

Annex 1

Overview of equipment used for analyzing metabolic physiology in mice and rats

【Major items to be analyzed and/or measured】

- 1) Measurement of motor-related neural activities using techniques such as electromyography, single-unit recordings of electroencephalographs in the awake state, and local field potentials including brain waves.
- 2) Energy intake and expenditure in free-moving animals
- 3) Body temperature, heart rate, and blood pressure in free-moving animals
- 4) Non-invasive 4-dimensional cardiac function and capillary blood flow (brain and umbilical cord) imaging using anesthetized mice and cardiac function measurement using isolated perfused hearts
- 5) Mouse temperature preference assays using a thermal gradient ring
- 6) Evaluation of behaviors related to emotions, learning, and memories

【Equipment】

- Device for simultaneously measuring energy metabolism and activity of small animals using mass spectrometry (Arco System, Shinfactory, for mice)
- Single-unit neuron activity recorder (made by the Division of System Neurophysiology, NIPS)
- Brain wave-measuring apparatus (Nihon Kohden, AB611J)
- Electromyograph (Nihon Kohden, AB611J)
- Telemetry automatic measurement system for chronic experiments (Harvard Bioscience, mouse, rat, etc.)
- Olympus FV100, 4D ultrasound imaging device VEVO3100 (Primetech Corporation, for mice)
- Isolated heart perfusion system (Primetech Corporation, for mice and rats)
- Thermal Gradient Ring (Ugo Basile, for mice)
- Open field test analyzer (Section of Instrument Design Room of NIPS and other, for mice)
- Elevated plus-maze test analyzer (Section of Instrument Design Room of NIPS and other, for mice)
- Forced swimming test analyzer (Section of Instrument Design Room of NIPS and other, for mice)
- Rotarod test analyzer (Ugo Basile, for mice RotaRod NG, 47650)
- Passive avoidance test analyzer (O'HARA, for mice)
- Fear conditioning test analyzer (O'HARA and other, for mice)
- Morris water maze pool (O'HARA and other, for mice)

ANNEX 2

Overview of magnetic resonance imaging (MRI) scanners

Performance and features of the MRI scanner installed at the NIPS Supportive Center for Brain Research (two Verio scanners, 2009, Siemens Co.; one 7-T scanner, 2014, Siemens Co., Ltd.)

Verio

1. Superconducting magnet

- 1) Magnetic field strength: 3 Tesla, magnet inner diameter 70 cm
- 2) Magnetic field uniformity: 0.03 ppm or less (spherical range with a diameter of 20 cm, volume residual mean squared method)
- 3) Shimming: Active + passive shimmmg, automatic shimmmg for each subject
- 4) Liquid helium evaporation: 0.01 L/year or less

2. Imaging functions

- 1) Nuclei: ^1H
- 2) Pulse sequence: echo planar imaging, turbo spin echo imaging, etc.
- 3) Slice direction: axial, sagittal, coronal, oblique
- 4) Min. slice thickness: 1 mm (2-dimensional imaging), 0.3 mm (3-dimensional imaging)
- 5) Gradient magnetic field: 45 mTesla/m, rise time 0.225 ms
- 6) Probe: 32-channel head coil, circular polarized body coil, etc.
- 7) Data processing device: Automatically saves obtained images in DICOM format via Windows network
- 8) Other functions: T1, T2, T2*, proton density-weighted images, MR angiography, diffusion-weighted image, image statistical processing software, communication mediation relay system for simultaneously measuring neural activity during interaction between two individuals

7-T MRI

1. Superconducting magnet

- 1) Magnetic field strength: 7 Tesla, magnet inner diameter 60 cm
- 2) Magnetic field uniformity : 1 ppm or less (spherical range with a diameter of 25 cm, volume residual mean squared method)
- 3) Shimming: Active + passive shimmmg, automatic shimmmg for each subject
- 4) Liquid helium evaporation: 0.01 L/year or less

2. Imaging functions

- 1) Nuclei: ^1H , ^{13}C , ^{17}O , ^{19}F , ^{23}Na , ^{31}P

- 2) Pulse sequence: echo planar imaging, turbo spin echo imaging etc.
- 3) Slice dimensions: axial, sagittal, coronal, oblique
- 4) Min. slice thickness: 0.5 mm (2-dimensional imaging), 0.05 mm (3-dimensional imaging)
- 5) Gradient magnetic field: 70 mTesla/m, rise time 0.350 ms
- 6) Probe: 32-channel receive-only head coil (^1H), circular polarized transmit/receive head coil (^1H , ^{23}Na , ^{31}P), transmit/receive surface coil (^{13}C , ^{17}O , ^{19}F), etc.
- 7) Data processing device: Automatically saves obtained images in DICOM format via Windows network
- 8) Other functions: T1, T2, T2*, proton density-weighted images, MR angiography, diffusion-weighted image, image statistical processing software