Summary
Oncology is one of the leading areas of research into new therapeutics. To help our clients identify the best fit for their oncology research, Charles River maintains a global portfolio of high-quality animal models with varying levels of immunodeficiency and phenotypic characteristics.

Immunodeficient Models — North America
Due to the challenges inherent in researching and developing anticancer therapeutics, it is important to have the right tools and resources. Charles River offers the following immunodeficient models to our clients in North America.

<table>
<thead>
<tr>
<th>Strain</th>
<th>Species</th>
<th>Hair Coat</th>
<th>Mature T Cells</th>
<th>Mature B Cells</th>
<th>NK Cells</th>
<th>Genetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athymic Nude</td>
<td>Mouse</td>
<td>No</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
<td>Outbred</td>
</tr>
<tr>
<td>BALB/c Nude</td>
<td>Mouse</td>
<td>No</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
<td>Inbred</td>
</tr>
<tr>
<td>CD-1® Nude</td>
<td>Mouse</td>
<td>Yes</td>
<td>Absent</td>
<td>Absent</td>
<td>Present</td>
<td>Congenic</td>
</tr>
<tr>
<td>Fox Chase SCID®</td>
<td>Mouse</td>
<td>Yes</td>
<td>Absent</td>
<td>Absent</td>
<td>Present</td>
<td>Congenic</td>
</tr>
<tr>
<td>Fox Chase SCID® Beige</td>
<td>Mouse</td>
<td>Yes</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
<td>Defective</td>
</tr>
<tr>
<td>NCG</td>
<td>Mouse</td>
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<td>Absent</td>
<td>Absent</td>
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<td>Congenic</td>
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<tr>
<td>NIH-III Nude</td>
<td>Mouse</td>
<td>No</td>
<td>Absent</td>
<td>Absent</td>
<td>Defective</td>
<td>Outbred</td>
</tr>
<tr>
<td>NU/Nu Nude</td>
<td>Mouse</td>
<td>No</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
<td>Outbred</td>
</tr>
<tr>
<td>RNU Nude</td>
<td>Rat</td>
<td>No</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
<td>Outbred</td>
</tr>
<tr>
<td>SCID Hairless Congenic (SHC™)</td>
<td>Mouse</td>
<td>No</td>
<td>Absent</td>
<td>Absent</td>
<td>Present</td>
<td>Congenic</td>
</tr>
<tr>
<td>SCID Hairless Outbred (SHO®)</td>
<td>Mouse</td>
<td>No</td>
<td>Absent</td>
<td>Absent</td>
<td>Present</td>
<td>Outbred</td>
</tr>
<tr>
<td>NCI SCID/NCr</td>
<td>Mouse</td>
<td>Yes</td>
<td>Absent</td>
<td>Absent</td>
<td>Present</td>
<td>Congenic</td>
</tr>
</tbody>
</table>

Tools to Help Find the Right Oncology Model
The CORE
The CORE (Collection of Oncology Research Experiments) is an online library of peer-reviewed publications designed to help researchers find the most appropriate research model for their oncology cell lines. Search through the publications on our website at: http://www.criver.com/core.

Xenograft data
Charles River has compiled xenograft data on certain immunodeficient models to assist in expediting the model selection process. Download the data at: http://www.criver.com/xenograft.
Athymic Nude Mice

Strain Code: 490 (homozygous), 491 (heterozygous)

Nomenclature Crl:NU(NCr)-Foxn1nu

Origin This immunodeficient nude mouse originated from NIH and was originally thought to be a BALB/c congenic. It was later determined that it was not inbred and is therefore maintained as an outbred. It is not associated with any stock or strain. The animal lacks a thymus, is unable to produce T cells, and is therefore immunodeficient. To Charles River from NCI in 2010. Coat Color Hairless, albino background Research Application Tumor biology and xenograft research

