

生物医学研究中 小鼠模型选择的注意事项

小鼠品系命名

查找小鼠资源

小鼠选择注意事项

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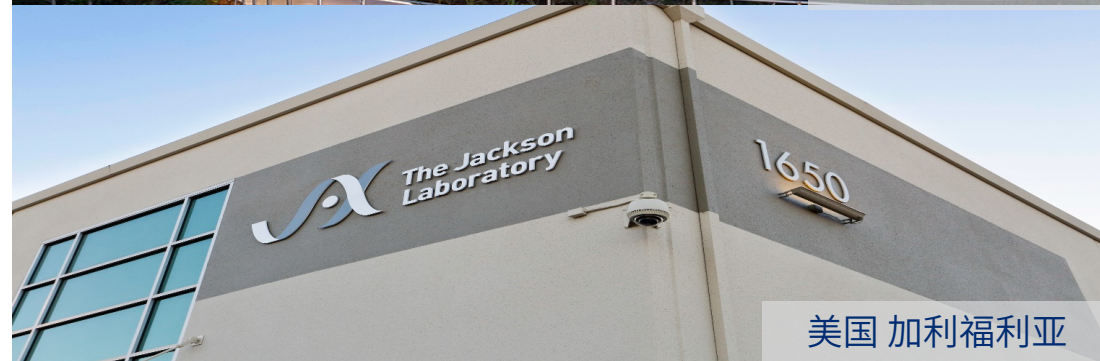


**The Jackson
Laboratory**

*Leading the search
for tomorrow's cures*

关于杰克森实验室(JAX)

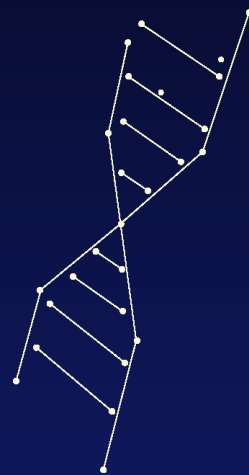
杰克森实验室(JAX)创立于1929年
是一家独立的生物医学研究机构



我们的使命

致力于人类疾病探究 寻找精准的基因解决方案
赋能全球生物医药研究 为改善人类健康这一共同诉求做出贡献

上海市实验动物学会2021夏季论坛



赋予科学卓越的力量

全球前沿的领先技术来源于强大的科研团队。JAX科学家不仅从事着开创性的研究工作，而且向全世界的研究人员提供前沿动物模型和卓越的临床前服务。

发现

创新

研究

教育

上海市实验动物学会2021学术论坛

JAX微课堂 – 3部中文课程现已发布

- <https://minicourses.jaxorg.cn/> (推荐PC端登陆)



小鼠模型系统的历史和发展课程

本简明课程概括了在遗传学和基因组学研究中使小鼠的独特优势。您将了解到孟德尔遗传学，能够认知繁育计划和遗传学资源，解释小鼠品系命名法，并探索基因改造小鼠的优势。

FREE

Registered



小鼠遗传学基础

本简明课程概括了在遗传学和基因组学研究中使小鼠的独特优势。您将了解到孟德尔遗传学，能够认知繁育计划和遗传学资源，解释小鼠品系命名法，并探索基因改造小鼠的优势。

FREE

Registered



实验室小鼠生殖生物学

本简明课程使学员能够掌握实验室小鼠生殖生物学的基础知识。您将了解到生殖解剖学、受精过程、雌性实验室小鼠生殖状态以及关于一般种群维护的繁育性能。

FREE

Registered

学习目标

- 查找可用的小鼠模型
 - 小鼠品系命名规则
 - 小鼠资源查找
- 选择合适的小鼠模型
 - 遗传背景
 - 繁育策略
 - 实验结果的可重复性



小鼠品系命名：名字里包含了什么？

- 唯一标识

- 遗传背景
- 相关基因/等位基因
- 使用的技术
- 首建鼠系
- 构建模型的实验室
- 维系种群的实验室

C57BL/6^J

C57BL/6^N

C57BL/6^{NJ}

B6;129P2-*Il2*^{tm1Hor}/J

B6.129P2-*Il2*^{tm1Hor}/J

B6.129P2-*Apoa1*^{tm1Unc}/J

C57BL/6-Tg(*APOA1*)1Rub/J

小鼠品系命名：近交系和杂物品系

- 表型

- Nonobese Diabetic NOD/ShiLtJ (001976)
- Nude NU/J (002019)



- 起源&毛色

- C57BL (Black)
- **C57BR** (Brown)
- C57L (Leaden)



- 杂交

Inbred*

C57BL/6J = B6
129S1/SvImJ = 129S

F1Hybrid*

B6129SF1/J
♀ ♂

- C57BL/6J

Parent strain

- C57BL/6NJ

Substrain designation
NIH (N)

- C57BL/6NCrl

Laboratory maintaining the strain

Jackson (J)
Crl (Charles River
Laboratories)

常用近交小鼠品系缩写

- 129S1/SvImJ = 129S
- **C57BL/6J = B6**
- **C3H/HeJ = C3**
- A/J = A
- C57BL/6JEi = B6Ei
- C3HeB/FeJ = C3Fe
- AKR/J = AK
- C57BL/10 = B10
- DBA/2J = D2
- **BALB/cJ = C**
- C57BR/cdJ = BR
- SJL/J = SJL or J
- C57BL = B
- C57L = L
- SWR/J = SW

