRAIN BALB/c  
DONOR STRAIN B6;129P-Il2<sup>tm1Hor</sup>  
GENERATION N10F9

Note: Additional contributing genetic material may be included in parentheses following the donor strain. In this example, a targeted mutation has been transferred from a mixed B6;129P background to a third inbred strain. The genomic region flanking the targeted gene is 129P2-like because of the origin of the ES cell line, but an unknown amount of the strain's genome may be of C57BL/6 origin. The amount of donor strain DNA, both linked and unlinked to the differential locus, decreases with increasing generations of backcrossing.

#### Example 5.

STRAIN NAME **B6;129P-Tcrb<sup>tm1Mom</sup>**  
STOCK NUMBER 002117  
TYPE Targeted Mutation  
CONTROL B6129PF2 100903

Note: This is not a congenic, but rather a mixture of C57BL/6 and 129P2 (from ES cell line) and so is segregating alleles from these two strains. The comma between strain abbreviations was replaced with a semicolon to make a clearer distinction from the period in congenic nomenclature.

### Strain with nomenclature that will not change, but that carries alleles from different origins

#### Example 6.

STRAIN NAME **C57BL/6J-Igh<sup>a</sup> Thy1<sup>a</sup> Gpi1<sup>a</sup>**  
STOCK NUMBER 001317  
TYPE Non-Histocompatibility Allogantigens or Other Cellular Marker Congenic

Note: This strain was made by mating together, not backcrossing, three individual congenic strains carrying differential alleles already on a C57BL/6J genetic background (B6.C-Igh<sup>a</sup>, B6.PL-Thy1<sup>a</sup>, and B6.CAST-Gpi1).

## NEW GENE NAME FOR NUDE MICE

Effective May 4, 2000, the gene nomenclature for nude mutant mice changed from *Hfh11<sup>nu</sup>* to *Foxn1<sup>nu</sup>* (see Table 1, page 3 for list of strains). The nomenclature was previously updated

(New Gene Name continued on page 8)

## JAX® | GEMM™<sub>S</sub>

Genetically Engineered & Mutant Mice



## NEWS

\*\* In response to increased demand, we have expanded the breeding colonies for the following strains:

### C57BL/6-TgN(APOA1)1Rub

Stock Number: 001927  
Standard Supply: Level 1: Greater than 25 mice of each sex can be shipped per order per month.  
Applications: Research studies in cardiovascular biology

### C57BL/6J-Trp53<sup>tm1Tyj</sup>

Stock Number: 002101  
Standard Supply: Level 3: Up to 10 mice of each sex can be shipped per month.  
Applications: Research studies in apoptosis, cancer, immunology & inflammation, toxicology

\*\* The new strains listed below are offered at "Standard Supply Level 4": up to 3 breeder pairs or 6 individual mice can be shipped per order during a 6 month period.

### B6;129S-Apob<sup>tm1Sgy</sup> Ldlr<sup>tm1Her</sup>

Stock Number: 002999  
Applications: Research studies in apoptosis, cancer, immunology & inflammation, toxicology

### C57BL/6-TgN(PRG1)19Wlad

Stock Number: 003185  
Applications: Research studies in immunology & inflammation, neurobiology

### C57BL/6-TgN(HrKhGH1)106Bri Relb<sup>TgN106Bri</sup>

Stock Number: 002835  
Applications: Research studies in immunology & inflammation

### C57BL/6-Itgb7<sup>tm1Cgn</sup>

Stock Number: 002965  
Applications: Research studies in immunology & inflammation

For availability information or to place an order, call Customer Service at 1-800-422-MICE or 207-288-5845.

## C3H STRAINS FREE OF EXOGENOUS MMTV

The C3H parent strain was developed from a mating of a Bagg albino female with a DBA male followed by selection for mammary tumors. This high tumor incidence resulted from exogenous mouse mammary tumor virus (MMTV) transmitted through the dam's milk.

The Jackson Laboratory maintains four C3H substrains. C3HeB/FeJ and C3H/HeSnJ were both rederived approximately 40 years ago resulting in the elimination of exogenous MMTV virus. In 1999, both C3H/HeJ and C3H/HeOuj substrains were rederived to improve the overall health status of our distribution colonies. Current plans do not include the reintroduction of exogenous virus.

These rederivations and specific genetic mutations present in certain C3H substrains have resulted in a significant delay in onset of mammary tumor development and decrease in tumor incidence in all four C3H substrains compared to C3H substrains harboring exogenous virus.

