Animal Models of Disease
Metabolic, Renal and Cardiovascular

**GK (Goto-Kakizaki) Rat**
Strain Code: 460  Nomenclature: GK/TohiCskCrljCrl  Therapeutic Area: Metabolic  Control: Crl:WI (Wistar)  Origin: The Goto-Kakizaki (GK) rat is a non-obese Wistar substrain that develops adult onset type 2 diabetes early in life. This model was developed in the 1970s by Goto and associates at Tohoku University in Sendai, Japan, by selecting breeder pairs with the highest blood glucose levels (OGTT) from a colony of Wistar rats. Repeated selection of breeders based on OGTT resulted in glucose intolerance after five generations. To Charles River Japan from Chugai Pharmaceutical Co., in 1995. To Charles River North America in 2006. Characteristics: Non-Obese, Type 2 Diabetes, Hyperinsulinemia, Insulin Resistance, Mild Hyperglycemia, Neuropathy, Osteopathy, Retinopathy, Nephropathy. The GK rat is a non-obese, type 2 diabetes model.


**ZDF (Zucker Diabetic Fatty) Rat**
Strain Code: 370 (obese), 380 (lean fa/+), 371 (lean +/?)


Overview
Worldwide incidence of cardiovascular, metabolic and renal diseases continues to rise due to growing rates of obesity, type 2 diabetes and hypertension, increasing the priority for developing new methods and technologies to investigate and fight these diseases. Specific animal models for studying these disease conditions can help support research efforts towards finding the necessary cures.

Charles River’s Disease Models program supports these efforts by making rodent models available for the study of cardiovascular, metabolic and renal diseases and their related complications. Additionally, through our Discovery and Imaging Services and Preclinical Services groups we have extensive experience using multiple models and species within these therapeutic areas.
**Zucker Rat**

**Strain Code:** 185 (obese), 186 (lean +/?)  
**Nomenclature:** Crl:ZUC-Lepr<sup>fa</sup>  
**Therapeutic Area:** Metabolic  
**Control:** Zucker lean  
**Origin:** The obese condition appeared spontaneously in the 13M strain when crossed to the Sherman strain. Dr. Theodore and Dr. Lois Zucker maintained the colony at the Laboratory of Comparative Pathology in Stow, MA. Colonies were established at many institutions from this nucleus colony. To Charles River in 1985 from a research colony maintained at a pharmaceutical company.  
**Characteristics:** Obesity, Insulin Resistance, Hyperinsulinemia, Hypertriglyceridemia, Hypercholesterolemia, Metabolic Syndrome. The Zucker rat is commonly used as an obese metabolic syndrome model.  


**Obese Prone (OP-CD) Rat**

**Strain Code:** 463  
**Nomenclature:** Crl:OP(CD)  
**Therapeutic Area:** Metabolic, Cardiovascular  
**Control:** OR-CD  
**Origin:** Developed from a line of Crl:CD(SD) rats by selecting future breeders with accelerated weight gain. Two lines were developed from this outbred colony, the OP-CD (Obese Prone) and OR-CD (Obese Resistant). The OP-CD becomes obese when fed high-fat diets eliminating the subpopulation of non-responders. Polygenic obesity develops despite having a fully functioning leptin receptor. The OR-CD is the control model.  
**Characteristics:** Obesity, Metabolic Syndrome, Hypertension, Hypertriglyceridemia, Hyperinsulinemia, Insulin Resistance. The OP-CD is a polygenic obesity rat model.

**Obese Resistant (OR-CD) Rat**

**Strain Code:** 462  
**Nomenclature:** Crl:OR(CD)  
**Therapeutic Area:** Metabolic, Cardiovascular  
**Origin:** Developed from a line of Crl:CD(SD) rats by selecting future breeders with accelerated weight gain. Two lines were developed from this outbred colony, the OP-CD (Obese Prone) and OR-CD (Obese Resistant). The OR-CD does not become obese (non-responder) when fed high-fat diets.  
**Characteristics:** Obesity Non-Responder, Hyperinsulinemic, Insulin Resistant. The OR-CD is the control for the OP-CD.