小鼠品系命名：基因工程小鼠

自发或诱导突变

C57BL/6J-Apc^{Min}/J

Background Strain

Affected Gene

Mutant Allele

*Mixed Background

靶向突变(tm)
敲除、敲入或floxed

B6;129P-Tcrb^{tm1Mom}/J

Background (Recipient) Strain

Donor Strain

Affected Gene

Allele #

Targeted Mutation

Creator Lab Code

Holding Site Lab Code

转基因(Tg)

B6.Cg-Tg(PDGFB-APP)5Lms/J

**Congenic N ≥ 5

Transgenic

(Promoter-Gene)

Founder Line

核酸内切酶介导的基因编辑(em)

C57BL/6J-Ngly1^{em9}Lutzy/J

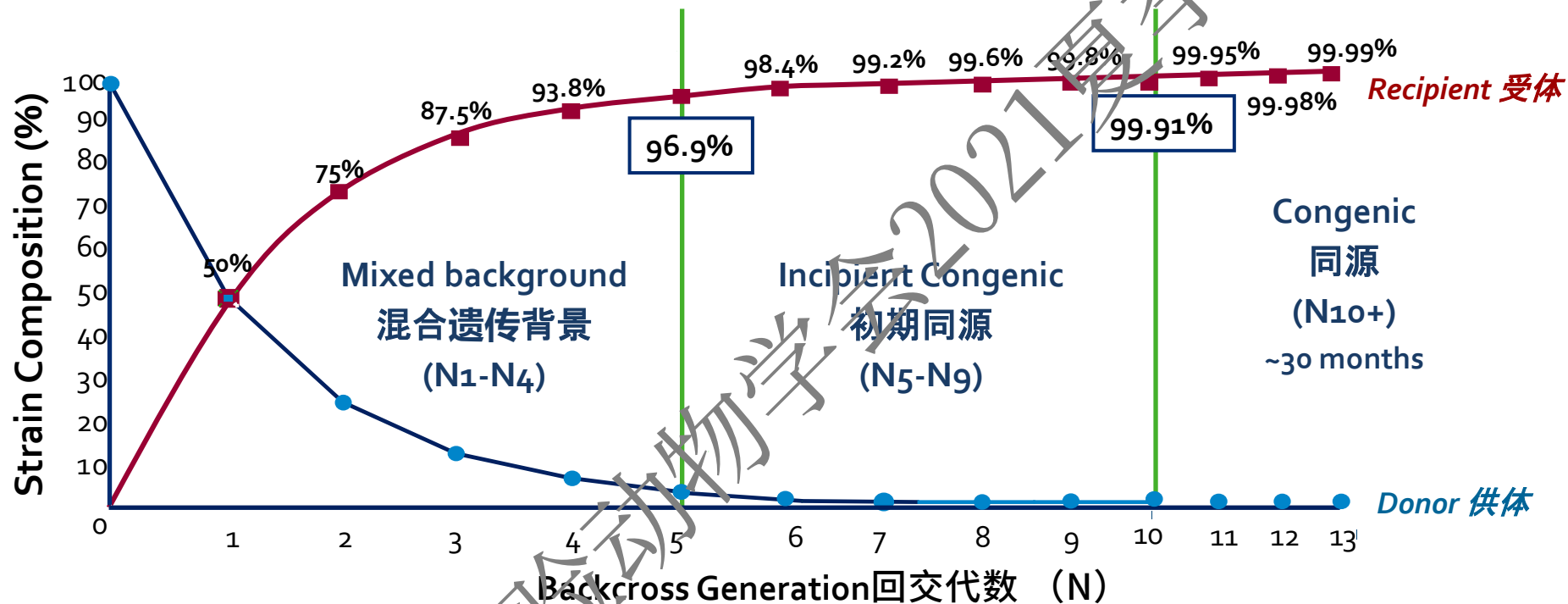
Background Strain

Affected Gene

Endonuclease-mediated Mutation

Creator Lab Code

回交



B6;Cg-Gt(ROSA)26Sor^{tm9}(CAG-tdTomato)^{Hze}/J (Stock # 007905)

B6.Cg-Gt(ROSA)26Sor^{tm9}(CAG-tdTomato)^{Hze}/J (Stock # 007909)

小鼠命名举例

受体品系

供体品系

B6;129P2-*Il2*^{tm1Hor}/J

与C57BL/6J 回交至少5次

B6.129P2-*Il2*^{tm1Hor}/J

转基因插入位点未知

B6.Cg-Tg(*Alb-cre*)21Mgn/J

测序获得插入整合位点信息

B6.Cg-*Speer6-ps1*Tg(*Alb-cre*)21Mgn/J

转基因插入位点明确

通过JAX在线资源寻找小鼠模型

- JAX Mice Database (<https://mice.jax.org/>)
- MGI (<http://www.informatics.jax.org>)
- IMSR (<http://www.findmice.org>)
- JAX小鼠模型搜索指南

JAX小鼠资源库



按品系号搜索

按关键词搜索

- 品系名
- 基因名
- 疾病名
- 表型

RESEARCH & FACULTY ▾

EDUCATION & LEARNING ▾

JAX MICE & SERVICES ▾

PERSONALIZED MEDICINE ▾

NEWS ▾

ABOUT US ▾

GIVE

+ Usage

+ Strain Type

+ Platform

+ Strain Attributes

+ Products

Search for stock #, strain name, allele, gene, keywords...

