# X-ray IMPC_XRY_001

## Purpose

Construct and analyse digital X-ray images in immobilised mice using a Faxitron X-Ray system or NTB digital X-ray scanner.

## Experimental Design

- **Minimum number of animals :** 4M + 4F
- **Age at test:** Week 14

## Procedure

Perform steps 3.1 and 3.2 unless the mouse is coming from DEXA analysis

3.1 Anesthetize the mice.

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

3.3 Mount the anesthetized mouse onto an X-ray permeable plate. Curve the tail along the left side of the mouse. (Note: this will enable identification of the X-ray as a dorsal or ventral image.)

Faxitron X-ray system

3.3.1 Insert the plate into the Faxitron X-ray system.

3.3.2 Take an image using the software that is supplied by the X-ray scanner.

3.3.3 Set the machine to a voltage of 25kV with an integration time of 40ms.

3.3.4 Take an image using the iX-Pect software that is supplied by the X-ray scanner.

NTB digital X-ray scanner

3.4 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 fully regained.

3.5 Analyze the image.

3.6 Or continue with ABR.

# Notes

The protocol described herein employs anaesthesia using intraperitoneal (IP) administration; however, anaesthesia using isoflurane is also suitable.

[Digit integrity IMPC_XRY_031_001](#)  *Definition:* **The state of being whole and undivided.**

# Parameters and Metadata

## Skull shape IMPC_XRY_001_001 | v1.0

simpleParameter

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

**Description:** skull_shape

**Options:** imageOnly, normal, abnormal, unobservable,

---

## Zygomatic bone IMPC_XRY_002_001 | v1.0

simpleParameter

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

**Description:** zygomatic_bone

**Options:** imageOnly, normal, abnormal, unobservable,

---

## Maxilla/Pre-maxilla IMPC_XRY_003_001 | v1.1

simpleParameter

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

**Description:** maxilla

**Options:** imageOnly, normal, abnormal, unobservable,

-------------------------------------------------------------------------------------

## Mandibles IMPC_XRY_004_001 | v1.0

simpleParameter

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

**Description:** mandibles

**Options:** imageOnly, normal, abnormal, unobservable,

-------------------------------------------------------------------------------------

## Teeth IMPC_XRY_005_001 | v1.0

simpleParameter

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

**Description:** teeth

**Options:** imageOnly, normal, abnormal, unobservable,

-------------------------------------------------------------------------------------

