

Surgical Capabilities

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At Charles River, we understand how important high-quality surgical models that meet exacting scientific and regulatory standards are to your research. As the premiere provider of surgically altered research models, we have the specialized skills and resources that allow us to tailor research models to your specific needs. This paper addresses general information regarding Charles River Europe's laboratory rodent surgery capabilities, along with specific topics that include surgical facilities, preoperative evaluation of animals, anaesthesia, analgesia, and postoperative recovery.

Surgical Facilities

Surgical Suites, Personnel, and Services

The surgical suites at each of our European sites are HEPA-filtered, positive pressured, barrier room facilities with a series of entry locks. The facilities consist of all functional areas that are used for surgical manipulations, animal husbandry support, preoperative holding, postoperative recovery, supply preparation, and clerical activities.

Charles River conducts over 50 different surgical procedures. They range from commonly requested, simple procedures such as soft tissue/organ extractions to highly complex catheterizations and cannulations. The academic credentials of our surgeons include degrees in veterinary medicine, biology, animal science, and animal health technology.

Aseptic Technique

Surgeries are performed in laminar flow hoods using aseptic technique or dedicated benches. The flow hoods are designed to create a work area free from particulate contaminants. All surgical instruments and equipment, as well as surgery personnel, go through a series of decontamination procedures. Surgical drapes are used during all procedures. Glove changing processes allow surgeons to maintain sterile hands at all times. Each step of a procedure is carefully considered in order to best maintain an aseptic environment.

Animals

Origin

The animals used for surgical modifications are produced in barrier rooms on-site at each production facility. The animals are of a known health profile with respect to viral and microbial agents. Their source colonies are regularly monitored for the presence of such agents, as well as for their genetic integrity.

Biosecurity precautions limit our service offerings to the animals produced at our facilities.

Transportation

Animals selected for surgery are transported from the on-site barrier room to the surgical suite in shipping containers. The animals' sex, weight, and genetic background are verified, and they are given a brief physical examination prior to being placed in preoperative caging. Once the operative procedure is complete and an appropriate recovery period has elapsed, the animals are packed for shipping.



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Preoperative Evaluation

Prescreening Process

Prior to surgery, each animal is examined for the presence of any clinical signs that could affect its ability to survive the anaesthetic and surgical protocol. Any deviations from normal appearance, activity, or behaviour are evaluated. At Charles River, animals are prescreened by barrier production room personnel prior to delivery to the surgery facility. Hence, the frequency of encountering abnormal findings upon pre-surgical examination is low.

Fasting

Unlike humans, rodents do not normally actively regurgitate. Hence, there is no need to fast animals to prevent the potential aspiration of stomach contents during anaesthesia and surgery. However, a period of withholding food lasting less than 12 hours and usually only four to six hours helps to ensure consistent absorption of intraperitoneally administered injectable anaesthetics. Water is never withheld, since it does not affect anaesthetic absorption.

Antibiotics

Since aseptic surgery is performed, no preoperative antibiotics to prophylactically guard against bacterial infection are administered on a routine basis, unless it is required by the customer. However, for a few invasive models (multiple catheterisations for example), the surgical team could advise a pre-operative injection of an antibiotic. In such cases, Charles River works with the customer to determine what kind of antibiotic is necessary, either pre- or post-operatively, to ensure an appropriate surgical outcome.

Preoperative Preparation

Following anaesthesia administration, the operator site is prepared by removing hair with an electric clippers. The clipped area surrounding the incision site is then decontaminated with repeated applications of povidone-iodine soap and solution followed by 70% alcohol.

Anaesthesia

Pre-Anaesthetics

In general, pre-anaesthetics, including the use of Atropine, are not used for most surgical procedures conducted by Charles River. Each surgical regimen is evaluated separately in terms of its anaesthetic requirements, and an analysis is made of the advantages and disadvantages of using pre-anaesthetics in that regimen. Charles River reserves the use of such agents for special circumstances, or for client requests.

Choice of Agent

Choosing an anaesthetic agent is a complex decision making process that must take into account both clinical and humane requirements. The scientific aspects of the research project must also be considered. A variety of biological and environmental factors are important in selecting the appropriate agent.