WELCOME TO JAX MOUSE SEARCH

Search the comprehensive JAX collection of innovative mouse models by disease term, gene name, allele, or part of a strain name using our improved search experience. Not sure what to search? Browse through the popular models below or use our filtering to the left.

[Search Tips and Tricks](#)

<https://mice.jax.org/>

- Usage

- ☐ Only show strains that can be used in For-Profit research

- Strain Type

- ☐ Congenic
- ☐ F1 or F2 Hybrid
- ☐ Inbred Strain
- ☐ Outbred
- ☐ Recombinant Inbred (RI)
- ☐ Wild-Derived

- Platform

- ☐ Cre Expressing
- ☐ Cre Reporter
- ☐ GFP
- ☐ Tet On/Off

- Strain Attributes

- ☐ Conditional ready (e.g. floxed)
- ☐ Constitutively active
- ☐ Epitope tag
- ☐ Humanized sequence
- ☐ Inducible
- ☐ Null/Knockout
- ☐ Recombinase-expressing

Show All (11)

- Products

- ☐ Cryo-Recovered Mouse
- ☐ Frozen Mouse Embryo
- ☐ Frozen Mouse Sperm
- ☐ Live Mouse
- ☐ Mouse ES Cells



小鼠模型搜索 MGI + IMSR

MGI Mouse Genome Informatics

Due to maintenance, access to MGI may be intermittent 7:30-8:30 AM EDT Thursday, May 28.

About Help FAQ

Search Download More Resources Submit Data Find Mice (IMSR)

SNCA

Or use topic specific search and analysis tools:

- Genes
- Phenotypes & Mutant Alleles
- Human-Mouse: Disease Connection
- Gene Expression Database (GXD)
- Recombinase (cre)
- Function
- Strains, SNPs & Polymorphisms
- Vertebrate Homology
- Mouse Models of Human Cancer
- Batch Data and Analysis Tools
- Nomenclature

Getting Started:

- Introduction to mouse genetics
- How to use MGI (Text & Video)
- Cre Portal Tutorial

MGI Mouse Genome Informatics

Due to maintenance, access to MGI may be intermittent 7:30-8:30 AM EDT Thursday, May 28.

About Help FAQ Genes Phenotypes Human Disease Expression Recombinases Function Strains / SNPs Homology

Search Download More Resources Submit Data Find Mice (IMSR) Analysis Tools

Quick Search Results for SNCA

Examples: embryo* develop* MGI:97490 Fas<lpr> Pax* axial "skeletal dysplasia" Tg(ACTB-cre)2M

See details for this search.

Genome Features sorted by best match, showing 1-10 of 79

Score	Type	Symbol	Name	Chr	Location	Str	Best Match
★★★★	protein coding gene	Snca	synuclein, alpha	6	60731575-60829855	-	SYMBOL : Snca and 7 more...
★★★★	protein coding gene	Mageb1b	melanoma antigen family B, 16	X	79623231-79671435	-	RAT SYNONYM : Snca and more detail...
★★★	Endonuclease-mediated allele	Snca ^{em1(IMR)H}	synuclein, alpha; endonuclease mediated mutation 1, Harwell	6	60731575-60829855	-	MARKER SYMBOL : Snca and 1 more...

Mutations, Alleles, and Phenotypes

less

Phenotype Summary 39 phenotypes from 10 alleles in 9 genetic backgrounds
188 phenotypes from multigenic genotypes
404 phenotype references

Phenotype Overview ?

adipose tissue behavior/neurological cardiovascular system cellular craniofacial digestive/alimentary system embryo endocrine/exocrine glands growth/size/body hearing/vestibular/ear hematopoietic system homeostasis/metabolism immune system integument limbs/digits/tail liver/biliary system mortality/aging muscle neoplasm nervous system pigmentation renal/urinary system reproductive system respiratory system skeleton taste/smell/tact vision/eye

Click cells to view annotations.

Mice homozygous for disruptions in this gene display resistance to the effects of MPTP on dopamine levels. Mice expressing a knock-in allele exhibit impaired stride length, abnormal response to reserpine and reduced brain dopamine levels.

All Mutations and Alleles 73

- Endonuclease-mediated 2
- Spontaneous 1
- Targeted 11
- Transgenic 59

Genomic Mutations 1 involving Snca

Find Mice (IMSR) 23 strains or lines available

Comparison Matrix Gene Expression + Phenotype

小鼠模型搜索 MGI + IMSR

International Mouse Strain Resource (IMSR)

Search Repositories Participate Glossary Contact About Deposit Strains

Summary

Search for: Search Reset Show Options [MGI News: Mouse Resources for COVID-19 Research](#)

You searched for: 23 strains(s) match your unfiltered search. Showing items 1 - 23 of 23

Export:

Filter by: State Type Provider Mutation

Filter by Provider

- ☐ EMMA
- ☐ JAX
- ☐ MMRRC
- ☐ SMOC

Go

N	Strain Name	States	Repository	Mutation Types	Alleles	Genes
?	C57BL/6J-Snca ^{em2Smoc}	sperm	SMOC	targeted mutation	Snca ^{em2Smoc}	Snca synuclein, alpha
?	C57BL/6J-Snca ^{em1Smoc}	embryo	SMOC	targeted mutation	Snca ^{em1Smoc}	Snca synuclein, alpha
+	C57BL/6NTac-Snca ^{em1(IMPC)H/H}	live	EMMA	endonuclease-mediated mutation 1, Marwell	Snca ^{em1(IMPC)H/H}	Snca synuclein, alpha
+	B6(Cg)-Snca ^{tm1.1Vlb/J}	sperm	JAX	targeted mutation	Snca ^{tm1.1Vlb/J}	Snca synuclein, alpha
+	B6;129X1-Snca ^{tm1Rosl/J}					

15 item(s) match after applying filter(s).