To clearly indicate that our C3H substrains are MMTV-free, we have added "MMTV" with a minus symbol (-) to our C3H substrain names (see list below). The JAX® Mice Database ([www.jax.org/jaxmice/pricelist](http://www.jax.org/jaxmice/pricelist)) indicates this change and serves as the most updated source of JAX® Mice strain information.

- C3H/HeJ MMTV<sup>-</sup> (No. 000659)
- C3H/HeOuj MMTV<sup>-</sup> (No. 000635)
- C3HeB/FeJ MMTV<sup>-</sup> (No. 000658)
- C3H/HeSnJ MMTV<sup>-</sup> (No. 000661)

Please contact our Technical Information Services staff if you have further questions (tel 800-422-6423 or 207-288-5845, fax 207-288-6150, email [micetech@jax.org](mailto:micetech@jax.org)).

from *nu* to *Hfh11<sup>nu</sup>*, when the gene was cloned and identified as a mutation in the HNF-3/forkhead homolog 11 gene (Segre *et al.*, 1995). Further research has delineated the structure of the HNF3 (hepatocyte nuclear factor 3) domain and identified the gene as a member of the *Fox* gene family (Kaestner *et al.*, 2000).

*Fox* (forkhead box) has been adopted as the symbol for all winged helix/forkhead transcription factors characterized by a 100 amino acid DNA-binding domain. The FOX proteins have been assigned to subclasses based on phylogenetic analysis, with each subclass given a specific letter. Within each subclass, proteins are given a specific number.

Corresponding names follow the format of, "Fox, subclass N, member X". All gene symbols are italicized. For human nomenclature, all letters are capitalized (e.g., *FOXN1*), for mice, only the first letter is capitalized (e.g., *Foxn1*), and for all other species, the first letter and the subclass letters are capitalized (e.g., *FoxN1*).

### References

- Authors in bold indicate Jackson Laboratory scientists
- Segre JA, Nemhauser JL, Taylor BA, Nadeau JH, Lander ES. 1995. Positional cloning of the nude locus: genetic, physical, and transcription maps of the region and mutations in the mouse and rat. *Genomics* 28:549-559.
  - Kaestner KH, Knöchel W, Martinez, DE. 2000. Unified nomenclature for the winged helix/forkhead transcription factors. *Genes & Devel* 14:142-146. ●

## STUDY CONCLUDED: THE JACKSON LABORATORY DOES NOT HAVE MHV

It came to our attention in the summer of 1999 that several institutions throughout the United States had experienced as yet unexplained outbreaks of mouse hepatitis virus (MHV) infection. A few of our customers called to request our help in determining whether JAX® Mice might be the source of the infection. Although our rigorous, routine monitoring program has shown that we have had no MHV at The Jackson Laboratory for over

18 years, we immediately began an intensive investigation into the possibility that we might have an undetected nidus of infection within our mouse colonies.

We have now completed that investigation, which involved all of our Production mouse rooms. We have extensive and overwhelming evidence that JAX® Mice do not have MHV.

For copies of our summary report, please contact Customer Service at 800-422-MICE or 207-288-5845 or review the report on our Web site (go to [www.jax.org/jaxmice](http://www.jax.org/jaxmice); select "Animal Health and Genetic Quality" from the Main Menu; select "JAX Bulletin No. 3, Addendum 3: Summary Report: The Jackson Laboratory Does Not Have MHV, April 2000".

A new educational document on MHV, *JAX Communication No. 3: An Overview of Diagnostic Tests for MHV Detection* is also available. Please call Customer Service or see our Web site using the information above. ●

## FIRST GROUP OF LEXICON'S OMNIBANK® MICE HAVE ARRIVED

Under agreement with Merck Genome Research Institute (MGRI), Lexicon Genetics Inc. has shipped ten lines of targeted mutant ("knockout") mice from its OmniBank® library to The Jackson Laboratory for breeding and distribution. These strains, selected by a committee of leading scientists appointed by MGRI, are intended to support studies in functional genomics. It is important to note that unlike other "knockout" strains from The Jackson Laboratory, these OmniBank® strains have not yet been characterized and are being distributed without published references describing phenotypes and applications. Published information describing these strains will be added to our Web-accessible databases as it becomes available.