Fox Chase SCID® Mice

Strain Code: 236

Nomenclature CB17/Icr-Prkdcscid/IcrcoCrl

Origin SCID mice possess a genetic autosomal recessive mutation (SCID). Discovered in 1980 by Bosma in C.B-17/Icr mice at Fox Chase Cancer Center. SCID mice show a severe combined immunodeficiency affecting both B and T lymphocytes. They have normal natural killer (NK) cells, macrophages and granulocytes. To Charles River in 1991 from an Ifla Credo foundation colony. Coat Color White (albino)

Research Application Tumor biology and xenograft research

Fox Chase SCID® Beige Mice

Strain Code: 250

Nomenclature CB17.Cg-Prkdcscid/Lystbg-J/Crl

Origin A congenic mouse that possesses both autosomal recessive mutations SCID (Prkdcscid) and beige (Lystbg-J). The SCID mutation results in severe combined immunodeficiency affecting both the B and T lymphocytes. The beige mutation results in defective natural killer (NK) cells. This mouse was developed by Croy et al. at the University of Guelph by an intercross of C.B-17 SCID/SCID to C57BL/6 bg/bg mice. To Charles River in 1993. Coat Color White (albino)

Research Application Tumor biology and xenograft research

NCG Mice

Strain Code: 572

Nomenclature NOD-Prkdcem26Cd52 Il2rgem26Cd22/NjuCrl

Origin Co-developed by Nanjing Biomedical Research Institute of Nanjing University and Nanjing Galaxy Biopharma in 2014 and transferred to Charles River in 2016. This model was created by sequential CRISPR/Cas9 editing of the Prkdc and Il2rg loci in the NOD/Nju mouse, generating a mouse coisogenic to the NOD/Nju. The NOD/Nju carries a mutation in the Sirpa (SIRP α) gene that allows for engrafting of foreign hematopoietic stem cells. The Prkdc knockout generates a SCID-like phenotype lacking proper T-cell and B-cell formation. The knockout of the Il2rg gene further exacerbates the SCID-like phenotype while additionally resulting in a decrease of NK cell production. Coat Color White (albino)

Research Application Oncology, immunology, infectious disease, graft vs. host disease, diabetes, regenerative medicine and human organ transplantation

NOD SCID Mice

Strain Code: 394

Nomenclature NOD.CB17-Prkdcscid/NCrCrl

Origin The SCID mutation has been transferred onto a non-obese diabetic background. Animals homozygous for the SCID mutation have impaired T- and B-cell lymphocyte development. The NOD background additionally results in deficient natural killer (NK) cell function. To Charles River in 2003 from NIH. Coat Color White (albino)

Research Application Tumor biology and xenograft research
Nude Mice – BALB/c

Strain Code: 194 (homozygous), 195 (heterozygous)

Nomenclature: CAnN.Cg-Foxn1nu/Crl

Origin: Developed through crosses and back-crosses between BALB/cABom-nu and BALB/cAnNCrj-nu at Charles River Japan. Pedigreed pregnant females of CAnN.Cg-Foxn1nu/Crl were received from Charles River Japan in 1985. This mouse is inbred, and genetic monitoring results confirm it to be a BALB/c nude. The homozygous animal lacks a thymus, is unable to produce T cells, and is therefore immunodeficient. Coat Color: Hairless, albino background

Research Application: Tumor biology and xenograft research

Nude Mice – CD-1®

Strain Code: 086 (homozygous), 087 (heterozygous)

Nomenclature: Crl:CD1-Foxn1nu

Origin: Developed from the transfer of the nude gene from Crl:NU-Foxn1nu to a CD-1 mouse through a series of crosses and backcrosses beginning in 1979 at Charles River Wilmington, MA. The animal lacks a thymus, is unable to produce T cells, and is therefore immunodeficient. Coat Color: Hairless, albino background

Research Application: Tumor biology and xenograft research

Nude Mice – NIH-III

Strain Code: 201 (homozygous), 202 (heterozygous)

