Also Known As: lymphoproliferation, MRL-lpr

This strain is commonly known as MRL-lpr or lpr mutant. Mice are homozygous for the lymphoproliferation spontaneous mutation (Fas<sup>lpr</sup>), and show systemic autoimmunity, massive lymphadenopathy associated with proliferation of aberrant T cells, arthritis, and immune complex glomerulonephrosis. Mice are useful as a model to determine the etiology of systemic lupus erythematosus (SLE) and Sjögren (Sicca) syndrome and to evaluate therapies. Information about lupus disease phenotypes in MRL-lpr is available here.

Our preclinical efficacy testing services offer scientific expertise and an array of target-based and phenotype-based outcome measures, both in vivo and at endpoint, for flexible study designs and assay development in mouse models of Lupus. See our full service platform.

GENETIC OVERVIEW

<table>
<thead>
<tr>
<th>Genetic Background</th>
<th>Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F5pF13</td>
</tr>
<tr>
<td></td>
<td>(2014-08-05 00:00:00)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Allele Type</th>
<th>Gene Symbol</th>
<th>Gene Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Important Note
July 2007: This strain has been recovered from cryopreservation and the original phenotype was observed: The sixteen-week old mice have lymph nodes that were 4.5 (females) to 10.1 times (male) larger than age and sex matched individuals from the former colony. Splenomegaly is 3 to 6 times greater and their life spans were also greatly reduced. The former version of this line, which displayed a loss of lymphoproliferative phenotype, has been renamed MRL/MpJ-Fas\(^{lpr}/2J\) and is available as Stock No. 006825.

Details

Mice homozygous for the lymphoproliferation spontaneous mutation (Fas\(^{lpr}\)) show systemic autoimmunity, massive lymphadenopathy associated with proliferation of aberrant T cells, arthritis, and immune complex glomerulonephrosis. Starting at about three months of age, levels of circulating immune complexes rise greatly in the MRL-lpr/lpr mouse but not the MRL normal (Hewicker 1990). Onset and severity of symptoms associated with the Fas\(^{lpr}\) gene is strain-dependent. For example, lymphoproliferation varies greatly with congeneric strain C57BL/6J-Fas\(^{lpr}/Fas\(^{lpr}\) at a 24 fold increase over control lymph node weight, MRL/Mp-Fas\(^{lpr}/Fas\(^{lpr}\) at 75 fold and congeneric strain C3H/HeJ-Fas\(^{lpr}/Fas\(^{lpr}\) highest at 116 fold increase over control lymph node weight (Morse et al 1985). Variance in renal pathology ranks from extensive in MRL/Mp-Fas\(^{lpr}/Fas\(^{lpr}\) at 4 to 7 months to negligible at 14 to 16 months in mice with C57BL/6J and C3H/HeJ backgrounds.
and homozygous for the Fasl
lpr
(Kelley and Roths 1985). Spontaneous production of anti-dsDNA autoantibodies is likewise affected with percentage binding of radiolabeled dsDNA in Fasl
lpr
/Fasl
lpr
mice varying from 5 percent on C57BL/6J to 26 percent on C3H/HeJ to as high as 49 percent on MRL/Mp (Izui et al 1984). Female MRL/Mp-Fasl
lpr
mice die at an average age of 17 weeks of age and males at 22 weeks. This compares to between 42 and 52 weeks in females on the C57BL/6J or C3H/HeJ background (Roths 1987). Embryonic stem cell lines have been established with MRL/Mp-Fasl
lpr
mice strains (Kawase et al 1994). This mouse is a model for systemic lupus erythematosus-like autoimmune syndromes.

MRL/MpJ and one of its ancestral strains LG/J display heightened wound healing relative to a panel of other inbred strains. At 4 weeks post-injury, 2mm ear punch wounds healed to 0-0.4mm in MRL/MpJ mice but were still 1.2-1.6mm in C57BL/6 mice. At 15 days post-injury C57BL/6 showed a maximal closure of 30% reduction in ear hole size while MRL showed 85% reduction. The process of healing in MRL/MpJ mice was faster, more complete, showed increased swelling, angiogenesis, fibroblast migration, extracellular matrix deposition, and decreased scarring and fibrosis. Additionally, hair follicles and accompanying sebaceous glands were regenerated to a much greater degree. The other ancestral strains of MRL/MpJ (C3H, C57BL/6, and AKR) do not display this enhanced healing. Bone marrow transplantation showed that the MRL/MpJ healing phenotype did not readily transfer with bone marrow and did remain in the irradiated host tissues. Enhanced healing of cardiac wounds has also been reported in MRL/MpJ mice. In this model a very high mitotic index (10-20%) was found, similar to that seen in non-mammalian tissue regeneration. Using F2 and backcross mapping of MRL/MpJ-Fasl
lpr
x B6 progeny McBrearty et al. identified wound healing QTLs: the heal2 and heal3 loci were identified on MRL/MpJ Chromosome 13 in the region of D13Mit115 and D13Mit129 respectively; the heal5 locus was identified on MRL/MpJ chromosome 12 in the region of D12Mit233; the heal1 locus was identified on chromosome 8 of C57BL/6 in the region of D8Mit211; and a highly suggestive locus was found on MRL/MpJ Chromosome 7 in the region of D7Mit220. (Clark et al., 1998; Leferovich et al., 2001; Kench et al., 1999; McBrearty et al., 1998.)