The OmniBank® strains listed in Table 5 are currently under development and not

(Lexicon Mice continued on page 9)

TABLE 5: LIST OF LEXICON'S OMNIBANK® MICE IN DEVELOPMENT AT THE JACKSON LABORATORY

Stock Number	Strain Name	Approved Gene Name	Approved Gene Symbol	GenBank	Common Names
003694	B6;129S- <i>Vamp8</i> <sup>tm1Lex</sup>	vesicle-associated membrane protein 8	<i>Vamp8</i>	W65964	Edb, endobrevin
003695	B6;129S- <i>Scg3</i> <sup>tm1Lex</sup>	secretogranin III	<i>Scg3</i>	U02982	SgIII
003696	B6;129S- <i>Thbs3</i> <sup>tm1Lex</sup>	thrombospondin 3	<i>Thbs3</i>	L04302	
003697	B6;129S- <i>Msemb</i> <sup>tm1Lex</sup>	beta-microseminoprotein	<i>Msemb</i>	U89840	PSP94, prostate secretory protein of 94 amino acids
003698	B6;129S- <i>Npr1</i> <sup>tm1Lex</sup>	natriuretic peptide receptor 1	<i>Npr1</i>	J05504	NPRA, Anf-R, atrial natriuretic factor receptor
003702	B6;129S- <i>Pecam</i> <sup>tm1Lex</sup>	platelet/endothelial cell adhesion molecule	<i>Pecam</i>	L06039	CD31
003703	B6;129S- <i>Fkbp3</i> <sup>tm1Lex</sup>	FK506-binding protein 3 (25kD)	<i>Fkbp3</i>	AF135595	FKBP25
003705	B6;129S- <i>Tle4</i> <sup>tm1Lex</sup>	transducin-like enhancer of split 4, homolog of <i>Drosophila</i> E(spl)	<i>Tle4</i>	U61363	Grg4, groucho related gene 4
003706	B6;129S- <i>Mip</i> <sup>tm1Lex</sup>	major intrinsic protein of eye lens fiber	<i>Mip</i>	U27502	MIP26
003707	B6;129S- <i>Cnlp</i> <sup>tm1Lex</sup>	cathelin-like protein	<i>Cnlp</i>	AF035680	CRAM

NOTE: These OmniBank® strains have been created using Cre-lox technology and are distributed by The Jackson Laboratory under conditions of use required by DuPont Pharmaceuticals. Please call 800-422-MICE or 207-288-5845 for more information.

yet available. You can help us determine the size of our breeding colonies for these mice by registering your interest in these strains. To register interest, call Customer Service or complete our Web form (go to [www.jax.org/jaxmice](http://www.jax.org/jaxmice) and select "submit forms" from the home page; then select "New Strain Interest Form").

This group of OmniBank® strains is the first set received by The Jackson Laboratory. Please be sure to check our Web site for the most updated information on strains of OmniBank® mice received. For more information about Lexicon's OmniBank, see [www.lexgen.com](http://www.lexgen.com).

### Jackson Laboratory Research News FRANKEL NAMED EDITOR OF NEW GENE EXPRESSION JOURNAL

Dr. Wayne Frankel, a neurogeneticist at The Jackson Laboratory, will serve as editor of *Gene Expression Patterns*, the latest in the Brain Research series of journals published by Netherlands-based Elsevier Science. *Gene Expression Patterns* is devoted to the rapid publication of quality research papers reporting novel patterns of gene expression during development, maturity, and aging of the central nervous system.

### MOUSE GENOME INFORMATICS UPDATE

The following new features have been added to Mouse Genome Informatics (MGI) Web site:

- New home page containing news and announcements and links to services and prototypes;
- Genealogy Chart of Inbred Strains which graphically depicts the origins and relationships among inbred mouse strains;
- Web interface to the MGI-LIST and RAT-LIST bulletin boards that allows users to search the archived email postings;
- Links to mouse T31 radiation hybrid

## COURSES & CONFERENCES YEAR 2000

- Colony Management Workshop  
*Dates: May 19 - 20  
November 17 - 18*
- Courses on Cryopreservation of Mouse Germplasm  
*Dates: Call to be placed on waiting list for 2001 courses*
- Atlantic Coast Contaminants Workshop: "Endocrine Disruptors in the Marine Environment: Impacts on Marine Wildlife and Human Health"  
*Dates: June 22 - 25*
- Mouse Initiatives II: Making New Mouse Mutants for Human Disease  
*Dates: July 12 - 15*
- 41st Annual Short Course in Medical and Experimental Genetics  
*Dates: July 16 - 28*
- The 3rd Genetic Effects on Aging Meeting  
*Dates: August 4 - 8*
- Graduate Course in Experimental Genetics of the Laboratory Mouse in Cancer Research  
*Dates: August 20 - 31*
- Genetic Approaches to Complex Heart, Lung and Blood Disease  
*Dates: September 6 - 17*
- Molecular Biology of Chromosome 21 and Downs Syndrome  
*Dates: September 23 - 26*
- 3rd Workshop on Animal Models as Biomedical Tools: Skin and Hair Mutations  
*Dates: October 3 - 7*
- Short Course on Mathematical Approaches to the Analysis of Complex Phenotypes  
*Dates: October 11 - 17*

