The **Rai1** allele has loxP sites flanking exon 3 of the retinoic acid induced 1 gene. Removal of the floxed sequence creates a null allele. These mice may be useful in studying circuit assembly and neuronal communication in human disorders such as Smith-Magenis syndrome (SMS).

**Donating Investigator**
Liqun Luo, Stanford University

**GENETIC OVERVIEW**

<table>
<thead>
<tr>
<th>Genetic Background</th>
<th>Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rai1</strong>&lt;sup&gt;tm2.1Luo&lt;/sup&gt;</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Allele Type</th>
<th>Gene Symbol</th>
<th>Gene Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Targeted (Conditional ready (e.g. floxed))</td>
<td><strong>Rai1</strong></td>
<td>retinoic acid induced 1</td>
</tr>
</tbody>
</table>

**RESEARCH APPLICATIONS**

- Diabetes and Obesity Research
- Research Tools
- Neurobiology Research
- Cell Biology Research
- Cancer Research

Typically mice are recovered in 10-14 weeks. Contact Customer Service to place an order or for more information.
Haploinsufficiency of retinoic acid induced 1 (RAI1) in humans causes Smith-Magenis syndrome (SMS), which is associated with diverse neurodevelopmental and behavioral symptoms as well as obesity. RAI1 encodes a nuclear protein with emerging functions in the expression of genes involved in circuit assembly and neuronal communication.

The Rai1\(^{\text{loxP}}\) allele has \(\text{loxP}\) sites flanking exon 3 of the retinoic acid induced 1 gene. Mice homozygous for this floxed allele are viable and fertile with no reported abnormalities. When bred to mice that express Cre recombinase, the resulting offspring will have the floxed region (encoding amino acid 1-1837) deleted in cre-expressing tissues; creating a knock-out allele (Rai1\(^{\text{KO}}\)).

For example, when bred to mice with Cre-expression throughout the central and peripheral nervous system (Nestin-Cre; Stock No. 003771), the resulting Nestin\(^{\text{Cre}}\);Rai1\(^{\text{Cre, KO}}\) homozygotes have pan-neural loss of Rai1 and exhibit three major characteristics of SMS - deficits in body weight homeostasis, motor function and associative learning and memory. They are smaller than control littermates prior to weaning and show prominent hindlimb clasping. More than 80% die by 25 weeks of age. Females (but not males) show obesity beginning ~5 weeks of age.

Furthermore, individual aspects of these three major SMS phenotypes may be observed by crossing Rai1\(^{\text{loxP}}\) to different cre-expressing mice.

Breeding to Gad2-IRES-Cre mice (Stock No. 010802) results in Rai1 knock-out in most GABAergic inhibitory neurons. Those Gad2\(^{\text{Cre}}\);Rai1\(^{\text{Cre, KO}}\) mice show learning deficits, but no motor function abnormalities, obesity or early lethality.

When bred to Vglut2-ires-cre mice (Stock No. 016963), the resulting Vglut2\(^{\text{Cre}}\);Rai1\(^{\text{Tag}}\) mice have Rai1 knock-out in subcortical excitatory neurons - leading to increased body weight, poor motor function and learning deficits, with no early lethality. In addition, Rai1 knock-out specifically in neurons of the paraventricular nucleus of hypothalamus (PVH; via breeding to Sim1-cre [see Stock No. 006395]) or ventromedial nucleus of hypothalamus (VMH; via breeding to Sf1-Cre [Stock No. 012462]) both contributed to the obesity phenotype observed in Vglut2\(^{\text{Cre}}\);Rai1\(^{\text{Cre, KO}}\) mice.

No SMS-like characteristics were observed for mice with Rai1 knock-out in astrocytes and subsets of adult neural progenitors (via breeding to Gfap-Cre73.12 ; Stock No. 012886) or with Rai1 knock-out in cortical and hippocampal excitatory neurons and glia (via breeding to Emx1-IRES-Cre; Stock No. 005628).
Genotyping Protocols
Standard PCR: Rai1-Alternate 1
Genotyping resources and troubleshooting

Breeding Considerations
Mice homozygous for the Rai1$^{\text{flox}}$ allele are viable and fertile with no reported gross physical or behavioral abnormalities.

When maintaining a live colony, heterozygous mice may be bred together, to wildtype mice from the colony or to C57BL/6J inbred mice (Stock No. 000664). Alternatively, homozygous mice may be bred together.

Additional Breeding and Husbandry Support
Mating System
Heterozygote x Heterozygote

Citation
When using the Rai1-flox (Rai1$^{\text{flox}}$) mouse strain in a publication, please cite the originating article(s) and include JAX stock #029103 in your Materials and Methods section.
Production of mice from cryopreserved embryos or sperm occurs in a maximum barrier room, G200

Pricing & Availability

Typically mice are recovered in 10-14 weeks. Contact Customer Service to place an order or for more information.

Domestic

Pricing effective for USA, Canada and Mexico shipping destinations

<table>
<thead>
<tr>
<th>CRYORECOVERY - DOMESTIC PRICING</th>
<th>SERVICE/PRODUCT</th>
<th>DESCRIPTION</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cryo Recovery &gt;</td>
<td>Heterozygous for Rai1&lt;tm2.1Luo&gt;</td>
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<td>$2,854.50</td>
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</tbody>
</table>

RELATED PRODUCTS AND SERVICES

| Frozen Mouse Embryo | B6.129S1(Cg)-Rai1<tm2.1Luo>/J Frozen Embryo | $2595.00 |

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.

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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.
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*General Terms and Conditions*

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**LICENSING INFORMATION**

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

### Related Strains

- **All**
- By Allele
- By Gene
- By Collection