Microarray analysis and SELDI ProteinChip analysis have identified multiple genes and proteins that have varied expression in the ear punch wounds of MRL/MpJ-Fasl
lpr
versus C57BL/6. The changes in expression patterns suggest that in MRL/MpJ mice there is less of an inflammatory response and an earlier transition into tissue repair than is seen in C57BL/6. (Li et al., 2000 and 2001.)

Blankenhorn et al. found that MRL/MpJ females heal faster and more completely than males. Some heal QTL are sexually dimorphic with heal 2, 3, 7, 8, 10, and 11 having greater effect in males and heal 4, 5, and 9 having greater effect in females. Castration improves wound healing in MRL/MpJ males to nearly the degree seen in females, but ovariectomy does not improve the degree of healing seen in MRL/MpJ females. (Blankenhorn et al., 2003)

Relative to B10.D2nSnJ mice, MRL/MpJ mice have decreased Neutrophil accumulation in the bronchiolar lavage in response to LPS infusion and tests using bone marrow chimeras revealed that the pulmonary inflammatory response transfers with bone marrow. Transforming growth factor beta 1 autologous induction is reduced in MRL/MpJ splenocytes while macrophages show a reduction in the transforming growth factor beta 1 induction of interleukin 1 beta and tumor necrosis factor alpha production but no significant reduction in transforming growth factor beta 1 production. (Kench et al., 1999.) MRL-Fasl
lpr
are also highly susceptible to Mycobacterium leprae (Yogi et al., 1989).
Genotyping Protocols
Standard PCR: Fas
Standard PCR: Fas MCA
Genotyping resources and troubleshooting

Dietary Information
LabDiet® 5K52 formulation (6% fat)

Breeding Considerations
This strain is a challenging breeder.

Due to the heightened healing which occurs in mice with the MRL genetic background, ear punch is not a good method for individual mouse identification in this strain. Mice may have only 2 litters before developing phenotype.

Additional Breeding and Husbandry Support

Mating System
Homozygote x Homozygote

Appearance
albino

Related Genotype: a/a Tyr<sup>c</sup> / Tyr<sup>c</sup>

Citation
When using the MRL-lpr mouse strain in a publication, please cite the originating article(s) and include JAX stock #000485 in your Materials and Methods section.

Animal Health Reports
Facility Barrier Level Descriptions

- MP14 (Maximum)
- RB03 (Maximum)
Pricing & Availability

Readily Available

Sized to accommodate orders of up to 100 or more. Ask Customer Service for details.

Domestic

International

Pricing effective for USA, Canada and Mexico shipping destinations

<table>
<thead>
<tr>
<th>AGE</th>
<th>GENOTYPE</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 weeks</td>
<td>Female Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$135.41</td>
</tr>
<tr>
<td>3 weeks</td>
<td>Male Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$135.41</td>
</tr>
<tr>
<td>4 weeks</td>
<td>Female Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$135.41</td>
</tr>
<tr>
<td>4 weeks</td>
<td>Male Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$135.41</td>
</tr>
<tr>
<td>5 weeks</td>
<td>Female Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$135.41</td>
</tr>
<tr>
<td>5 weeks</td>
<td>Male Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$135.41</td>
</tr>
<tr>
<td>6 weeks</td>
<td>Female Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$139.06</td>
</tr>
<tr>
<td>6 weeks</td>
<td>Male Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$139.06</td>
</tr>
<tr>
<td>7 weeks</td>
<td>Female Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$142.71</td>
</tr>
<tr>
<td>7 weeks</td>
<td>Male Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$142.71</td>
</tr>
<tr>
<td>8 weeks</td>
<td>Female Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$146.36</td>
</tr>
<tr>
<td>8 weeks</td>
<td>Male Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$146.36</td>
</tr>
<tr>
<td>9 weeks</td>
<td>Male Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$150.01</td>
</tr>
<tr>
<td>10 weeks</td>
<td>Male Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$153.66</td>
</tr>
<tr>
<td>11 weeks</td>
<td>Male Homozygous for Fas&lt;sup&gt;lpr&lt;/sup&gt;</td>
<td>$157.31</td>
</tr>
</tbody>
</table>

PAYMENT TERMS AND CONDITIONS

Terms are granted by individual review and stated on the customer invoice(s) and account statement. These transactions are payable in U.S. currency within the granted terms. Payment for services, products, shipping containers, and shipping costs that are rendered are expected within the payment terms indicated on the invoice or stated by contract. Invoices and account balances in arrears of stated terms may result in The Jackson Laboratory pursuing collection activities including but not limited to outside agencies and court filings.

