Also Known As: Akita

The Akita strain is a monogenic model for phenotypes associated with type 1 diabetes. A spontaneous mutation in the insulin 2 gene leads to incorrect folding of the insulin protein producing toxicity in pancreatic β cells, reduced β cell mass and reduced insulin secretion. Heterozygous $Ins2^{Akita}$ mice develop insulin dependent diabetes, including hyperglycemia, hypoinsulinemia, polydipsia, and polyuria by 3-4 weeks. The phenotype is more severe in males than females. Obesity and insulitis do not accompany diabetes. Akita mice may be useful for testing islet transplantation and studying diabetic complications such as nephropathy, sympathetic autonomic neuropathy, and macrovascular disease.

Due to progression of the diabetic phenotype and subsequent increased fragility in heterozygous males, shipment of heterozygous male mice of this strain is restricted to four to six weeks of age [February 2020].
Mice heterozygous for the Akita spontaneous mutation ($\text{Ins2}^{\text{Akita}}$) are viable and fertile. Symptoms in heterozygous mutant mice include hyperglycemia, hypoinsulinemia, polydipsia, and polyuria, beginning around 3-4 weeks of age. The diabetic phenotype is more severe and progressive in the male than in the female. Obesity or insulitis does not accompany diabetes.

Expression of glutathione S-transferase mRNA is increased in epithelial cells in proximal tubules of hyperglycemic mutants (Fujita et al., 2001). As well, plasma concentrations of valine, leucine, isoleucine, as well as the total branched chain amino acids, alanine, citrulline and proline, were significantly higher in the Akita mice (Mochida et al., 2011). Sphingosine-1-phosphate is elevated and diabetic animals demonstrated reductions in plasma levels of omega-9 24:1 (nervonic acid)-containing ceramide, sphingomyelin, and cerebrosides. Reduction of 24:1-esterified sphingolipids was also observed in liver and heart (Fox et al., 2011).

Aged mice exhibit gait disturbance and decreased sensory nerve conduction velocity, but do not exhibit learning or
memory deficits (Choeiri C et al., 2005). They do, however, exhibit hyperphagia and anxiety behavior (Asakawa et al., 2007).

Progressive retinal abnormalities begin as early as 12 weeks after the onset of hyperglycemia. Retinal complications include increased vascular permeability, alterations in the morphology of astrocytes and microglia, increased apoptosis and thinning of the inner layers of the retina (Barber AJ, et al., 2005).

The mean lifespan of diabetic male mice on the C57BL/NJcl background (305 days) was significantly shorter than that of nondiabetic males in another colony of the same strain (690 days). Mortality rates of diabetic and nondiabetic female mice of this strain did not differ significantly. Islets from \textit{Ins2}\textsubscript{Akita} mice are depleted of beta cells and those remaining release very little mature insulin. This, and the finding that mutant mice respond to exogenously administered insulin, indicate that \textit{Ins2}\textsubscript{Akita} mice will serve as an excellent substitute for mice made insulin dependent diabetic by treatment with alloxan or streptozotocin. Heterozygous \textit{Ins2}\textsubscript{Akita} mice are also ideally suited to allogeneic or xenogeneic islet transplantation protocols because the investigator does not need to treat the mice with a diabetogen to induce the hyperglycemic state. Untreated homozygotes rarely survive beyond 12 weeks of age.

Metabolic phenotype data may be found on the Diabetic Complications Consortium (DiaComp) website.
Genotyping Protocols
Restriction Enzyme Digest: Ins2
Pyrosequencing: Ins2
End Point Analysis: Ins2

Genotyping resources and troubleshooting

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

Breeding Considerations

Mice are currently maintained by breeding a C57BL/6J inbred female with a heterozygous male. After onset of diabetes, when cages become very wet (due to diabetes-associated polyuria), the health of heterozygotes is best maintained by housing them individually in cages containing a mixture of regular litter and Alpha-Dri, changed twice weekly. Due to progression of the diabetic phenotype and subsequent increased fragility in heterozygous males, shipment of heterozygous male mice of this strain is restricted to four to six weeks of age [February 2020].

Additional Breeding and Husbandry Support

Mating System
C57BL/6J (000664) x Heterozygote
Breeding Summary: C57BL/6J (000664) female x Heterozygous male

Appearance
black

Related Genotype: a/a

Citation
When using the Akita mouse strain in a publication, please cite the originating article(s) and include JAX stock #003548 in your Materials and Methods section.

Animal Health Reports
Facility Barrier Level Descriptions

 AX12 (Maximum)

Pricing & Availability

Sized to accommodate orders of up to 10 or more with age range. Ask Customer Service for details.

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<thead>
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<td>Heterozygous for Ins2&lt;sup&gt;Akita&lt;/sup&gt;</td>
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## RELATED PRODUCTS AND SERVICES

**Frozen Mouse Embryo**
- **C57BL/6-Ins2<Akita>/J**
- **$2595.00**

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## 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

**TERMS OF USE**

*General Terms and Conditions*

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**LICENSING INFORMATION**

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

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## Related Strains

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