



Surgical Services

Your research plays an important role in improving the health of both humans and animals alike. At Charles River, we understand surgically altered animal models that meet exacting scientific and regulatory standards can be vital to this research. As a result, we are committed to continually expanding our surgical service offerings in order to provide the models and technical support necessary to meet your specific research needs.

State-of-the-Art Facilities

With more and more research being conducted on a global scale, it is critical that you have the resources available to you regardless of geography. Charles River currently offers full surgical capabilities in several AAALAC-accredited facilities in North America. The surgical suites at each site are comprised of HEPA-filtered, positive-pressure barrier rooms with a series of entry locks. They come complete with functional areas that are used for surgical manipulations, animal husbandry support, preoperative holding, postoperative recovery, supply preparation and clerical activities.

Biosecurity

To ensure strict adherence to biosecurity policies, animals are not transferred between barrier production facilities nor are non-Charles River animals used. Additional biosecurity measures include barrier-type surgical suites, use of dedicated laminar flow workstations by each surgeon and housing of animals in filter-top caging systems during the animals' stay in surgery.

Animal Welfare

Charles River's Institutional Animal Care and Use Committee (IACUC) governs the entire surgical process, including any postoperative holding in our facilities prior to shipment. The receiving institution's IACUC, the investigators using the animals and each institution's animal care staff are responsible for the well-being of the animals upon arrival. Justifications for use of surgically altered animals, review of experimental protocols, authorization to order animals that are surgically altered from Charles River and all aspects of the use of surgically altered animals after arrival at the institution are the responsibility of the receiving institution's IACUC.

North American Surgical Locations

- Hollister, California
- Kingston, New York
- Raleigh, North Carolina
- Portage, Michigan
- Wilmington, Massachusetts

European Surgical Locations

- Lyon, France
- Margate, United Kingdom

Capabilities

- Vascular catheterizations
- Non-vascular catheterizations
- Cardiovascular procedures
- Neurological procedures
- Soft tissue procedures
- Device implants
- Customized procedures
- Biospecimens



Surgical Capabilities

Charles River conducts over 50 different surgical procedures that range from commonly requested, simple procedures (e.g., soft tissue/organ extractions) to highly complex catheterizations and cannulations. Our expert surgeons have years of experience in veterinary medicine, biology, animal science and animal health technology. The following is a list of available procedures from our North American surgical facilities.

VASCULAR CATHETERIZATIONS

Species	Procedure	Common Applications	Description/Comments
Rat	Abdominal aorta	Blood pressure monitoring	A catheter is inserted into the abdominal aorta.
Rat Mouse Guinea Pig	Carotid artery catheterization-common	Blood pressure monitoring, blood sampling, available in extended length catheters for automated samplers	A catheter is inserted into the common carotid artery. The catheter tip terminates at the aortic arch.
Rat Mouse	Carotid artery catheterization-cranial dosing model	For dosing compounds directly to the brain.	A catheter is inserted into the common carotid artery with the catheter tip directed towards the brain. The common carotid is not ligated and retains blood flow to carry compounds to the brain.
Rat	Femoral artery catheterization	Blood pressure monitoring, blood sampling, available in extended length catheters for automated samplers	A catheter is inserted into the femoral artery.
Rat	Femoral vein catheterization	Dosing compounds or blood sampling, available in extended length catheters for automated samplers	A catheter is inserted into the femoral vein.
Rat	Hepatic artery catheterization	Direct infusion into the liver	A catheter is inserted into the hepatic artery. Animal's body weight is 320g and greater. <i>Rent-A-Surgeon only.</i>
Rat Mouse Guinea Pig Hamster Gerbil	Jugular vein catheterization	Blood sampling or compound dosing, also available in extended length catheters for automated samplers	A catheter is inserted into the jugular vein. The catheter tip terminates 2-3mm in the right atria.
Rat Guinea Pig	Jugular vein catheterization-double	Blood sampling from the right jugular vein and compound dosing through the left jugular vein	Both jugular veins are catheterized. The anterior facial vein is used to catheterize both sides with the right side terminating 2-3mm in the right atria and the left side terminating in the superior vena cava.
Rat	Jugular vein catheterization w/ attached cannula head mount	Blood sampling or compound dosing	A jugular vein catheter is tunneled subcutaneously to the head, where it is attached to a cannula head mount.
Rat	Portal vein catheterization t-tubing	Intestinal drug absorption, portal vein sampling, or infusion	A specially designed catheter is inserted directly into the portal vein.
Rat	Portal vein catheterization via mesenteric vein	Intestinal drug absorption, recommended for portal vein infusion only	A catheter is inserted into the portal vein via the mesenteric vein.