THE JACKSON LABORATORY'S GENOTYPE PROMISE

The Jackson Laboratory has rigorous genetic quality control and mutant gene genotyping programs to ensure the genetic background of JAX® Mice strains as well as the genotypes of strains with identified molecular mutations. JAX® Mice strains are only made available to researchers after meeting our standards. However, the phenotype of each strain may not be fully characterized and/or captured in the strain data sheets. Therefore, we cannot guarantee a strain's phenotype will meet all expectations. To ensure that JAX® Mice will meet the needs of individual research projects or when requesting a strain that is new to your research, we suggest ordering and performing tests on a small number of mice to determine suitability for your particular project. We do not guarantee breeding performance and therefore suggest that investigators order more than one breeding pair to avoid delays in their research.
TERMS OF USE
General Terms and Conditions

LICENSING INFORMATION

Phone: 207-288-6470
Email: TechTran@jax.org

JAX® Mice, Products & Services Conditions of Use

"MICE" means mouse strains, their progeny derived by inbreeding or crossbreeding, unmodified derivatives from mouse strains or their progeny supplied by The Jackson Laboratory ("JACKSON"). "PRODUCT(S)" means biological materials supplied by JACKSON, and their derivatives. "SERVICES" means projects conducted by JACKSON for other parties that may include but are not limited to the use of MICE or PRODUCTS. "RECIPIENT" means each recipient of MICE, PRODUCTS, or SERVICES provided by JACKSON including each institution, its employees and other researchers under its control. MICE or PRODUCTS shall not be: (i) used for any purpose other than internal research, (ii) sold or otherwise provided to any third party for any use, or (iii) provided to any agent or other third party to provide breeding or other services. Acceptance of MICE, PRODUCTS or SERVICES from JACKSON shall be deemed as agreement by RECIPIENT to these conditions, and departure from these conditions requires JACKSON’s prior written authorization.

No Warranty
MICE, PRODUCTS AND SERVICES ARE PROVIDED "AS IS". JACKSON EXTENDS NO WARRANTIES OF ANY KIND, EITHER EXPRESS, IMPLIED, OR STATUTORY, WITH RESPECT TO MICE, PRODUCTS OR SERVICES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY WARRANTY OF NON-INFRINGEMENT OF ANY PATENT, TRADEMARK, OR OTHER INTELLECTUAL PROPERTY RIGHTS.

Credit for PRODUCTS or SERVICES
In case of dissatisfaction for a valid reason and claimed in writing by a purchaser within ninety (90) days of receipt of, PRODUCTS or SERVICES, JACKSON will, at its option, provide credit or replacement for the PRODUCT received or the SERVICES provided; JACKSON makes no other representations and this shall be the exclusive remedy of the purchaser. Please note specific policy for live mice.

Animal Care and Use for SERVICES
Consistent with the requirement for a written understanding regarding animal care and use, the JACKSON Animal Care and Use Committee will review the animal care and use protocol(s) associated with any SERVICES to be performed at JACKSON, and JACKSON shall have ultimate responsibility and authority for the care of animals while on site or in JACKSON custody.

No Liability
In no event shall JACKSON, its trustees, directors, officers, employees, and affiliates be liable for any causes of action or damages, including any direct, indirect, special, or consequential damages, arising out of the provision of MICE, PRODUCTS, or SERVICES, including economic damage or injury to property and lost profits, and including any damage arising from acts or negligence on the part of JACKSON, its agents or employees. Unless prohibited by law, in purchasing or receiving MICE, PRODUCTS, or SERVICES from JACKSON, purchaser or recipient, or any party claiming by or through them, expressly releases and discharges JACKSON from all such causes of action or damages, and further agrees to defend and indemnify JACKSON from any costs or damages arising out of any third party claims.

MICE, PRODUCTS or SERVICES are to be used in a safe manner and in accordance with all applicable governmental rules and regulations.

The foregoing represents the General Terms and Conditions applicable to JACKSON’s MICE, PRODUCTS or SERVICES. In addition, special terms and conditions of sale of certain MICE, PRODUCTS, or SERVICES may be set forth separately in JACKSON web pages, catalogs, price lists, contracts, and/or other documents, and these special terms and conditions shall also govern the sale of these MICE, PRODUCTS and SERVICES by JACKSON, and by its licensees and distributors.
Acceptance of delivery of MICE, PRODUCTS or SERVICES shall be deemed agreement to these terms and conditions. No purchase order or other document transmitted by purchaser or recipient that may modify the terms and conditions hereof, shall be in any way binding on JACKSON, and instead the terms and conditions set forth herein, including any special terms and conditions set forth separately, shall govern the sale of MICE, PRODUCTS or SERVICES by JACKSON.