

Body Composition (DEXA lean/fat) HRWLLA_DXA_001

Purpose

Measure bone mineral content and density as well as body composition in mice using the DEXA (Dual Energy X-ray Absorptiometry) analyser.

Experimental Design

- **Minimum number of animals** : 7M + 7F
- **Age at test:** Week 57

Procedure

3.1 Calculate and record the volume of anaesthetic solution required for intraperitoneal (IP) injection.

3.2 Anesthetize the mice.

3.3 Monitor the animal carefully until unconsciousness by ensuring that the mouse is adequately sedated.

3.4 Weigh the mouse and record the value.

3.5 Measure the length of the mouse as follows and record the value (accuracy ± 0.1 cm)

3.5.1 Place the unconscious mouse on a disinfected ruler so that its nose is at zero (figure 1).

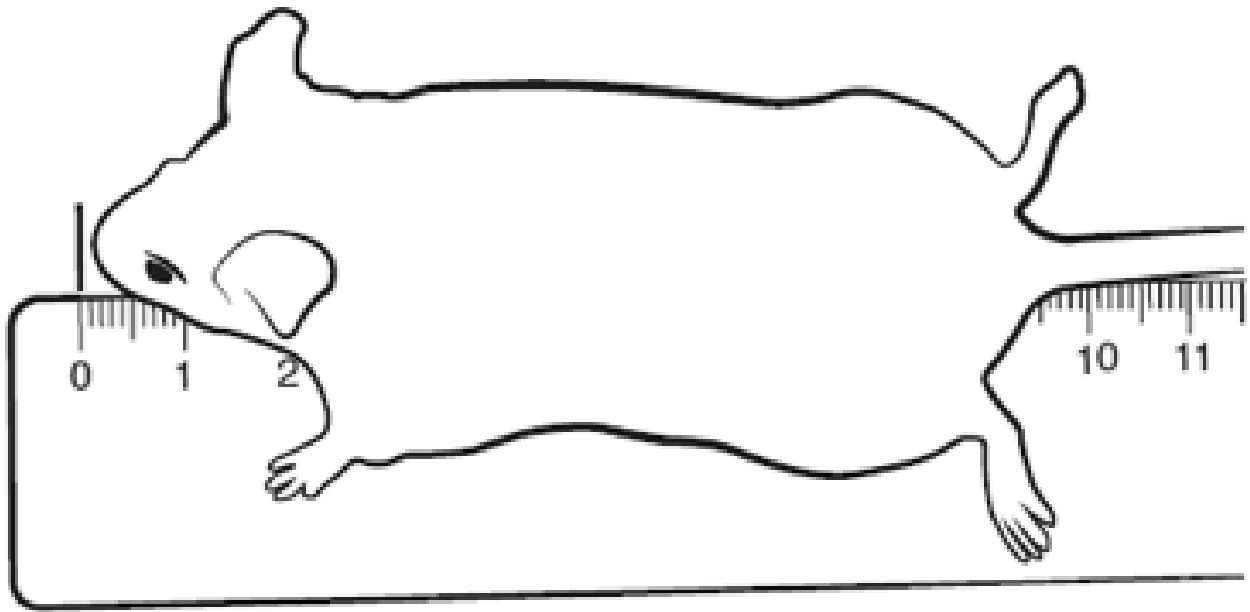


Figure 1

3.5.2 To measure the entire length of the head press gently against the ruler (figure 2) and gently pull the tail to ensure that the spine returns to its full length (figure 3).



Figure 2



Figure 3

3.5.3 Measure the length starting from the nose (0cm) to the beginning of the tail (figure 4). Record the measurement – the accuracy is within 0.1cm. For example in figure 4 the length of the mouse is 9.5cm.



Figure 4

3.5.4 Disinfect the ruler and contact area after the measurement has been taken.

3.6 Place the unconscious mouse into the DEXA analyser.

3.7 Perform a scout-scan.

3.8 Optimise the area of interest and perform a measure-scan.

3.9 Note that the exposure dose per mouse is 300Sv.

3.10 For the analysis of the data, regions of interest must be defined. The standard analysis comprises of a whole body analysis excluding the head area.

Continue with X-ray analysis or

3.11 Remove the mouse once the image is captured. Place the mouse on a heated mat, set at 37°C, in a cage and monitor closely until consciousness is regained.

Notes

Dual-energy X-ray Absorptiometry (DEXA or DXA) is a method of quantifying bone mineral content and density. DXA uses an X-ray generator of high stability to produce photons over a broad spectrum of energy levels. Its photon output is filtered to produce the two distinct peaks necessary to distinguish bone from soft tissue.