NON-VASCULAR CATHETERIZATIONS

Species	Procedure	Common Applications	Description/Comments
Rat Mouse	Bile duct catheterization	Routine sampling of bile for pharmacokinetic studies	Continuous loop system: one end of catheter placed in the bile duct, the other in duodenum. The catheter is looped over the animal's back subcutaneously, with catheter access in the scapular area where a 4mm section is exteriorized.
Rat	Colon catheterization	Dosing compounds into colon	Catheter is inserted into the colon. For infusion only.
Rat Mouse	Duodenal catheterization	Dosing compounds into duodenum	Catheter is inserted into the duodenum. For infusion only.
Rat Mouse	Ileum	Dosing compounds into ileum	Catheter is inserted into the ileum. For infusion only.
Rat Mouse Guinea Pig	Intraperitoneal catheterization	Infusion into the peritoneal cavity	A catheter is implanted in and secured to the abdominal wall allowing access to the peritoneal cavity for the infusion of compounds.
Rat	Intrathecal catheterization-lumbar approach	Direct infusion into subdural space of the spine	A catheter is inserted into the subarachnoid space of the spine at the L4-L5 region. The catheter is exteriorized from the scapular region. For infusion only.
Rat	Intrathecal catheterization-occipital crest approach	Direct infusion into subdural space of the spine	A catheter is inserted into the subarachnoid space of the spine at the occipital crest. The catheter is exteriorized from the scapular region. For infusion only.
Rat	Jejunum catheterization	Routine infusion of dosing compounds into jejunum	A catheter is inserted into the jejunum. For infusion only.
Rat	Mesenteric lymph duct catheterization	Immunological studies, lymph fluid sampling/collection	A catheter is implanted in the mesenteric lymph duct. For optimum patency, it is best to use these animals the day after surgery. <i>Rent-A-Surgeon only.</i>
Rat Mouse	Stomach catheterization	Routine compound infusion	Catheter is inserted into the stomach. For infusion only.
Rat Mouse	Urinary bladder catheterization	Used to study the effects of micturition of a normal or unstable bladder using cystometry	A catheter is implanted in the urinary bladder wall to allow for dosing compounds.

SOFT TISSUE PROCEDURES

Rat Mouse	Adrenal demedullation	Studies of sympathetic or parasympathetic nervous system, epinephrine, or norepinephrine	The cortex of each adrenal gland is cut and the medulla removed.
Rat Mouse	Adrenalectomy	Studies of steroidal hormone metabolism and obesity	Bilateral removal of the adrenal glands on each side. Retired animals are not recommended. Normal saline (0.9%) supplementation of water required after surgery.
Rat Mouse	Bile duct ligation	Studies of hepatic fibrosis, cholestasis, and drug metabolism with compromised liver function	The bile duct is ligated.
Rat Mouse	Castration	Behavior studies, prostatic hyperplasia, and cancer	Removal of the testes.