(Courses & Conferences continued on page 11)

data through the Maps and Mapping Data Menu;

- Enhanced representation of alleles and a new allele query form;
- Ability to search by and view GO (Gene Ontology) terms for molecular function, biological process, and cellular location of genes and gene products;
- Unified searching in a single field for gene symbol/name/synonyms;
- Improved query features, including the ability to:
  - search mapping data by marker type
  - search expression data by marker chromosomal location
  - restrict queries for cDNAs by chromosomal region

For more detailed information, go to the MGI site at [www.informatics.jax.org](http://www.informatics.jax.org) and select "What's New". For questions and comments, contact MGI User Support at [mgi-help@informatics.jax.org](mailto:mgi-help@informatics.jax.org) or 207-288-6445. ●

## MOUSE TUMOR BIOLOGY DATABASE ENHANCEMENTS

The Mouse Tumor Biology Database (MTB) is a Web-based resource that provides access to information on tumor frequency and latency, genetics, and pathology in genetically defined mice (transgenics, targeted mutations, and inbred strains). MTB is designed to serve as an information resource for cancer genetics researchers who use the laboratory mouse as a model system for understanding human disease processes. Data in MTB are obtained from the primary scientific literature and from direct submissions by the research community.

Access to the data in MTB is provided using multiple Web-based query forms. Queries can be broad (e.g., "Show me all of the records in MTB for tumors of the mammary gland") or very specific (e.g., "Show me all of the records in MTB for FVB strains carrying a human HRAS

transgene driven by a mouse Wap promoter"). Results are displayed with links to the other primary information areas in MTB and other databases (e.g., MGD, GXD, JAX Mice Database).

Recent enhancements to MTB include the Tumor Frequency Grid (see below), a graphical representation of tumor frequencies in selected strains of mice organized by organ affected. The color of a particular cell in the grid reflects the highest reported frequency of spontaneous tumors in a particular strain and organ combination. Selecting on a cell in the grid launches a database search that returns the relevant frequency data and links to the source of the information.

Above: Screen display of MTB Tumor Frequency Grid.

Another significant enhancement to MTB is the addition of detailed descriptions of the photomicrographs of the tumors that are available in the database. These descriptions are provided by Dr. John Sundberg of The Jackson Laboratory's Pathology Program and serve to highlight the diagnostic cellular features of a particular tumor.

MTB is accessible from the Mouse Genome Informatics Web site ([www.informatics.jax.org](http://www.informatics.jax.org)). User support is available for MTB by email at [mgi-help@informatics.jax.org](mailto:mgi-help@informatics.jax.org). ●

## SELECTED PUBLICATIONS AUTHORED BY JACKSON LABORATORY SCIENTISTS

Authors in bold indicate Jackson Laboratory scientists

### Cancer Research

• **Golovkina TV**. 2000. A novel mechanism of resistance to mouse mammary tumor virus infection. *J Virol* 74:2752-2759.

### Diabetes and Obesity Research

• **Graser RT, DiLorenzo TP, Wang F, Christianson GJ, Chapman HD, Roopenian DC, Nathenson SG, Serreze DV**. 2000. Identification of a CD8 T cell that can independently mediate autoimmune diabetes development in the complete absence of CD4 T cell helper functions. *J Immunol* 164:3913-3918.

• **Mathews CE, Graser RT, Serreze DV, Leiter EH**. 2000. Reevaluation of the major histocompatibility complex genes of the NOD-progenitor CTS/Shi strain. *Diabetes* 49:131-134.

### Genetics Research

• **Beck JA, Lloyd S, Hafezparast M, Lennon-Pierce M, Eppig JT, Festing MF, Fisher EMC**. 2000. Genealogies of mouse inbred strains. *Nat Genet* 24:23-25.

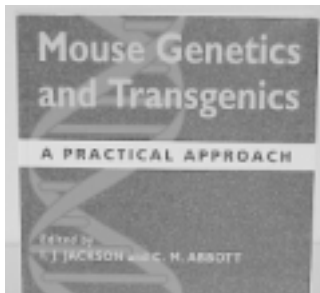
• **Munroe RJ, Bergstrom RA, Zheng QY, Libby B, Smith R, John SWM, Schimenti KJ, Browning VL, Schimenti JC**. 2000. Mouse mutants from chemically mutagenized embryonic stem cells. *Nat Genet* 24:318-321.

### Reproductive Biology Research

• **Sztejn JM, O'Brien MJ, Farley JS, Mobraaten LE, Eppig JJ**. 2000. Rescue of oocytes from antral follicles of cryopreserved mouse ovaries: competence to undergo maturation, embryogenesis, and development to term. *Hum Reprod* 15:567-571.