Nomenclature: Crl:NIH-Lystpo-1 Foxn1nu Btkxid bg-J

Origin: Most commonly called the NIH-III, it was developed at NIH. In addition to the nude gene, which results in the absence of thymus and T-cell function, this mouse has two other mutations important in regulating the function of the immune system. These are designated as x-linked immune defect Btkxid and beige Lystpo-1. The xid mutation affects the maturation of T-independent B lymphocytes. It has been demonstrated that beige (bg) homozygotes have defective natural killer (NK) cells that are cytotoxic in vitro to tumor cells. However, the extent of the T-independent B-lymphocyte and NK-cell deficiencies in the NIH-III have not been established. Coat Color: Hairless, light to dark gray pigmented skin

Research Application: Tumor biology and xenograft research

Nude Mice – NU/NU

Strain Code: 088 (homozygous), 089 (heterozygous)

Nomenclature: Crl:NU-Foxn1nu

Origin: This immunodeficient nude mouse originated from NIH and was originally thought to be a BALB/c congeneric. It was later determined that it was not inbred, and is therefore maintained as an outbred and is not associated with any stock or strain. The animal lacks a thymus, is unable to produce T cells, and is therefore immunodeficient. Coat Color: Hairless, albino background

Research Application: Tumor biology and xenograft research

Nude (RNU) Rats

Strain Code: 316 (homozygous), 118 (heterozygous)

Nomenclature: Crl:NIH-Foxn1nu

Origin: The NIH nude rat was developed in 1979-1980 through a series of matings involving eight inbred rat strains. To Charles River from the National Institute of Health in 2001. This athymic nude rat is T-cell deficient and shows depleted cell populations in thymus-dependent areas of peripheral lymphoid organs. Coat Color: White, black, black & white

Research Application: Tumor biology and xenograft research
**SCID Hairless Congenic (SHC™) Mice**

**Strain Code:** 488

**Nomenclature** CB17.Cg-Prkdc<sup>scid</sup> Hr<sup>hr</sup>/IcrCrl **Origin** The hairless SCID congenic was created in 2009 by Charles River Research Models by using marker-assisted accelerated backcrossing to place the hairless gene (Hr<sup>hr</sup>) present in the Crl:SKH1-Hr<sup>hr</sup> stock onto a CB17/Icr-Prkdc<sup>scid</sup>/IcrcoCr genetic background. These mice are homozygous for both Hr<sup>hr</sup> and Prkdc<sup>scid</sup> mutations, so they exhibit the severe combined immunodeficiency phenotype characteristic of SCID mice and are also hairless. **Coat Color** Hairless, albino background **Research Application** Tumor biology and xenograft research

**SCID Hairless Outbred (SHO®) Mice**

**Strain Code:** 474

**Nomenclature** Crl:SHO-Prkdc<sup>scid</sup> Hr<sup>hr</sup> **Origin** The hairless SCID mouse was produced by Charles River Research Models in 2007 by intercrossing the Crl:HA-Prkdc<sup>scid</sup> and Crl:SKH1-Hr<sup>hr</sup> stocks. The resulting animals are homozygous for the Prkdc<sup>scid</sup> and the Hr<sup>hr</sup> mutations and thus exhibit the severe combined immunodeficiency phenotype characteristic of SCID mice and are also hairless. **Coat Color** Hairless, albino background **Research Application** Tumor biology and xenograft research

**NCI SCID/NCr Mice**

**Strain Code:** 561

**Nomenclature** CB17/Icr-Prkdc<sup>scid</sup>/IcrCr **Origin** SCID mice possess a genetic autosomal recessive mutation Prkdc<sup>scid</sup>. Discovered in 1980 by Bosma in C.B-17/Icr mice at Fox Chase Cancer Center. SCID mice show a severe combined immunodeficiency affecting both B and T lymphocytes. They have normal natural killer (NK) cells, macrophages, and granulocytes. NCI received this mouse in 1991. To Charles River in 2014. **Coat Color** White (albino) **Research Application** Tumor biology and xenograft research