SOFT TISSUE PROCEDURES

Species	Procedure	Common Applications	Description/Comments
Rat	Cryptorchidism	Investigating the role of phosphodiesterase type 4 enzyme in cryptorchidism-induced apoptosis of the germ cells	The testes, vas deferens and attached epidermis as well as fatty tissue are pulled into the abdominal cavity. Then the inguinal canal is sutured closed, retaining the testicles in the abdominal cavity.
Mouse	Hepatectomy-partial	Liver function studies	70% of the liver is surgically removed.
Rat Mouse	Hypophysectomy	Endocrinology studies	Removal of the pituitary gland using parapharyngeal methods (through the neck). 5% glucose or sucrose supplementation in water required after surgery. Animals require warm environments.
Rat	Hysterectomy	Hormonal and reproductive physiology studies	Removal of the entire uterus, leaving the ovaries intact.
Rat Mouse	Nephrectomy	Studies of hypertension or renal impairment	The left kidney is removed.
Rat Mouse	Nephrectomy- 5/6	Hypertension, renal failure, and drug metabolism with compromised renal function	This is a two-part surgery with 5-7 days between surgeries. The first surgery removes 2/3 of one kidney. The second surgery removes the entire other kidney. A renal artery ablation model is available upon request.
Rat	Olfactory bulbectomy	Behavioral studies involving an impaired sense of smell, depression studies	Removal of the olfactory bulb.
Rat Mouse Guinea Pig	Ovariectomy	Osteoporosis, bone metabolism, and calcium absorption	Removal of both ovaries.
Rat Mouse	Ovariectomy & hysterectomy	Osteoporosis, bone metabolism, and calcium absorption	Removal of both ovaries and uterus.
Rat	Pancreatectomy-partial	Malabsorption model	Removes approximately 70-90% of the pancreas.
Rat	Parathyroidectomy	Study of calcium and phosphorus deficiencies and metabolism	Removes parathyroid glands only, leaving the thyroid glands intact. 1% calcium lactate water supplementation required after surgery.
Rat	Pinealectomy	Circadian rhythms, melatonin function, and metabolism	Removal of the pineal gland.
Rat	Portal caval shunt (eck-fistula)	Hepatic metabolism of compounds	Redirect portal flow to the vena cava.
Rat Mouse	Renal artery ablation (Nephrectomy- 5/6)	Hypertension, renal failure, and drug metabolism with compromised renal function	This procedure is performed as a single surgery. The anterior and medium branches of the right kidney's renal artery are ligated. Then the left kidney is removed, but the adrenal gland is left in the animal.
Rat	Renal artery banding	Hypertension model	Stenosis is created by a ligation in the renal arteries using suture.
Rat Mouse	Splenectomy	Studies of immunology and hematopoietic diseases	Removal of the spleen.
Rat	Splenic denervation	Research involving early immune response	Removal of a small section of the splenic nerve.

SOFT TISSUE PROCEDURES

Species	Procedure	Common Applications	Description/Comments
Rat	Suspensory ligament removal	Evaluation of drugs affecting penile function	The suspensory ligament on either side of the penile body is sectioned.
Rat Mouse	Thymectomy	Immunology studies and transplant research	Removal of both lobes of the thymus gland.
Rat	Thyroidectomy	Thyroid function studies	Removes the thyroid gland, replaces the parathyroid gland.
Rat Mouse	Thyroid-parathyroidectomy	Calcium metabolism and thyroid function studies	Removal of both thyroid and parathyroid glands. 1% calcium lactate water supplementation required after surgery.
Rat	Tubal ligation-bilateral	Studies of ovarian function	Both uterine horns are ligated just below the fallopian tubes.
Rat	Tubal ligation-unilateral	Studies of ovarian function	One uterine horn is ligated just below the fallopian tube.
Rat	Vagotomy- bilateral subdiaphragmatic	Differentiate peripheral and centrally mediated effects on autonomic nervous system of drugs or other therapies	Removal of a small section of the vagus nerve from both trunks below the diaphragm.
Rat Mouse	Vagotomy- hepatic branch	Studies involving liver function	Removal of a small section of nerve from each hepatic branch that originates from the vagus trunk.
Rat Mouse	Vasectomy	Bred to produce pseudopregnant females	Removes a section of each vas deferens.

CARDIOVASCULAR PROCEDURES

Rat	Abdominal aortic banding	Hypertension model	Stenosis is created by two ligations or a hemoclip between the renal arteries using suture.
Rat	Myocardial infarction	Study of heart disease	The left anterior descending coronary artery is permanently ligated.
Rat	Pulmonary artery banding	Study of hypertension relating to chronic obstructive pulmonary disease	Stenosis is created by ligation in the pulmonary artery resulting in a model that replicates chronic obstructive pulmonary disease.
Rat	Thoracic banding-ascending aorta	Studies of left ventricular hypertrophy	Stenosis is created by ligation in the ascending aorta resulting in acute/subacute model that develops cardiac hypertrophy in 10-14 days.
Rat	Thoracic banding-transverse aorta	Studies of left ventricular hypertrophy	Stenosis is created by ligation in the transverse aorta resulting in a chronic model that develops cardiac hypertrophy in 6-8 weeks.
Rat Mouse	Vena cava-abdominal approach	Dosing to or sampling from the vena cava	Direct catheterization of the vena cava. Best used for the precise placement of the catheter tip.
Rat Mouse	Vena cava- femoral vein approach	Dosing to or sampling from the vena cava	Catheterization of the vena cava via femoral artery catheterization. Best used for the generalized placement of the catheter tip.