N	Strain Name	Synonyms	States	Repository	Mutation Types	Alleles	Genes
+	B6(Cg)-Snca ^{tm1.1Vlb/J}		sperm	JAX Order	targeted mutation	Snca ^{tm1.1Vlb/J} targeted mutation 1.1, Vladimir L Buchman	Snca synuclein, alpha
+	B6;129X1-Snca ^{tm1Rosl/J}		live	JAX Order	targeted mutation	Snca ^{tm1Rosl/J} targeted mutation 1, Amon Rosenthal	Snca synuclein, alpha
+	B6(Cg)-Snca ^{tm1.2Vlb/J}		sperm	JAX Order	targeted mutation	Snca ^{tm1.2Vlb/J} targeted mutation 1.2, Vladimir L Buchman	Snca synuclein, alpha
+	C57BL/6N-Snca ^{tm1Mjff/J}		live	JAX Order	targeted mutation	Snca ^{tm1Mjff/J} targeted mutation 1, The Michael J Fox Foundation	Snca synuclein, alpha

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 - 遗传背景
 - 繁育策略
 - 实验结果的可重复性



了解小鼠模型遗传背景的重要性

C57BL/6J^{OlaHsd} (Mice from Envigo (Harlan), Bicester, UK)

Deletion of *Snca*

C57BL/6J (The Jackson Laboratory)

Wild-type *Snca*

Model	Strain	Phenotype difference
SOD1-G93A	B6SJL -Tg(SOD1*G93A)1Gur/J (002726)	50% 生存期128.9+/-9.1天
	B6.Cg -Tg(SOD1*G93A)1Gur/J (004435)	50% 生存期157.1+/-9.3天
APP/PS1	B6;C3 -Tg(APPswe,PSEN1dE9)85Dbo/Mmjax (004462)	无癫痫症状
	B6.Cg -Tg(APPswe,PSEN1dE9)85Dbo/Mmjax (005864)	癫痫高发

常见小鼠品系遗传背景分类和表示方法

- 近交系遗传背景

- C57BL/6J-*Trem2^{em1Aduj}*/J ([027918](#))

- 同源遗传背景

- B6.129S1-*Mnx1^{tm4(cre)Tmj}*/J ([006600](#))
- B6.Cg-*2310039L15Rik^{Tg(Prnp-SNCA* A53T)23Mhe}*/J ([006823](#))

- 混合遗传背景

- B6(SJL)-*Apoe^{tm1.1(APOE*4)Aduj}*/J ([027894](#))
- B6;129-Tg(APP^{Swe},tauP301^NILfa *Psen1^{tm1Mpm}*/Mmjax ([004807](#))
- STOCK Tg(Slc1a3-cre/ERT1)1Nat/J ([012586](#))
- B6SJL-Tg(SOD1*G93A)1Gur/J ([002726](#))

品系历史：它们经历过什么？

- 模型在构建中涉及哪些品系？
 - 卵母细胞供体是谁？
 - ES细胞系来自哪里？
- 在繁育过程中引入了哪些品系？
 - Cre/FLP
 - Reporters
 - Other mutations
- 目前的繁育策略是什么？
- 目前的代数信息是什么？
- 这个品系被冻存过吗？
 - 在哪一代被冻存？
 - 品系回交过吗？
- 这个品系的遗传背景被确认过吗？

JAX小鼠品系详情



MOUSE STRAIN DATASHEET - 005359

Email Download PDF Print JAX® Mice Search Help

B6.Cg-Tg(Camk2a-cre)T29-1St/J

POPULAR

Stock No: 005359 | T29-1

Congenetic, Transgenic

AVAILABLE NOW

PLACE ORDER

Live mice available in varying quantities. Ask Customer Service for details.

OVERVIEW

DETAILS

GENETICS

DISEASE/PHENOTYPE

TECHNICAL SUPPORT

PRICING & AVAILABILITY

TERMS OF USE

RELATED STRAINS

Also Known As: T29-1

This strain is commonly known as T29-1. CaMKII α -Cre line T29-1 transgenic mice have the mouse calcium/calmodulin-dependent protein kinase II alpha (*Camk2a*) promoter driving Cre recombinase expression in the forebrain, including the CA1 pyramidal cell layer of the hippocampus. See strain description below for additional information. This strain is useful in examining synaptic plasticity and Long Term Potentiation (LTP) in hippocampal networks.