The technique used for separating photon output into two distinct energy levels is known as 'K-edge' filtration. By placing a filter element in the beam path, energy levels reacting with the filter material are sharply attenuated. The filter effect gradually lessens at higher energy

levels, and so a second peak is introduced. The tin filter material used in this system produces energy peaks at 28keV and 48keV. Two solid-state detectors and proprietary energy discrimination are used to determine high and low energy counts.

The count data is transformed by software into bone and non-bone components, thus generating the bone density values. Information is generated about body weight, body length, fat and bone mass, bone mass density, and lean mass of each mouse.

Data QC

Calibration of the system is done daily and use of the phantoms delivered by the manufacturer (for BMC, total weight and fat percent) is performed in weekly intervals. The results from the calibration runs are recorded.

Parameters and Metadata

Equipment ID HRWLLA_DXA_011_001 | v1.0

procedureMetadata

Req. Analysis: false Req. Upload: true Is Annotated: false

Equipment model HRWLLA_DXA_013_001 | v1.0

procedureMetadata

Req. Analysis: true Req. Upload: true Is Annotated: false

Options: Sabre, Minispec LF50, Lunar Piximus II, Minispec MQ 10, UltraFocus DXA, UltraFocus 100, Minispec LF90,

Date equipment last calibrated HRWLLA_DXA_017_001 | v1.2

procedureMetadata

Req. Analysis: false

Req. Upload: false

Is Annotated: false

Fat/Body weight HRWLLA_DXA_009_001 | v1.3

simpleParameter

Req. Analysis: false

Req. Upload: false

Is Annotated: true

Unit Measured: ratio

Derivation: div('HRWLLA_DXA_002_001', 'HRWLLA_DXA_001_001')

Experimenter ID HRWLLA_DXA_016_001 | v1.0

procedureMetadata

Req. Analysis: false

Req. Upload: true

Is Annotated: false

Mouse Status HRWLLA_DXA_014_001 | v1.0

procedureMetadata

Req. Analysis: false

Req. Upload: true

Is Annotated: false

Options: Anesthetized, Awake, Dead,

HAW HRWLLA_DXA_018_001 | v1.1

procedureMetadata

Req. Analysis: true

Req. Upload: false

Is Annotated: false

Unit Measured: g/cm²

BMC/Body weight HRWLLA_DXA_007_001 | v1.3

simpleParameter

Req. Analysis: false

Req. Upload: false

Is Annotated: true

Unit Measured: ratio

Derivation: div('HRWLLA_DXA_005_001', 'HRWLLA_DXA_001_001')

Equipment manufacturer HRWLLA_DXA_012_001 | v1.1

procedureMetadata

Req. Analysis: true

Req. Upload: true

Is Annotated: false

Options: Bruker, Norland Stratec, Faxitron Bioptics LLC, GE Medical Systems,

Anesthesia HRWLLA_DXA_015_001 | v1.0

procedureMetadata

Req. Analysis: false

Req. Upload: true

Is Annotated: false

Options: Domitor+Ketamin, Ketamine+Xylazine, Euthatal, Tribromoethanol, Ketamine+Xylazine+Antisedan, Avertin, Pentobarb, No anesthesia, Isoflurane, Sevoflurane,

Body length HRWLLA_DXA_006_001 | v1.2

simpleParameter

Req. Analysis: false

Req. Upload: false

Is Annotated: true

Unit Measured: cm

Bone Area HRWLLA_DXA_010_001 | v1.3

simpleParameter

Req. Analysis: false

Req. Upload: false

Is Annotated: true

Unit Measured: cm²

Derivation: div('HRWLLA_DXA_005_001', 'HRWLLA_DXA_004_001')

Body weight HRWLLA_DXA_001_001 | v1.1

simpleParameter

Req. Analysis: false

Req. Upload: true

Is Annotated: false

Unit Measured: g

Bone Mineral Density (excluding skull) HRWLLA_DXA_004_001 | v1.2

simpleParameter

Req. Analysis: false Req. Upload: false Is Annotated: true

Unit Measured: g/cm^2

Lean mass HRWLLA_DXA_003_001 | v1.1

simpleParameter

Req. Analysis: false Req. Upload: true Is Annotated: true

Unit Measured: g

Fat mass HRWLLA_DXA_002_001 | v1.1

simpleParameter

Req. Analysis: false Req. Upload: true Is Annotated: true

Unit Measured: g

Lean/Body weight HRWLLA_DXA_008_001 | v1.3

simpleParameter

Req. Analysis: false

Req. Upload: false

Is Annotated: true

Unit Measured: ratio

Derivation: $\text{div}(\text{'HRWLLA_DXA_003_001'}, \text{'HRWLLA_DXA_001_001'})$

Bone Mineral Content (excluding skull) HRWLLA_DXA_005_001 | v1.2

simpleParameter

Req. Analysis: false

Req. Upload: false

Is Annotated: true

Unit Measured: g
