Myocardial Infarct Model

Model interest

According to the World Health Organization, 7.1 million people die from coronary heart disease every year. Coronary disease is the most common cause of death in the US and Europe.

In most cases, myocardial infarction is a consequence of coronary artery heart disease and leads to acute cardiac failure and frequently to death. In humans, the majority of myocardial infarcts result from thrombotic occlusion by arteriosclerosis plaques. In experimental animal models, this occlusion phenomenon can be mimicked by a ligation of one of the coronary arteries.

In the myocardial infarct mouse model, the myocardial infarction is induced by ligation of the left anterior descending coronary artery. This model has been extensively studied over the last 20 years to explore the functional, structural and molecular changes associated to ischemic heart disease. Surgical techniques of coronary artery ligation have been progressively improved, and standardized models of myocardial infarction have been developed.

Animal model

Charles River offers a state-of-the-art, ready-to-go model of myocardial infarction in 30-35g OF1 mice. The surgical technique was developed in cooperation with the pharmacology department of the Cardiovascular Research Institute Maastricht (Maastricht University, The Netherlands). Dr. B. Janssen and his team have built up considerable experience with the myocardial infarct mouse model and published the following reference papers in this field:


Surgical preparation

Animal preparation

A pre-operative injection of buprenorphine is administered. The anesthesia is induced by injection of a low dose of xylazine and ketamine mixture and maintained with an isoflurane and oxygen mixture administered after endotracheal intubation. The animals are kept under assisted ventilation throughout the surgery.

The animal chest is shaved, and the surgical area is aseptically prepared. The animal is then covered with a sterile drape during the entire surgery.

Surgical technique

A transverse skin incision is made at the level of the left axillary. Thoracic muscles are gently separated in order to have direct access to the chest. The chest cavity is opened between the third and fourth ribs. The great vessels and upper part of the left atrial appendage are visualized. The left anterior descending artery is identified as well as its main branch. A non-absorbable suture (Metric 0.7) is moved underneath the coronary artery at the level of the main branch and a double knot is made. The chest cavity is closed by bringing together the ribs with absorbable sutures (Metric 0.7). All layers of muscle and skin are closed with continuous absorbable and non-absorbable sutures, respectively (Metric 0.7 and 1).
Post-operative care

The animals are kept under close observation during the entire recovery period. An additional injection of buprenorphine is administrated on Day 1.

Animal shipment

The animals are shipped by groups of 4 to 10 individuals per crate within 5 to 8 days post-surgery. On the day of shipment, a clinical examination is performed and only animals suitable for transportation are shipped. Hydrated food developed specifically for transport is placed in the animal shipment boxes.

Validation data

The efficiency of the surgery to produce an infarct, the ability to reach an acceptable survival rate and the definition of appropriate endpoints have been extensively studied during training and validation sessions.

- Clinical observation and macroscopical observation at necropsy: The mean survival rate in OF1 animals is of 70% one week after the surgery. A critical time period was identified 5 to 7 days after the procedure, where animals having too large of an infarcted area show signs of respiratory depression. Endpoints were defined, and all animals showing signs of respiratory depression are humanely euthanatized. More than 90% of operated animals are showing an infarcted area at necropsy.

- Histological analysis: Hearts in which a myocardial infarct was macroscopically observed at necropsy were submitted to histological analysis. The macroscopic findings (suspicion of presence of a large infarcted area with major muscle fiber loss) were confirmed by histological analysis.

- Imaging: A batch of animals prepared by Charles River was sent to an imaging lab (Centre de Résonance Magnétique des Systèmes biologiques, UMR 5536 CNRS/Université Victor Segalen Bordeaux 2, Bordeaux, France) to validate the efficacy of an MRI technique to assess infarcted area size. All animals presented an infarct that could be identified by the MRI technique.

Figure 1: MRI images of an infracted mouse heart compared to a normal mouse heart (RMSB, Bordeaux, France)