转基因: calcium/calmodulin-dependent protein kinase II alpha promoter driving cre

表达位点: forebrain, CA1 of the hippocampus

Donating Investigator

Dr. Susumu Tonegawa, Massachusetts Institute of Technology

品系捐赠者

READ MORE +

不同遗传背景的小鼠繁育策略和对照选择

- 所需基因型
- 小鼠存活性和育性
- 遗传背景

The Jackson Laboratory

B6SJL-Tg(SOD1*G93A)1Gur/J POPULAR

Stock No: 002726 | SOD1-G93A

Transgenic

OVERVIEW DETAILS GENETICS DISEASE/PHENOTYPE TECHNICAL SUPPORT

Details

- + Detailed Description
- + **Development**
- + Expression Data
- + **Control Suggestions**
- + Selected References

Development

The SOD1-G93A (or G93A-SOD1) transgene was designed with a mutant human *SOD1* gene (harboring a single amino acid substitution of glycine to alanine at codon 93) driven by its endogenous human *SOD1* promoter. This transgene was injected into fertilized B6SJL F1 mouse eggs and founder animals were obtained. Transgenic mice on a mixed B6SJL genetic background were sent to The Jackson Laboratory.

Control Suggestions

Noncarrier

002297 B6SJL-Tg(SOD1)2Gur/J

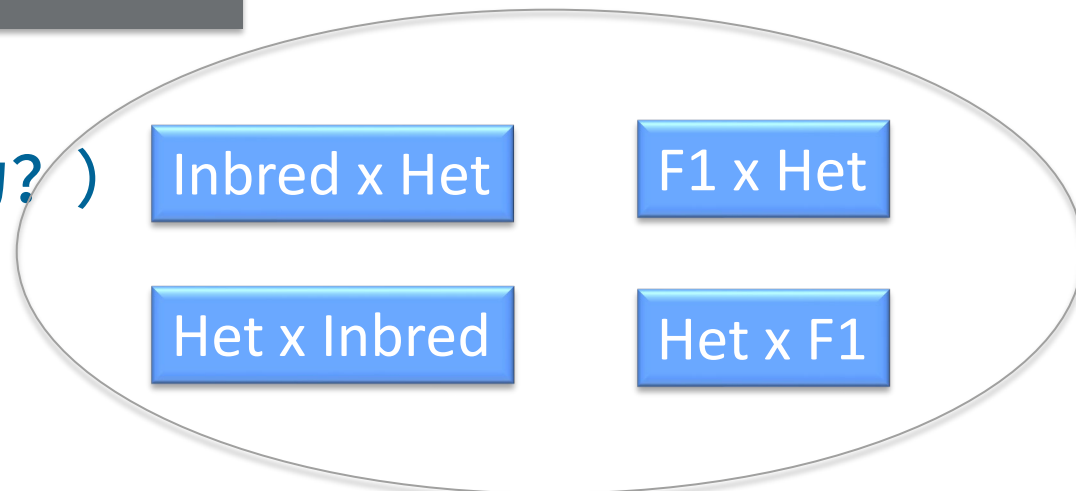
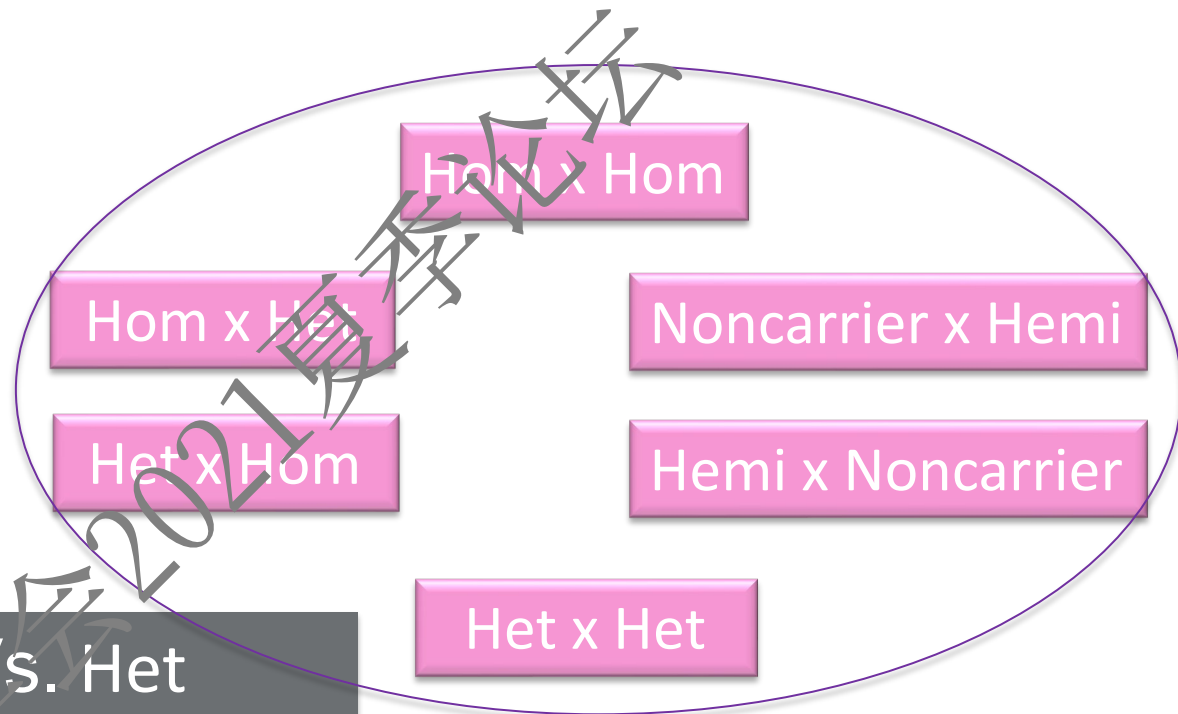
Additional Information

