School of Biomedical Sciences – Standard Operating Procedure

Integrated Physiology Facility (IPF), MacGregor Building (64) Room 445

15th December 2021

Non-Invasive Blood Pressure (NIBP) Controller

I. Objective

NIBP controllers perform non-invasive blood pressure measurements on mice and rats using specialised tail cuffs, providing a measurement of systolic pressure.

II. Comments and Recommendations

- This procedure has been written with specific reference to the Integrated Physiology Facility (IPF), the NIBP equipment includes both software (LabChart) and hardware (ADInstruments) components and may only be used by an IPF approved experienced operators
- Use of the NIBP controller and any variation to this SOP must be described in a relevant animal ethics application
- Most animals require some habituation to the protocol. Two to three short training sessions may be necessary to habituate the animals
- Users should read and understand the associated Risk Assessment prior to operation: 3657 UQBR Handling and restraint of laboratory animals; 3940 Handling rats and mice (available on the UQSafe website)
- Equipment/software failures and animal escapes need to be reported to the animal facility manager immediately
- All incidents/injuries should be reported via UQSafe online
- Spills must be cleaned up immediately
- Use of the NIBP controller involves mouse handling and appropriate care should be taken, refer to LAB_006 Handling and restraint in mice and neonates, and LAB_039 Handling and Restraint in Rats and Neonates
- Wild type and genetically modified animals must be transported to equipment as per OGTR guidelines and LAB_003 Transportation of Laboratory Rodents
- The IPF is a shared space with unknown commensal microbial status. Once transported to a shared space it is often not possible, for biosecurity reasons, to return rodents to their original animal facility. Arrangements for transportation and ongoing care of experimental animals must be made with relevant animal facility managers when planning projects that aim to use a shared facility

III. Equipment

- Minimum Personal Protective Equipment (PPE) consists of gloves, gown, closed in shoes, eye protection and face mask. Additional PPE may be required based on added risk e.g., working with infectious animals (P2 fitted mask and viral gown).
- PowerLab (4/35 or 8/35) and NIBP controller
- Computer with LabChart software
- NIBP tail cuff (mouse or rat)
- Rodent restraint tube and holder

- Towel
- Heating pad/lamp
- Disinfectant (1-2% Virkon), Ethanol (70%)

IV. Preparation

- Check booking date/s and time/s on PPMS
- All animal arrivals/departures and euthanasia's must be recorded on the Mosaic movement sheet available in the animal facility
- Pulse range bandwidth setting for mice is 240-600 BPM
- Pulse range bandwidth setting for rats is 90-420 BPM
- Average measurement cycle time is 20-40 seconds
- Most animals require some training/habituation to the protocol, 2-3 short training sessions may be needed for acclimatization. It may take a few minutes until a distinct pulse is measurable on the tail
- The Heat pad/lamp may be required once the mouse has been placed in restraint cage to improve blood flow taking care not to overheat an animal
- Avoid sudden movements or noises, a cloth may be placed over the restraint cage taking care not to overheat an animal
- Avoid excess vibrations

V. Procedure

1. Ensure the NIBP controller is connected to the PowerLab. Connect the tail pressure cuff to the cuff connection at the front of the NIBP controller, and the pulse transducer to the Pulse Input connector (MLT125M for mice, MLT125R for rats)

2. Open LabChart on the computer and set up two channels, one for pulse and one for pressure. The pulse channel range should be set to 50 mV, the pressure channel range should be set to 1 V, and the unit conversion should be set up to give 0 V = 0 mmHg and 1 V = 300 mmHg

3. Check animal identification and enter any relevant details into the software

4. Choose an appropriately sized restraint tube that prevents the animal from turning around

5. Place the restraint tube onto a heating pad and encourage the rodent into the tube. Carefully replace the tube end ensuring the tail protrudes

Place a towel over the tube to help calm the animal and reduce the impact of external stimuli

6. Connect the pressure cuff and pulse transducer to the proximal end of the animal's tail

The active site of the pulse transducer should line up with the ventral surface of the tail, directly adjacent to the caudal artery. The transducer is positioned directly following the pressure cuff

7. Click the start button in LabChart to begin recording

8. Push the Start/Stop button on the front of the NIBP Controller to begin the measurement cycle

The pump will start as the cuff inflates, observe the pressure waveform rise and the pulse signal decrease in amplitude as blood flow is occluded

When the pre-set maximum cuff pressure is reached the pump will stop and the pressure will drop slowly until it reaches approximately 40 mmHg, as the pressure drops the pulse increases (the pre-set maximum cuff pressure can be adjusted y using a switch on the rear panel)

Cuff pressure data is used in association with the reappearance of the caudal artery pulse to determine systolic pressure. SBP occurs when the cuff pressure corresponds to the restoration of the first caudal artery pulse (direct observation)

Average measurement cycle time is 20-40 seconds

Repeat each measurement 5-6 times to ensure reproducibility

9. At the end of the measurement, release the rodent back into home cage and clean restraint