

# Musculoskeletal Pathology

You need to know all the possible effects your test article might have on the bones and joints of patients. Charles River provides comprehensive bone, muscle, cartilage, and hard tissue pathology-based services to support the evaluation of metabolic diseases, arthritis, and orthopedic devices. Our experienced pathologists and scientists, together with a team of highly trained technicians, provide study design and project execution services for therapeutics devised for the treatment and prevention of osteoporosis, sarcopenia, arthritis, and bone and cartilage healing.

## Histomorphometry

State-of-the-art image analysis systems permit the evaluation of standard and user-defined static and dynamic measurements for bone and medical devices. Our staff has expertise in the preparation of high-quality ground and thin sections of plastic-embedded tissue for such measurements.

Structural and dynamic changes in cortical and cancellous bone can be monitored through the application of computer-assisted histomorphometry, which measures bone matrix, cells, and fluorochrome labels. In addition, histological scoring methods are used to assess the effects of medical or surgical treatments on disease progression or development in relevant animal models.

## Pathology Evaluations

- Decalcified paraffin processing
- Undecalcified bone embedding
- Bone labeling technique
- Organ and tissue morphology
- Cellular and molecular changes
- Histomorphometry
- Radiography
- Bone densitometry
- Biomechanical strength testing

## Experience

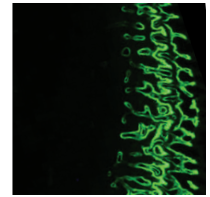
- Metabolic bone disease
  - Osteoporosis
  - Rickets/osteomalacia
  - Renal osteodystrophy
- Many bone and muscle anabolic and anticatabolic drugs
- Many toxicants targeting bone and cartilage
- Osteoarthritis and rheumatoid arthritis models
- Fracture healing and bone defect repair
- Orthopedic devices
- Bone substitutes, grafts, and cements
- Sarcopenia

## Histochemical Stains

- Goldner's trichrome
- Toluidine blue
- von Kossa
- Safranin O
- Sirius red
- Stevenel's blue

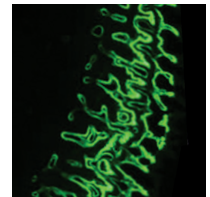
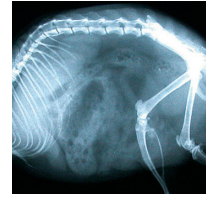
## Immunohistochemistry Stains

- Collagen I
- Collagen II
- Aggrecan
- Osteonectin



## Bone Densitometry, Radiography and Body Composition

Precise measurements of bone mass and geometry are crucial in evaluating the effects of drug efficacy or disease. The state-of-the-art imaging laboratory at Charles River offers high-throughput scanning of excised bones and *in vivo* scanning at clinically relevant sites in laboratory animals. Equipment is available for standard radiology, dual energy X-ray absorptiometry (DXA), quantitative computer tomography (QCT), and micro-CT scanning. DXA and pQCT are also used for body composition analysis *in vivo*. DXA total body composition provides useful information on whole-body fat mass and lean mass. QCT allows quantification of fat and lean mass at specific sites.



## Biomechanical Strength Testing

Bone strength measurements are the most critical endpoint in evaluating the effects of drug treatment on the integrity of bone, and are an important index of bone quality. Biomechanical tests validated to GLP standards include three- or four-point bending, femoral neck shear, compression, and torsion. Coupled with our expertise in imaging, bone strength measurements are correlated with bone densitometry parameters to evaluate the important relationship between bone mass and strength.

## Technical Capabilities

- Image Pro Plus image analyzers linked to microscopes
  - Epifluorescent illumination
  - Polarization attachment
- EXAKT systems for cutting and grinding undecalcified bone or biomaterial sections
- Polycut sledge microtomes for sectioning large undecalcified sections
- Hologic® Discovery A scanners for bone densitometry (DXA)
- Stratec® XCT Research SA and Stratec® XCT 3000 scanners for bone densitometry (QCT)
- Radiography
  - Conventional
  - Digital
  - High-resolution radiology: Faxitron
- Scanco VivaCT-40 for micro-CT scanning
- MTS Mini Bionix® servohydraulic test system for bone biomechanical testing
- Bose ElectroForce 3300 System for bone biomechanical testing