Considerations for Choosing Controls

繁育方案的选择

- 需要什么样的基因型？
 - 怎样来鉴定这些基因型？
- 可以使用什么样的对照？
- 是否有连锁的情况？
 - X-连锁还是常染色体？
- 是否多个基因涉及？
 - 是连锁的还是独立分离的？
- 对于生殖情况的考虑（不育或低生育能力？）
- 胚胎或幼鼠致死？

Hemi Vs. Het
Noncarrier Vs. WT



JAX小鼠品系详情提供的信息

B6.129-Kras^{tm4Tyj} Trp53^{tm1Brn} /J

Stock No: **032435** | KP, K;F1/F1

◆ Congenic, Targeted Mutation

Live mice available in varying quantities.
Ask Customer Service for details.



PLACE ORDER

OVERVIEW

DETAILS ▾

GENETICS

DISEASE/PHENOTYPE ▾

TECHNICAL SUPPORT ▾

PRICING & AVAILABILITY ▾

TERMS OF USE ▾

RELATED STRAINS

Technical Support

CONTACT TECHNICAL
SUPPORT

Genotyping Protocols

Probe: [Trp53 Probe](#)

Standard PCR: [Trp53](#)

Standard PCR: [Kras Alt1](#)

[Genotyping resources and troubleshooting](#)

Dietary Information

LabDiet® 5K52/5K67

Breeding Considerations

When maintaining a live colony, mice may be bred as heterozygous for the *Kras*^{tm4Tyj} and homozygous for the *Trp53*^{tm1Brn} allele. Mice homozygous for the *Kras*^{tm4Tyj} allele die *in utero*.

[Additional Breeding and Husbandry Support](#)

Mating System

Heterozygous for *Kras*^{tm4Tyj} Homozygous for *Trp53*^{tm1Brn}
x Wildtype for *Kras*^{tm4Tyj}
Homozygous for *Trp53*^{tm1Brn}

or

Wildtype for *Kras*^{tm4Tyj} Homozygous for *Trp53*^{tm1Brn}
x Heterozygous for *Kras*^{tm4Tyj}
Homozygous for *Trp53*^{tm1Brn}

Citation

When using the KP, K;F1/F1 mouse strain in a publication, please [cite the originating article\(s\)](#) and include JAX stock #032435 in your Materials and Methods section.

基因工程小鼠对照的选择

- 同源品系

- 同窝的小鼠（杂合 x 杂合、杂合 x 野生型、或半合 x 野生型的交配方案）
 - 野生型或者携带突变基因（或等位基因）的杂合子/半合子
 - 不携带转基因的小鼠
 - 也可以使用来自同一群体的非同窝小鼠作对照
- 近交系（纯合 x 纯合 交配）
 - 与突变型匹配的背景（包括亚系）

- 混合遗传背景

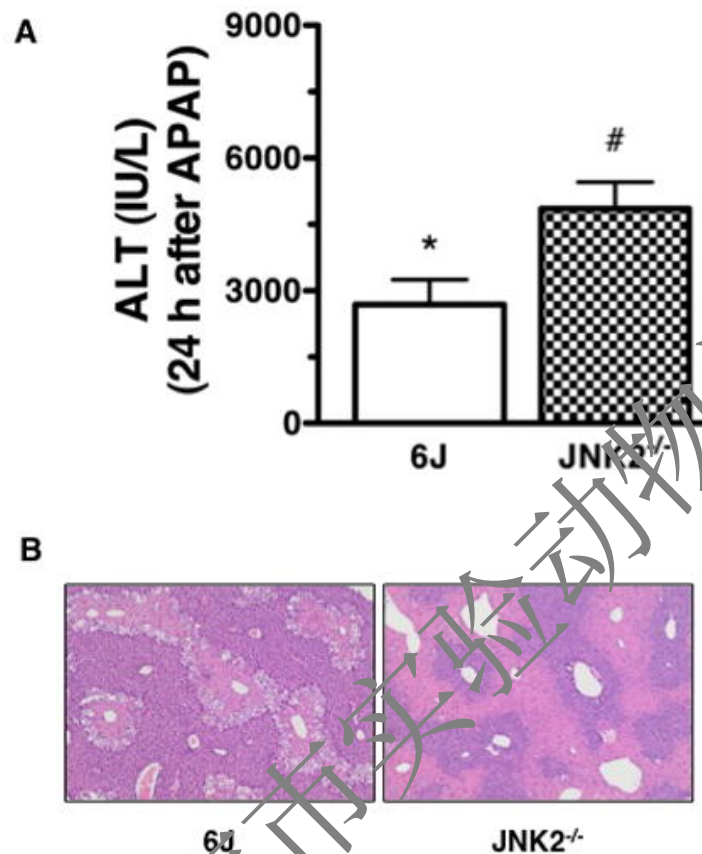
- 同窝小鼠
 - 野生型或者携带突变基因（或等位基因）的杂合子/半合子
 - 不携带转基因/突变的小鼠
 - 也可以使用来自同一群体的非同窝小鼠作对照
- 杂交 F2 代（可作为由两种遗传背景混合后的近似对照）