Administration of Anaesthetic

Brief manual restraint is required for successful administration of anaesthetics. Charles River makes every effort to minimise distress to the animals.



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Injectable Anaesthetics

The intraperitoneal (IP) route of administration is principally used for agents selected to reduce potential tissue damage from intramuscular (IM) or subcutaneous (SC) injections. Although some agents could be administered intramuscularly, this technique generally requires a large muscle mass. This requirement could be problematic in small rodent species where muscle masses are small, and dependent pooling of the subcutaneous agents may occur.

The IP injection technique is usually accomplished with a one-inch needle ranging in size from 23 to 26 gauge. Using a larger gauge needle prevents the inadvertent introduction of anaesthetics into the lumen of the abdominal viscera. Smaller gauge needles are more likely to penetrate the lumen of organs due to a high total entry force on the needle tip coupled with the small lumen size of the needle. Typically, injections are administered in the lower left or lower right abdominal quadrant with the animal in the head down position.

In rodents, intravenous administration (IV) of anaesthetics is generally avoided. Needle or catheter placement requires complete stabilisation of the vessel prior to percutaneous entry. Failure to achieve proper needle placement can cause the release of anaesthetic agents perivascularly, which may result in tissue necrosis and postoperative complications, especially in small rodents. The restraint required to perform such an injection is often quite stressful to the animals and generally cannot be justified for the procedures which Charles River commonly performs. For surgery on outbred rats, a combination of Ketamine and Xylazine is diluted with sterile water in a ratio of: Ketamine:Xylazine:sterile water = 1:1:5, and administered at a dosage rate of 3.0 ml/kg intraperitoneally. This combination usually produces about 20 minutes of surgical anaesthesia. It provides good analgesic activity, relatively short induction and recovery times, and an acceptable margin of safety. This combination results in appropriate levels of muscle relaxation. For surgery on mice and inbred rats, the above combination and dosage does not have as wide a margin of safety. For this reason, we prefer to customise the anaesthetic mixture in these cases.

Inhalational Anaesthesia

Inhalational anaesthesia has numerous advantages, especially in prolonged or extremely complex surgical manipulations. Rodents are generally induced with these agents by using an induction chamber coupled with a scavenged face mask delivery system. Operator safety concerns are a significant factor when using these agents, given the likelihood of prolonged exposure if the system is inappropriately scavenged for waste gas. Inhalational agents have significant advantages in terms of rapid induction, rapid recovery, ease of manipulating the plane of anaesthesia, and prevention of problems associated with redosing injectable anaesthetics. Isoflurane anaesthesia is preferred and commonly used at Charles River for invasive surgeries, surgical modifications involving the liver, procedures conducted on aged, young, diabetic, obese, or pregnant animals, and certain cardiac manipulations.

Postoperative Recovery

Recovery Time

All postoperative animals are closely monitored during recovery. A minimum of 24 hours recovery time is recommended for all surgical procedures prior to shipment. Recovery time may be significantly longer, depending on the nature of the procedure. In general, procedures such as ovariectomies, castration, vasectomies, and certain cannulations require relatively short recovery times prior to shipment.



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Signs of Infection

During the postoperative recovery period animals are observed for signs of pain, distress, or morbidity. Appropriate treatments are administered (rehydration, for example) when needed and if marked or severe clinical abnormalities develop, the animal is euthanised following Ethic's Committee validated procedures. In these cases, post-mortem examinations are conducted to determine the nature of the problem. If necessary, alterations can be made to the surgical technique to prevent reoccurrence.

Use of Analgesics

Charles River's goal is to remain at the forefront of humane care and use initiatives for animal health and well-being. In accordance with this goal, and in order to ensure the best possible care for the animals undergoing surgical procedures, Charles River has adopted a uniform policy requiring the administration of analgesics for all animals undergoing surgical procedures. The standard default analgesic is an opioid, buprenorphine hydrochloride. An alternative non-steroidal antiinflammatory agent (NSAID), carprofen, is available for neurological procedures and substitution upon request.

