



Immunodeficient JAX[®] Mice Strains

Immunodeficient mice engrafted with human cells or tissues are proving to be powerful tools in the investigation of many human biological processes and promise to accelerate research in the search for a cure for many human diseases. Here at The Jackson Laboratory, we offer a wide array of immunodeficient strains that are the results of decades of research on immunocompromised mice. Because the study of human biology *in vivo* is severely limited by ethical and technical constraints, the utilization of immunocompromised mouse models promises to facilitate translational research in several biomedical disciplines. As part of our commitment to this important research effort, we are proud to offer several immunodeficient JAX[®] Mice strains.

Strain Name: NU/J
Stock Number: 002019
Common Name: Nude
Major application: solid tumor xenograft



Since the initial discovery of the *nude* mutation in the 1960s, nude mice have become useful tools in the study of human solid tumors. These mice carry a mutation in the *Foxn1* gene, leading to a developmental failure of the thymic anlage. Consequently, homozygous nude mice lack T cells, providing a permissive environment for a variety of human cancer cell lines to develop solid tumors. The lack of hair coat phenotype also makes the nude mice ideal to track the growth of solid tumors.



Strain Name: NOD.CB17-Prkdc^{scid}/J
Stock Number: 001303
Common Name: NOD-*scid*
Major application: human hematopoiesis and blood-borne cancers

The *scid* mutation was originally discovered in the C.B-17 mice in 1983¹. The Jackson Laboratory carries a comparable strain to the original C.B-17 *scid*, CBySnm.CB17-Prkdc^{scid}/J (Stock Number 001803). The *scid* mutation affects somatic DNA re-arrangement, leading to T and B cell deficiency in the mutant mice. While the C.B-17 *scid* strain supported human cell engraftment at a very low level, the spontaneous generation of mouse T and B cells during aging (known as leakiness) and high level of host natural killer (NK) cells remained the major limitations for this strain. Crossing the *scid* mutation onto different strain backgrounds led to the observation

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NOD.CB17-Prkdc^{scid}/J continued

that the NOD-*scid* strain had the lowest NK cell activity and leakiness among inbred backgrounds. As a result, engraftment efficiency in the NOD-*scid* mice was the highest² among similar strains. Further strain comparison suggests that NOD-*scid* is the strain of choice to study human leukemia and lymphoma³.

Strain Name: B6.129S7-Rag1^{tm1Mom}/J

Stock Number: 002216

Common Name: B6 Rag1 null

Major application: T and B cell

reconstitution; engraftment studies
with high doses of irradiation



These mice carry a targeted (knockout) mutation in the *Rag1* gene which is essential for the initiation of the V(D)J recombination of Ig or TCR genes⁴. The *Rag1* null mice have no functional T or B cells and they do not show leakiness as they age. They are ideal for reconstitution of mouse T and B cells from bone marrow stem cells. Unlike the protein affected by the *scid* mutation, the *Rag1* gene product is not involved in DNA repair, therefore, the *Rag1* null mice are radiation-resistant, serving as an alternative strain for those applications that require high doses of irradiation.

References:

1. Bosma GC, et al. 1983. *Nature* 301:527-30.
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4. Mombaerts P, et al. 1992. *Cell* 68:869-77.
5. Shultz LD, et al. 2005. *J Immunol* 174:6477-89.
6. King M, et al. 2008. *Clin Immunol* 126:303-14.
7. Majeti R, et al. 2007. *Cell Stem Cell* 6:635-45.
8. Ishikawa F, et al. 2007. *Nat Biotechnol* 25:1315-21.
9. Simpson-Abelson MR, et al. 2008. *J Immunol* 180:7009-18.
10. Kumar P, et al. 2008. *Cell* 134:577-86.

Strain Name:

NOD.Cg-Prkdc^{scid} Il2rg^{tm1Wjl}/SzJ

Stock Number: 005557

Common Name:

NOD *scid* gamma (NSG)

Major application: versatile model

for applications including analysis of cancer stem cells and pathogenesis of human specific pathogens



The NSG strain represents the latest breakthrough in the development of immunodeficient models. These mutant mice combine the features of the NOD/ShiLtJ background that has a number of deficiencies in innate immunity, the *scid* mutation and IL2 receptor gamma chain deficiency due to gene targeting. As a result, the NSG mice lack mature T cells, B cells, or functional NK cells, and are deficient in signaling of multiple cytokines (IL-2, IL-4, IL-7, IL-9, IL-15 and IL-21), leading to significantly improved engraftment of human tissues, hematopoietic stem cells and peripheral-blood mononuclear cells⁵. Recent publications have demonstrated this strain's outstanding utility in the studies of islet transplantation⁶, hematopoietic stem cells⁷, leukemic stem cells⁸, tumor-stromal cell interactions *in situ*⁹ and HIV pathogenesis¹⁰.

For additional suggestions on choosing an immunodeficient strain, please explore our website

www.jax.org/jaxmice/jaxnotes/archive/501a.html.

For further information specifically on the NSG model, please go to:

www.jax.org/jaxmice/research/immunology/005557.

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