**THE POUND MOUSE™**

**Strain Code:** 457 (obese), 464 (lean +/?)  
**Nomenclature:** C57BL/6NCrl-Lepr<sup>ob-ob</sup>/Crl  
**Therapeutic Area:** Metabolic  
**Control:** THE POUND MOUSE™ lean or the standard C57BL/6NCrl  
**Origin:** This model was isolated from a C57Bl/6NCrl colony in a Charles River barrier facility in the United States in 2005. The mutation was mapped to a region within less than 2 centimorgan (cM) of the leptin receptor on Chr. 4.  
**Characteristics:** Obesity, Hyperinsulinemia, Insulin Resistance, Dyslipidemia, Metabolic Syndrome, Leptin Receptor Deficiency, Fatty Liver Disease. THE POUND MOUSE™ is a recently established pre-diabetes/metabolic syndrome model.

**ZSF1 Rat**

**Strain Code:** 378 (obese), 379 (lean +/?)  
**Nomenclature:** ZSF1-Lepr<sup>fa</sup>Lepr<sup>cp</sup>/Crl  
**Therapeutic Area:** Renal, Metabolic, Cardiovascular  
**Control:** ZSF1 lean  
**Origin:** This hybrid rat is a cross between a ZDF female and an SHHF male rat. It was developed at Genetic Models, Inc. (GMI). Charles River acquired GMI in 2001.  
**Characteristics:** Nephropathy, Congestive Heart Failure, Hypertension, Obesity, Type 2 Diabetes, Insulin Resistance, Hyperinsulinemia, Hypertriglyceridemia, Hypercholesterolemia. The obese ZSF1 is commonly used to study renal failure with additional disease complications.  

**Dahl/Salt Sensitive (Dahl/SS) Rat**

*Strain Code: 320  Nomenclature: SS/JrHsdMcwiCrl  Therapeutic Area: Renal, Cardiovascular*


**SS-13BN Rat**

*Strain Code: 334  Nomenclature: SS-Chr 13BN/McwiCrl  Therapeutic Area: Renal, Cardiovascular*

*Origin: A consomic rat model developed at the Medical College of Wisconsin, in which chromosome 13 from the normotensive inbred Brown Norway rat was introgressed into the background of the Dahl/Salt Sensitive rat.  Characteristics: Insulin Resistant, Hyperinsulinemia, Hypertriglyceridemia, Normotensive Control. The normotensive SS-13BN is used as the control for the hypertensive Dahl/Salt Sensitive rat.*


**SHR (Spontaneously Hypertensive) Rat**

*Strain Code: 007  Nomenclature: SHR/NCRl  Therapeutic Area: Cardiovascular, Metabolic, Renal*

*Control: WKY/NCRl  Origin: Okamoto, at the Kyoto School of Medicine in 1963, started with an outbred Wistar Kyoto male with marked elevation of blood pressure and mated him to a female with slightly elevated blood pressure. NIH expanded on the model beginning in 1966. To Charles River in 1973.  Characteristics: Hypertension, Insulin Resistance, Hyperinsulinemia, Hypertriglyceridemia, Hypercholesterolemia. The SHR is the most commonly used genetically hypertensive rat model.*

**SHRSP (Spontaneously Hypertensive Stroke Prone) Rat**

Strain Code: 324  Nomenclature: SHRSP/A3NCrl  Therapeutic Area: Cardiovascular, Renal


**SHROB (Spontaneously Hypertensive Obese) Rat**


**SHHF (Spontaneously Hypertensive Heart Failure) Rat**

Strain Code: 373 (obese), 374 (lean +/?)  Nomenclature: SHHF/MccGmiCrl-Lepr<sup>cp</sup>  Model available in limited supply. Therapeutic Area: Cardiovascular, Metabolic, Renal  Control: SHHF lean  Origin: Breed stock for this colony was transferred to Dr. Sylvia McCune at the University of Chicago Medical School in 1983, from the laboratory of Dr. J.E. Miller at G.D. Searle and Company. The animals were developed by backcrossing the SHROB rat to the SHR/N rat. To Genetic Models, Inc., in 1994. To Charles River in 2001.  Characteristics: Congestive Heart Failure, Hypertension, Nephropathy, Obesity, Insulin Resistance, Hyperinsulinemia, Type 2 Diabetes, Hypertriglyceridemia, Hypercholesterolemia. The lean and obese phenotypes exhibit heart failure characteristics, but at different ages.


For more information, please contact our Technical Services department at 1-800-338-9680.