- 未经处理的小鼠



案例分析

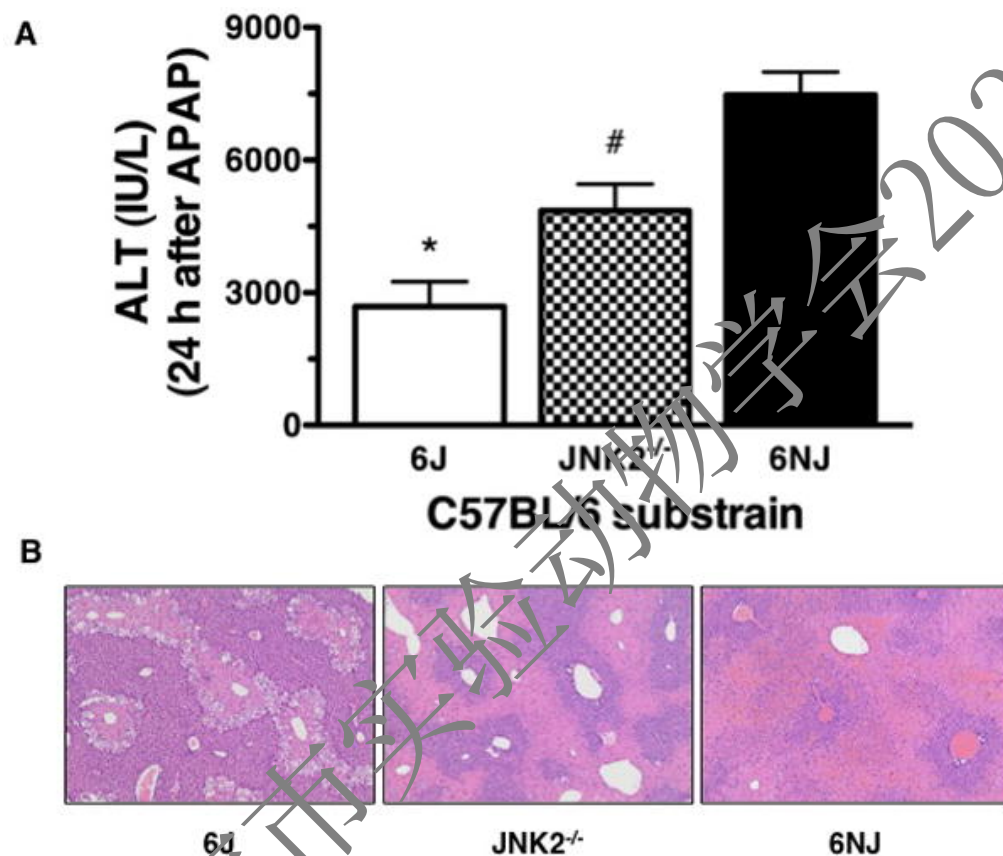
Mapk9 (*Jnk2*) 基因突变对乙酰氨基酚诱导的肝损伤的影响



Bourdi M et al. 2011. *Chem Res Toxicol* 24: 794-6. PMID:[21557537](https://pubmed.ncbi.nlm.nih.gov/21557537/)

