

RENAL MODELS

ZSF1 Rat

Nomenclature: Crl:ZSF1-*Lepr^{fa}* *Lepr^{cp}*

Origin: A hybrid between a ZDF female and SHHF male developed at Genetic Models, Inc. To Charles River in 2001.

Characteristics: Nephropathy, Congestive Heart Failure, Hypertension, Obesity, Type 2 Diabetes, Insulin Resistance, Hyperinsulinemia, Hypertriglyceridemia, Hypercholesterolemia

References: Tofovic, S.P., Kusaka, H., Kost, C.K., and Bastacky, S., 2000, Renal function and structure in diabetic, hypertensive, obese ZDFxSHHF-hybrid rats. *Renal Failure* 22: 387-406.
Tofovic, S.P., Kusaka, H., Jackson, E.K., and Bastacky, S.I., 2001, Renal and metabolic effects of caffeine in obese (*fa/fa*(cp)) diabetic hypertensive ZSF1 rats, *Renal Failure* 23 2: 159-173.

Dahl/Salt-Sensitive (DSS) Rat

Nomenclature: SS/JrHsdMcwiCrl

Origin: Inbred from a congenic group of Dahl/SS rats (SS/JrHsd) from Dr. Theodore Kurtz at UCSF. Originally derived from the Harlan SS/Jr colony. To the Medical College of Wisconsin in 1991. To Charles River in 2001.

Characteristics: Nephropathy, Hypertension, Insulin Resistance, Hyperinsulinemia, Hypertriglyceridemia, Hypercholesterolemia, Cardiac Hypertrophy, Heart Failure

References: Rapp, J.P. and Dene, H., 1985, Development and characteristics of inbred strains of Dahl salt-sensitive and salt-resistant rats. *Hypertension* 7: 340-349.
Chen, P.Y., St. John, P.L., Kirk, K.A., Abrahamson, D.R., and Sanders, P.W., 1993, Hypertensive nephrosclerosis in the Dahl/Rapp rat: initial sites of injury and effect of dietary L-arginine administration. *Lab Investigation* 68:174-349.
Taylor, N.E. and Cowley, A.W., Jr., Effect of renal medullary H₂O₂ on salt-induced hypertension and renal injury. *Am. J. Physiol. Regul. Integr. Comp. Physiol.* Aug 18., 2005.

Fawn Hooded Hypertensive (FHH) Rat

Nomenclature: FHH/EurMcwiCrl

Origin: Introduced in Europe by Tschopp in the early 1970s. To Erasmus University in Rotterdam, Netherlands. To the Medical College of Wisconsin in the 1990s. To Charles River in 2001.

Characteristics: Nephropathy, Pulmonary Hypertension, Hypertriglyceridemia, Hypercholesterolemia

References: Brown, D.M., Provoost, A.P., Lander, E.S., and Jacob, H.J., 1996, Renal disease susceptibility and hypertension are under independent genetic control in the Fawn-Hooded rat *Nature Genet.* 12: 44-51.
Le Cras, T.D., Kim, D., Markham, N.E., and Abman, S.H., 2000, Early abnormalities of pulmonary vascular development in the Fawn-Hooded rat raised at Denver's altitude. *Am. J. Physiol. Lung Cell Mol. Physiol.* 279: L283-L291.

With the worldwide increase in renal disease due to obesity, Type 2 diabetes, and hypertension, specific animal models for studying these disease conditions can support research efforts towards finding cures. Charles River's Disease Models Program makes available a variety of rodent models for the study of renal disease, along with models exhibiting related complications. Additionally, our Preclinical Services division has extensive experience using multiple models and species within this therapeutic area.



SHHF Rat

Nomenclature: SHHF/MccCrl-Lepr^{cp}

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: Nephropathy, Congestive Heart Failure, Hypertension, Obesity, Insulin Resistance, Hyperinsulinemia, Type 2 Diabetes, Hypertriglyceridemia, Hypercholesterolemia

References: McCune S.A., Baker, P.B., and Stills, H.F., 1990, SHHF/Mcc-cp rat: model of obesity, non-insulin-dependent diabetes, and congestive heart failure. *ILAR News* 32: 23-27. Heyen, J.R.R., Blasi, E.R., Nikula, K., Rocha, R., Daust, H.A., Frierdich, G., Van Bleet, J.F., De Ciechi, R., McMahon, E.G., and Rudolph, A.E., 2002, Structural, functional, and molecular characterization of the SHHF model of heart failure. *Am. J. Physiol. Heart Circ. Physiol.* 283: H1775-H1784. Emter, C.A., McCune, S.A., Sparagna, G.C., Radin, M.J. and Moore, R.L., 2005. Low-intensity exercise training delays onset of decompensated heart failure in spontaneously hypertensive heart failure rats. *Am J. Physiol. Heart Circ. Physiol.* 289(5):H2030-2038.

SHROB Rat

Nomenclature: SHR/OBKolCrl-Lepr^{cp}

Origin: Originated in the laboratory of Dr. Simon Koletsky at Case Western Reserve University School of Medicine in 1969. Developed from a cross between a SHR female rat and a normotensive male Sprague Dawley rat. To Genetic Models, Inc. in 2000. To Charles River in 2001.

Characteristics: Nephropathy, Hypertension, Syndrome X, Obesity, Insulin Resistance, Hyperinsulinemia, Hypertriglyceridemia, Hypercholesterolemia

References: Koletsky, S., 1972, New type of spontaneously hypertensive rats with hyperlipidemia and endocrine gland defects. In Spontaneous Hypertension: Its Pathogenesis and Complications, edited by K. Okamoto pp. 194-197. Tokyo: Igaku Shoin W. Koletsky, R.J., Friedman, J.E., and Ernsberger, R., 2001, The obese spontaneously hypertensive rat (SHROB, Koletsky Rat): a model of metabolic syndrome X. In Animal Models of Diabetes A Primer, edited by A.A.F. Sima and E. Shafir pp. 143-158. The Netherlands: Harwood Academic Publishers. Velliquette, R.A., Friedman, J.E., Shao, J., Zhang, B.B., and Ernsberger, P., 2005. Therapeutic actions of an insulin receptor activator and novel peroxisome proliferators-activated receptor gamma agonist in the spontaneously hypertensive obese rat model of metabolic syndrome X. *J. Pharmacol. Exp. Ther.* 314(1):422-430. Koletsky, R.J., Velliquette, R.A., and Ernsberger, P., 2003. The role of I(1)-imidazoline receptors and alpha(2)-adrenergic receptors in the modulation of glucose and lipid metabolism in the SHROB model of metabolic syndrome X. *Ann. N.Y. Acad. Sci.* 1009:251-261.

Our commitment to innovation and quality in the breeding of research models requires conformance to rigorous standards of biosecurity to both maintain the health and genetic integrity of our production colonies and to deliver standardized research models worldwide.



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