Heat Loss

Because the ratio of body surface area to mass is greater in small rodents than in large domestic animals, heat dissipation during surgery and post-surgical recovery is common with general anaesthesia. This can cause significant variations in the metabolism of anaesthetics and hence the rate of recovery. This heat loss also affects cardiovascular performance, as well as the urinary excretion of anaesthetics, there by prolonging anaesthesia. For this reason, during the surgical period, as well as postoperatively, supplemental heat is provided to the animals via heated surfaces. The temperature of the heating devices is closely monitored to avoid harmful elevation in temperature on the skin's surface that could result in burns. Generally, the animals are removed from the heated surface when their righting reflexes are regained and they can maintain normal posture.

When removed from the supplemental heat, the animals are placed in a clean, bedded recovery cage with sufficient bedding to insulate them from further heat loss into the environment. Normal husbandry practices are resumed once the animal has recovered from anaesthesia and regained mobility.

Postoperative Nutrition

Animals are provided with food and water in their recovery cage. Some procedures such as adrenalectomy, parathyroidectomy, and hypophysectomy, require diet supplementation with specific salts or sugars. Surgical technicians make sure that appropriate supplementation is provided. During surgery, certain procedures may cause significant fluid loss through evaporation from body cavities. In those instances, replacement fluid is important for a successful recovery. Charles River uses sterile isotonic replacement fluids, including normal saline and lactated ringers, given in amounts of up to 5% of body weight or rehydration gel. Fluids are administered into a body cavity, or subcutaneously in multiple sites. For routine procedures that do not involve extensive invasion or prolonged operative times, replacement therapy is not usually required.

The Customer's Role in Postoperative Management

Providing surgically modified animals is a team effort requiring communication and follow-up between the client and Charles River. This interaction is necessary to assure that any necessary adjustments to surgical manipulations, postoperative recovery time, and the anaesthesia and analgesia program are made to appropriately provide for the well-being of the animal.



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Transportation to the Customer

Shipment to customers takes place after an appropriate recovery period. The animals are shipped in climate controlled vehicles within containers. Each container holds Transgel™, a jelled water substitute providing a source of hydration and a pelleted rodent diet. All catheterised animals are shipped singly housed in compartment crates.

Post-Shipment Animal Evaluation

Upon receiving animals, the customer should thoroughly examine them for any signs of postoperative complications or clinical abnormalities. The animals should be given free access to food and water as soon as possible and placed in a temperature controlled environment. They should have a clean, bedded cage that is changed as frequently as necessary to ensure that the operative site does not become excessively moistened with contaminated fluids from the bedding.

Post-Shipment Nutrition

For animals that have had endocrine organs removed, some types of supplementation may be required in either the food or drinking water. Charles River will provide receiving institutions with instructions for preparing supplemental materials.

Any animal that appears dehydrated should be given access to regular drinking water and observed to ensure consumption. Supplemental fluids can be administered subcutaneously, but this should be done under the direction of the veterinary staff.

Care of Catheterised/Cannulated Animals

For catheterised animals, a program of regular flushing of the catheters with solutions may be necessary for longer studies. Instruction sheets are sent with each order. These instruction sheets describe how to use and maintain the catheter and cannula.

Wound Care

In most cases, dressing wounds and applying local antiseptics or disinfectants is not required. Wounds are usually closed with clips, which should be removed five to seven days following surgery. By that time, there is enough tensile strength in the healing wound to ensure that all layers will remain closed. Special wound clip removers are commercially available, although other surgical instruments can serve this purpose.

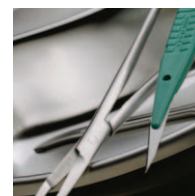
Customer's Responsibility

Any abnormal occurrences with respect to the health of the animals or the success of the surgery should be conveyed to Charles River. Please contact Charles River's Technical Services at surgery@eu.crl.com

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Ethics Committee

The entire surgical process is governed by Charles River's Institutional Ethics Committee while animals are in Charles River's care. 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 modified animals, review of experimental protocols, authorisation to order animals that are surgically modified from Charles River, and all aspects of the use of the surgically modified animals after arrival at the institution are the responsibility of the receiving institution's ethics committee.




charles river

Contact us
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www.criver.com