案例分析

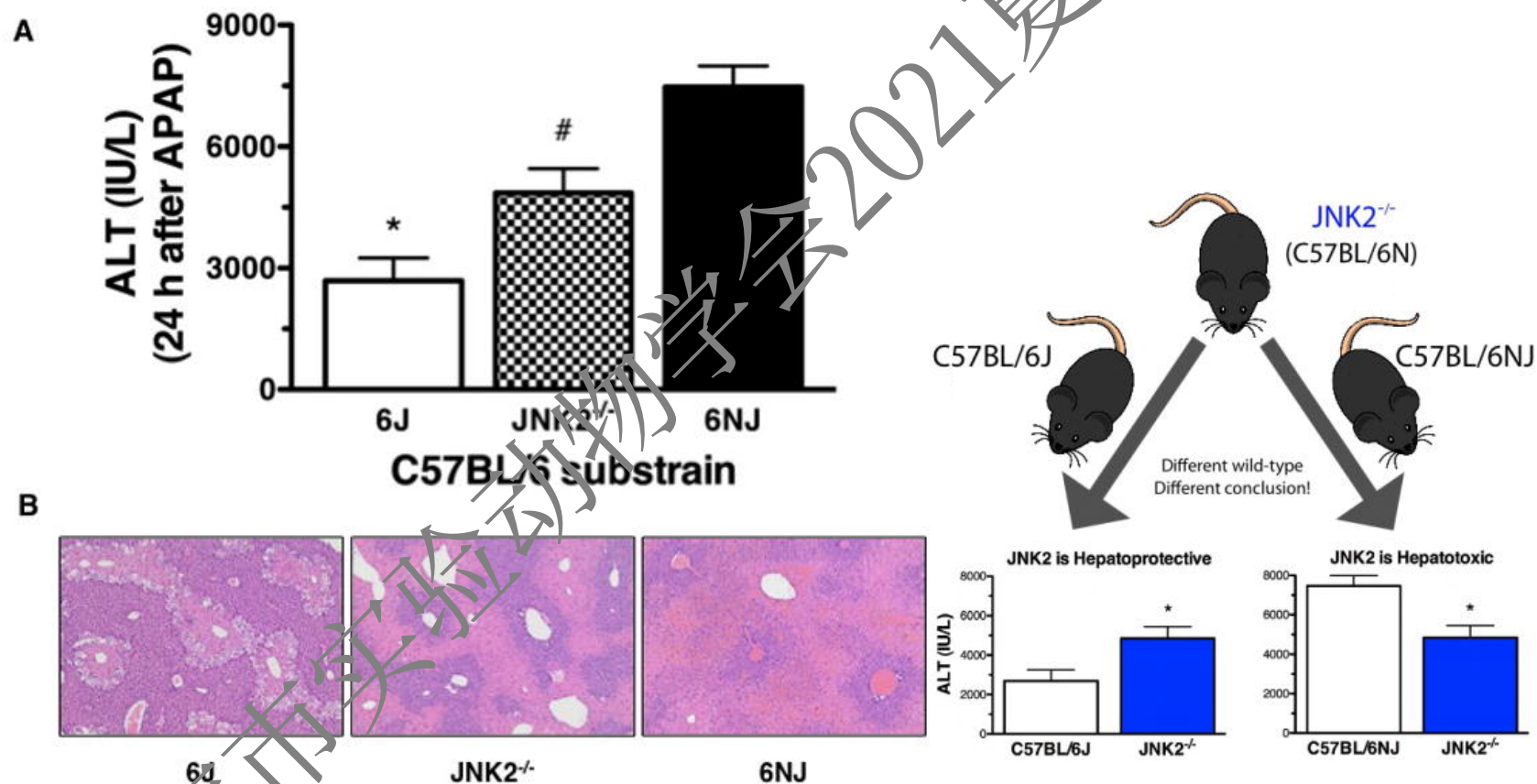
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Bourdi M et al. 2011. *Chem Res Toxicol* 24: 794-6. PMID:[21557537](https://pubmed.ncbi.nlm.nih.gov/21557537/)

案例分析

Mapk9 (*Jnk2*) 基因突变对乙酰氨基酚诱导的肝损伤的影响

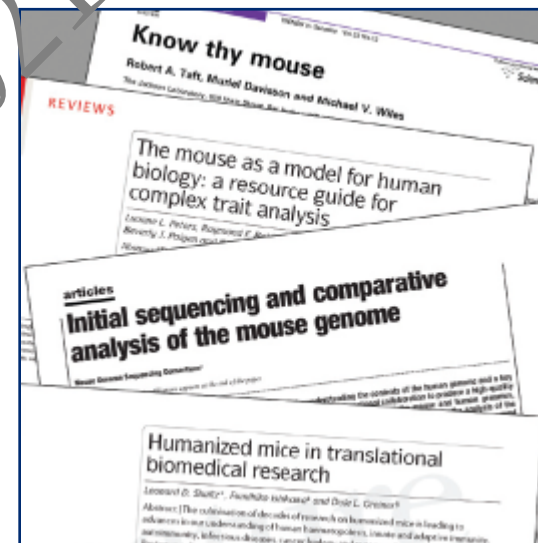


Bourdi M et al. 2011. *Chem Res Toxicol* 24: 794-6. PMID:[21557537](https://pubmed.ncbi.nlm.nih.gov/21557537/)

使用标准的品系命名

Total 27,519 PubMed publications using C57BL/6 mice

Substrain	# of Citations*
C57BL/6J	11,830
C57BL/6N	1,119
C57BL/6JOlaHsd	38
C57BL/6Jlco	21
C57BL/6JBom	11



标准而完善的品系命名可以造福每位研究者！

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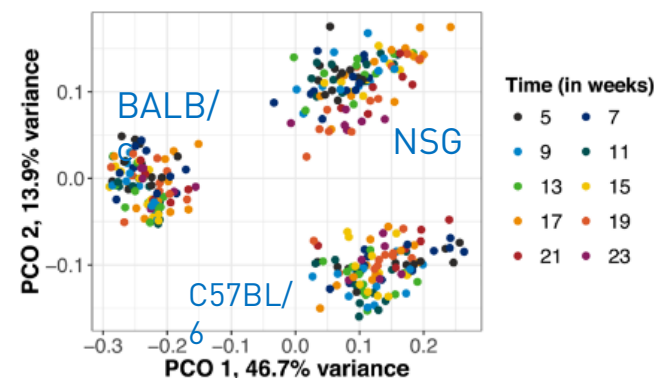
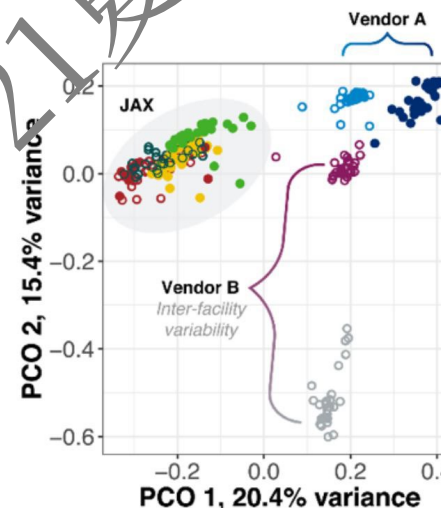
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