NEUROLOGICAL PROCEDURES

Species	Procedure	Common Applications	Description/Comments
Rat	Alzheimer's model	Physiologically induced Alzheimer model used to screen compounds and evaluate therapies	Lesion on brain resembling Alzheimer's disease is produced by injecting 192-Saporin into the left lateral ventricle.
Rat Mouse Guinea Pig	Angiotensin testing	Validation challenge test for ventricle cannulation surgery (can be added to any ventricle cannulation)	Animals are given a dose of Angiotensin II and allowed free drink from pre-weighted bottles for 30 minutes. A water consumption of 5 grams or more in the allotted time frame indicates a successful ventricle cannulation.
Rat	Bilateral brain cannulation	Routine dosing into two areas of the brain simultaneously	Coordinates for insertion of brain cannula need to be specified by customer at time of order.
Rat	Intracisternal cannulation	Cerebrospinal fluid (CSF) sampling	A cannula is implanted in the cisterna magna, between the caudal part of the cerebellum and the medulla oblongata.
Rat Mouse Guinea Pig	Intralateral ventricular cannulation	Routine infusion of dosing compounds into the brain	A cannula is implanted in the lateral ventricle of the brain using standard coordinates.
Rat Mouse Guinea Pig	Intralateral or 3rd ventricular cannulation for osmotic pump attachment	Continuous infusion into the brain	A cannula is implanted in the lateral ventricle of the brain. Tubing, connected to the cannula, is subcutaneously tunneled towards the scapular region to connect to an osmotic pump for continuous delivery of compound to the brain.
Rat	Intrathecal catheterization	Direct infusion into subdural space of the spine	A catheter is inserted into the subarachnoid space of the spine at the L4-L5 region. The catheter is exteriorized from the scapular region. For infusion only.
Rat Mouse	Microdialysis guide implantation	Brain microdialysis	A microdialysis guide cannula is placed in a customer-specified target area of the brain.
Rat	Middle cerebral artery occlusion	Ischemic stroke model	The middle cerebral artery, which provides blood supply to the brain, is occluded to create an ischemic stroke model. <i>Rent-A-Surgeon only.</i>
Rat	Parkinson's model	Parkinson's drug screening	6-Hydroxydopamine solution is injected into the substantia nigra of the brain. An apomorphine challenge is done 7 days after surgery to verify success. Only animals that pass this challenge test are shipped.
Rat Mouse	Ganglion denervation-superior cervical	Study effects of parasympathetic denervation on the function of other organ systems	Excise a small piece of nerves at a point 1 mm beyond the caudal portion of the Superior Cervical Ganglion.
Rat Mouse	3rd ventricular cannulation	Routine infusion to ventricular system	A cannula is implanted in the third ventricle using standard coordinates.
Rat Mouse	Unilateral brain cannulation	Routine infusion to a target brain area	A cannula is implanted in the customer-specified target area on one side of the brain.