## Scapulae IMPC_XRY_006_001 | v1.0

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

**Description:** scapulae

**Options:** imageOnly, normal, abnormal, unobservable,

----------------------------------------------------------------------

## Clavicle IMPC_XRY_007_001 | v1.0

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

**Description:** clavicle

**Options:** imageOnly, normal, abnormal, unobservable,

----------------------------------------------------------------------

## Number of ribs right IMPC_XRY_008_001 | v1.0

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

**Description:** number_of_ribs_right

----------------------------------------------------------------------

## Number of ribs left IMPC_XRY_009_001 | v1.0

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

**Description:** number_of_ribs_left

--------------------------------------------------------------------------------

# Shape of ribs IMPC_XRY_010_001 | v1.0
simpleParameter

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

**Description:** shape_of_ribs

**Options:** imageOnly, normal, abnormal, unobservable,

--------------------------------------------------------------------------------

# Fusion of ribs IMPC_XRY_011_001 | v1.0
simpleParameter

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

**Description:** fusion_of_ribs

**Options:** imageOnly, fused, not fused, unobservable,

--------------------------------------------------------------------------------

# Pelvis IMPC_XRY_012_001 | v1.0
simpleParameter

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

**Description:** pelvis

**Options:** imageOnly, normal, abnormal, unobservable,

--------------------------------------------------------------------------------

# Number of cervical vertebrae IMPC_XRY_013_001 | v1.0
simpleParameter

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

**Description:** number_of_cervical_vertebrae

--------------------------------------------------------------------------------

# Number of thoracic vertebrae IMPC_XRY_014_001 | v1.0
simpleParameter

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

**Description:** number_of_thoracic_vertebrae

--------------------------------------------------------------------------------

# Number of lumbar vertebrae IMPC_XRY_015_001 | v1.0
simpleParameter

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

**Description:** number_of_lumbar_vertebrae

-------------------------------------------------------------------------------

# Number of pelvic vertebrae IMPC_XRY_016_001 | v1.0

simpleParameter

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

**Description:** number_of_pelvic_vertebrae

-------------------------------------------------------------------------------

# Number of caudal vertebrae IMPC_XRY_017_001 | v1.1

simpleParameter

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

**Description:** number_of_caudal_vertebrae

-------------------------------------------------------------------------------

# Shape of vertebrae IMPC_XRY_018_001 | v1.0

simpleParameter

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

**Description:** shape_of_vertebrae

**Options:** imageOnly, normal, abnormal, unobservable,

-------------------------------------------------------------------------------

## Fusion of vertebrae IMPC_XRY_019_001 | v1.0

simpleParameter

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

**Description:** fusion_of_vertebrae

**Options:** imageOnly, yes, no, unobservable,

---

## Processes on vertebrae IMPC_XRY_020_001 | v1.0

simpleParameter

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

**Description:** processes_on_vertebrae

**Options:** imageOnly, normal, abnormal, unobservable,

---

## Humerus IMPC_XRY_021_001 | v1.0

simpleParameter

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

**Description:** humerus

**Options:** imageOnly, normal, abnormal, unobservable,

---

## Radius IMPC_XRY_022_001 | v1.0

simpleParameter

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

**Description:** radius

**Options:** imageOnly, normal, abnormal, unobservable,

---

## Ulna IMPC_XRY_023_001 | v1.0

simpleParameter

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

**Description:** ulna

**Options:** imageOnly, normal, abnormal, unobservable,

---

## Femur IMPC_XRY_024_001 | v1.0

simpleParameter

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

**Description:** femur

**Options:** imageOnly, normal, abnormal, unobservable,

---

---

## Tibia IMPC_XRY_025_001 | v1.0
simpleParameter

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

**Description:** tibia

**Options:** imageOnly, normal, abnormal, unobservable,

---

## Fibula IMPC_XRY_026_001 | v1.0
simpleParameter

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

**Description:** fibula

**Options:** imageOnly, normal, abnormal, unobservable,

---

## Joints IMPC_XRY_027_001 | v1.0
simpleParameter

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

**Description:** joints

**Options:** imageOnly, normal, abnormal, unobservable,

---

## Number of digits IMPC_XRY_028_001 | v1.0

simpleParameter

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

**Description:** number_of_digits

---

## Syndactylism IMPC_XRY_029_001 | v1.0

simpleParameter

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

**Description:** syndactylism

**Options:** imageOnly, Syndactylism, no syndactylism, unobservable,

---

## Brachydactyly IMPC_XRY_030_001 | v1.1

simpleParameter

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

**Description:** completeness_of_digits

**Options:** imageOnly, yes, no, unobservable,

---

## Digit integrity IMPC_XRY_031_001 | v1.0

simpleParameter

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

**Description:** digit_integrity

**Options:** imageOnly, yes, no, unobservable,

---

## Comment on XRay image IMPC_XRY_032_001 | v1.1

simpleParameter

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

**Description:** comment_on_xray_image

---

## Tibia length IMPC_XRY_033_001 | v1.1

simpleParameter

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

**Unit Measured:** mm

**Description:** tibia_length

---

## XRay Images Whole Body Dorso Ventral IMPC_XRY_034_001 | v1.3

seriesMediaParameter

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

**Description:** xray_images

**Increments:** Minimum 1

-------------------------------------------------------------------------------

## Alive IMPC_XRY_035_001 | v1.0

simpleParameter

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

**Description:** alive

-------------------------------------------------------------------------------

## Xray equipment ID IMPC_XRY_036_001 | v1.1

procedureMetadata

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

**Description:** xray_equipment_name

-------------------------------------------------------------------------------

# Xray equipment manufacturer IMPC_XRY_037_001 | v1.4

procedureMetadata

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

**Description:** xray_equipment_manufacturer

**Options:** Faxitron X-Ray Corporation, Rigaku Corporation (Micro-CT), Bruker, Faxitron Bioptics LLC, Scintica, Medikors,

-------------------------------------------------------------------------------

# Xray equipment model IMPC_XRY_038_001 | v1.4

procedureMetadata

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

**Description:** xray_equipment_model

**Options:** MX-20-DC12, MX-20-DC4, R_mCT (Micro-CT), MX-20, MS-FX Pro, UltraFocus 100, UltraFocus DXA, PathVision, Insight-VET-DXA, InAlyzer2 Model S,