### New Book

• **Title: Mouse Genetics and Transgenics**.  
Editors: JJ Jackson and CM Abbott  
Oxford Univ Press 2000  
([www.oup-usa.org](http://www.oup-usa.org))



*Above: New book from Oxford University Press with chapters authored by Jackson Laboratory scientists.*

Chapters by Jackson Laboratory scientists  
➤ **Akeson EC, Davisson MT**. Analysing mouse chromosomal rearrangements with G-banded chromosomes. pp 144-153.

➤ **Eppig JT**. Electronic tools for accessing the mouse genome. pp 171-183.

➤ **Taylor BA**. Mapping phenotypic trait loci. pp 87-120. ●

### Questions and Answers

## FREQUENTLY ASKED QUESTIONS ABOUT JAX® MICE



**What is The Jackson Laboratory's Position on Use-Licenses for Mouse Strains?**



The Jackson Laboratory makes every effort to accept and distribute mouse strains that are unencumbered by license restrictions. However, some institutions that create genetically engineered strains or that have developed patented technology that is used to create genetically engineered mice require that users obtain use-licenses.

To expedite distribution of new strains, we request that users work directly with the institutions requiring licenses to obtain user licenses. Specific patented technologies requiring licenses include the following:

- "OncoMouse™" Technology (E.I. duPont de Nemours and Company)
- "Cre-lox" Technology (DuPont Pharmaceuticals Company)
- "TET-System" Technology (BASF Bioresearch Corporation).

We also supply M.I.T. originated p53 "knockout" mice (*Trp53<sup>tm1Tyf</sup>*), which require: 1) a license from Taconic Farms, which has licensed the Baylor College of Medicine patent (Donehower); and 2) a license from E.I. duPont de Nemours and Company for use of OncoMouse™ Technology.

For more information on licensing, please call Customer Service at 800-422-MICE or 207-288-5845. ●

## COURSES & CONFERENCES YEAR 2000 CONTINUED

- **Techniques for Modeling Human Cancer in Mice**  
Dates: October 22 - 26
- **Modeling Human Colo-Rectal Cancer in Mice**  
Dates: October 26 - 29

### Animal Care Technician Week

## ODE TO A CARETAKER AT JAX

*Tend ever so carefully these small creatures*

*They are a woman's family*

*A man's dream*

*A parent's hope*

*A child's future*

*They are more candles for the birthday cake*

*They are the tools for the healers*

*Let this one I handle today answer a prayer*

*By: Margaret Ames, JAX Caretaker, March 2000*



*Above: Dr. Rob Weichbrod, a new member of The Jackson Laboratory's Customer Relations Team and President of AALAS, presenting awards during "National Animal Care Technician Week" at a Jackson Laboratory luncheon honoring animal care staff.*

## CONTACT INFORMATION

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Fax: 207.288.6150

email for Technical Help:

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Research Affiliates Web Site

[www.jax.org/industrial/index.html](http://www.jax.org/industrial/index.html)

#### Custom Breeding Services

email: [custom-breeding@jax.org](mailto:custom-breeding@jax.org)

#### Support for Investigators

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(Candidate Strain Submission)

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Fax: 207.288.6150

email: [sfr@jax.org](mailto:sfr@jax.org)

Phyllis Mobraaten

(Status of Strains in Importation)

Tel: 207.288.6247

Fax: 207.288.6150

email: [pam@jax.org](mailto:pam@jax.org)

#### Web Sites

JAX® MICE

[www.jax.org/jaxmice](http://www.jax.org/jaxmice)

JAX® Mice Searchable Database

[www.jax.org/jaxmice/pricelist](http://www.jax.org/jaxmice/pricelist)

Induced Mutant Resource

[www.jax.org/resources/documents/imr](http://www.jax.org/resources/documents/imr)

Mouse Genome Informatics

[www.informatics.jax.org](http://www.informatics.jax.org)

## JAX NOTES™

*JAX® Notes* is a quarterly publication produced by the Marketing Communications group at The Jackson Laboratory: Susan Bean (Marketing Communications Coordinator); Carol Linder, PhD (Sr. Technical Information Scientist); Sonya P. Swing DVM, PhD (Technical Information Scientist); Megan Macauley (Manager); and Linda Neleski (Technical Publications Specialist).

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#### Share Your Ideas:

If you would like a special topic addressed in a future issue of *JAX Notes*, please contact Susan Bean with your idea (tel: 207-288-6294; fax: 207-288-6150; email: [sbean@jax.org](mailto:sbean@jax.org)).

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