DEVICE IMPLANT PROCEDURES

Species	Procedure	Common Applications	Description/Comments
Rat Mouse Guinea Pig	Blood pressure telemetry	Blood pressure monitoring	For abdominal aorta approach, minimum 7-day postoperative holding time to ensure catheter adequately secured in place through healing process. Customer supplies telemetry device in manufacturer packaging.
Rat Guinea Pig	Blood pressure / electrocardiograph telemetry	Blood pressure, heart rate, and ECG monitoring	For abdominal aorta approach, minimum 7-day postoperative holding time to ensure catheter adequately secured in place through healing process. Customer supplies telemetry device in manufacturer packaging.
Rat Guinea Pig	Blood pressure / electroencephalograph telemetry	Blood pressure, heart rate, and EEG monitoring	For abdominal aorta approach, minimum 7-day postoperative holding time to ensure catheter adequately secured in place through healing process. Customer supplies telemetry device in manufacturer packaging.
Rat Guinea Pig	Blood pressure / electromyograph telemetry	Blood pressure, heart rate, and EMG monitoring	For abdominal aorta approach, minimum 7-day postoperative holding time to ensure catheter adequately secured in place through healing process. Customer supplies telemetry device in manufacturer packaging.
Rat Mouse	Button	Accessory to catheterization surgery that allows for tethering or easier access to the catheter. Comes in many variations and material composition. Vendors include SAI, Instech, Access Technologies, and possible others.	The standard practice is to suture the button to the underlying musculature around the scapular area. The catheter is then fed from the subcutaneous space up through the button to be exteriorized. In some cases, buttons with septums are available so that no catheter is exposed.
Rat Mouse	Device Implantation 1	Subcutaneous implantation of varied nature with minimal manipulation required. This includes hormone pellets, etc.	Subcutaneous implantation of small device with limited manipulation required. Device supplied by customer in manufacturer packaging.
Rat Mouse	Device Implantation 2	Subcutaneous implantation of varied nature with extensive manipulation required. This includes vascular access ports (VAP), osmotic pumps, etc.	Device implant requiring surgical manipulation (e.g., vascular access port implant). Requires an additional code to indicate vessel of entry. Device supplied by customer in manufacturer packaging.
Rat Mouse Guinea Pig	Electrocardiograph telemetry	Recording changes in electrical potential that occur as the heart beats	Customer supplies telemetry device in manufacturer packaging.
Rat Mouse Guinea Pig	Electrocardiograph / electroencephalograph telemetry	Used in cardiovascular studies for recording changes in electrical potential that occur as the heart beats and for recording brain wave activity in neurological studies	Customer supplies telemetry device in manufacturer packaging.
Rat Mouse Guinea Pig	Electrocardiograph / electromyograph telemetry	Used in cardiovascular studies for recording changes in electrical potential that occur as the heart beats and for monitoring animal activity or studying neuromuscular disorders by recording electrical activity associated with skeletal muscle functioning	Customer supplies telemetry device in manufacturer packaging.
Rat Mouse Guinea Pig	Electroencephalograph telemetry	Recording brain wave activity in neurological studies	Customer supplies telemetry device in manufacturer packaging.

DEVICE IMPLANT PROCEDURES

Species	Procedure	Common Applications	Description/Comments
Rat Mouse Guinea Pig	Electromyograph telemetry	Used for monitoring animal activity or studying neuromuscular disorders by recording electrical activity associated with skeletal muscle functioning	Customer supplies telemetry device in manufacturer packaging.
Rat Mouse Guinea Pig	Harness / jacket	Accessory to a catheterization surgery to allow for tethering or easier access to catheter. Vendors include SAI, Instech, Covance and possible others.	The catheter is attached to the harness allowing access via the harness septum. Harnesses supplied by customer in manufacturer packaging.
Rat Mouse Guinea Pig	Identification chip implant	Individual animal identification	Implantation of either AVID or BIOMEDICAL identification transponders. Standard placement is in the scapular region unless surgery dictates otherwise.
Rat Mouse Guinea Pig Hamster	Telemetry implant- activity / temperature monitoring	Activity/temperature monitoring	Customer supplies telemetry device in manufacturer packaging. The device is placed in abdominal cavity.
Rat Mouse	Vascular pump implant- osmotic	Osmotic infusion dosing studies	Osmotic pump implanted. Also need to specify relevant vascular catheterization procedure.

SURGICAL SUPPORT

Rat Mouse Guinea Pig Hamster Gerbil	Rent-A-Surgeon	On-site surgical support for procedures	Full-day service only. Typically Thursdays and/or Fridays. Requires prior IACUC approval of procedures to be performed.
Rat Mouse Guinea Pig Hamster Gerbil	Rent-A-Trainer	On-site surgical training for procedures	Full-day service only. Typically Thursdays and/or Fridays. Requires prior IACUC approval of procedures to be performed.
Rat Mouse Guinea Pig Hamster Gerbil	Sham surgical procedures	Used for scientific controls to measure impact of surgical procedure itself	Typically done for soft tissue procedures, but available for most surgical procedures upon request.