-------------------------------------------------------------------------------

# Settings time of exposure IMPC_XRY_039_001 | v1.1

procedureMetadata

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

**Unit Measured:** s

**Description:** settings_time_of_exposure

-------------------------------------------------------------------------------

## Settings level IMPC_XRY_040_001 | v1.1

procedureMetadata

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

**Description:** settings_level

--------------------------------------------------------------------------------

## Experimenter ID (scan) IMPC_XRY_041_001 | v1.1

procedureMetadata

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

**Description:** experimenter_scan_

--------------------------------------------------------------------------------

## Experimenter ID (analysis) IMPC_XRY_042_001 | v1.1

procedureMetadata

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

**Description:** experimenter_analysis_

--------------------------------------------------------------------------------

## Voltage settings IMPC_XRY_043_001 | v1.1

procedureMetadata

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

**Description:** voltage_settings

---

## Scanner equipment ID IMPC_XRY_044_001 | v1.1

procedureMetadata

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

**Description:** scanner_equipment_name

---

## Scanner equipment manufacturer IMPC_XRY_045_001 | v1.1

procedureMetadata

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

**Description:** scanner_equipment_manufacturer

---

## Scanner equipment model IMPC_XRY_046_001 | v1.1

procedureMetadata

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

**Description:** scanner_equipment_model

---

---

## Date Xray equipment last calibrated IMPC_XRY_047_001 | v1.3

procedureMetadata

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

---

## XRay Images Whole Body Lateral Orientation IMPC_XRY_048_001 | v1.2

seriesMediaParameter

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

**Increments:** Minimum 1

---

## XRay Images Forepaw IMPC_XRY_049_001 | v1.1

seriesMediaParameter

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

**Increments:** Minimum 1

---

## XRay Images Skull Lateral Orientation IMPC_XRY_050_001 | v1.2

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

**Increments:** Minimum 1

-------------------------------------------------------------------------------

# XRay Images Skull Dorso Ventral Orientation IMPC_XRY_051_001 | v1.2

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

**Increments:** Minimum 1

-------------------------------------------------------------------------------

# XRay Images Hind Leg and Hip IMPC_XRY_052_001 | v1.1

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

**Increments:** Minimum 1

-------------------------------------------------------------------------------

# Date Scanner equipment last calibrated IMPC_XRY_053_001 | v1.1

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

-------------------------------------------------------------------------------------------------------

# Free Ontology IMPC_XRY_054_001 | v1.0
simpleParameter

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

-------------------------------------------------------------------------------------------------------

# Shape of spine IMPC_XRY_055_001 | v1.1
simpleParameter

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

**Options:** normal, abnormal, imageOnly, unobservable,

-------------------------------------------------------------------------------------------------------

# Scoliosis IMPC_XRY_056_001 | v1.2
simpleParameter

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

**Options:** yes, no, imageOnly, unobservable,

-------------------------------------------------------------------------------------------------------

## Kyphosis IMPC_XRY_057_001 | v1.1
simpleParameter

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

**Options:** yes, no, imageOnly, unobservable,

-------------------------------------------------------------------------------------------

## Lordosis IMPC_XRY_058_001 | v1.1
simpleParameter

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

**Options:** yes, no, imageOnly, unobservable,

-------------------------------------------------------------------------------------------

## Shape of ribcage IMPC_XRY_059_001 | v1.1
simpleParameter

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

**Options:** normal, abnormal, imageOnly, unobservable,

-------------------------------------------------------------------------------------------

## Transitional vertebrae IMPC_XRY_060_001 | v1.1
simpleParameter

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

**Options:** yes, no, imageOnly, unobservable,

------------------------------------------------------------------------

# Fusion of processes IMPC_XRY_061_001 | v1.1

simpleParameter

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

**Options:** yes, no, imageOnly, unobservable,

------------------------------------------------------------------------

# Polysyndactylism IMPC_XRY_062_001 | v1.1

simpleParameter

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

**Options:** yes, no, imageOnly, unobservable,

------------------------------------------------------------------------

# Cervical processes IMPC_XRY_063_001 | v1.1

simpleParameter

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

**Options:** normal, abnormal, imageOnly, unobservable,

------------------------------------------------------------------------

## Thoracic processes IMPC_XRY_064_001 | v1.1

simpleParameter

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

**Options:** normal, abnormal, imageOnly, unobservable,

----------------------------------------------------------------------------------------

## Lumbar processes IMPC_XRY_065_001 | v1.1

simpleParameter

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

**Options:** normal, abnormal, imageOnly, unobservable,

----------------------------------------------------------------------------------------

## Sacral processes IMPC_XRY_066_001 | v1.0

simpleParameter

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

**Options:** normal, abnormal, imageOnly, unobservable,

----------------------------------------------------------------------------------------

## Caudal processes IMPC_XRY_067_001 | v1.0

simpleParameter

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

**Options:** normal, abnormal, imageOnly, unobservable,

--------------------------------------------------------------------------

# Missing cranial rib IMPC_XRY_068_001 | v1.0

simpleParameter

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

**Options:** Yes, No,

--------------------------------------------------------------------------

# Rib morphology IMPC_XRY_069_001 | v1.0

simpleParameter

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

**Description:** rib_morphology

**Options:** abnormal, normal, imageOnly, unobservable,

--------------------------------------------------------------------------

# Cervical vertebrae morphology IMPC_XRY_070_001 | v1.0

simpleParameter

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

**Description:** cervical_vertebrae_morphology

**Options:** abnormal, normal, unobservable, imageOnly,

---

# Thoracic vertebrae morphology IMPC_XRY_071_001 | v1.0
simpleParameter

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

**Description:** thoracic_vertebrae_morphology

**Options:** abnormal, normal, unobservable, imageOnly,

---

# Lumbar vertebrae morphology IMPC_XRY_072_001 | v1.0
simpleParameter

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

**Description:** lumbar_vertebrae_morphology

**Options:** normal, abnormal, imageOnly, unobservable,

---

# Pelvic vertebrae morphology IMPC_XRY_073_001 | v1.0
simpleParameter

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

**Description:** pelvic_vertebrae_morphology

**Options:** abnormal, normal, imageOnly, unobservable,

------------------------------------------------------------

# Caudal vertebrae morphology IMPC_XRY_074_001 | v1.0

simpleParameter

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

**Description:** caudal_vertebrae_morphology

**Options:** normal, abnormal, imageOnly, unobservable,

------------------------------------------------------------