

JOINT REPLACEMENT THERAPY

Bone-on-bone

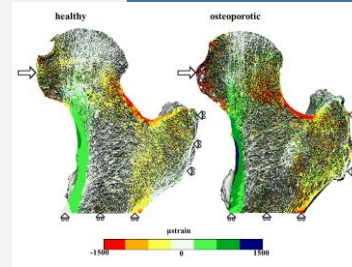


Total Knee



- Over 1 million joint replacements are performed annually, making them one of the most common operations.
- Osteoarthritis (OA), or degeneration of cartilage lining the joint, affects 65% of people over 70 and is the leading cause for joint replacements
- Biomaterials and biomechanics research has significantly increased the lifespan of replacements
- Research is needed to stop or slow cartilage loss, prevent joint infection, and develop new implant materials.

ADVANCED IMAGING

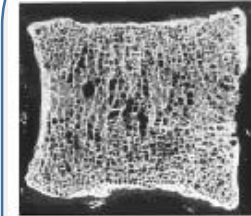


Computational modeling of the hip

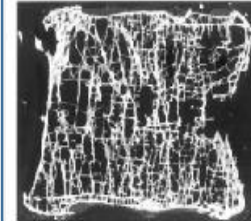
- Recent advances in imaging technology – including CT scans, MRI's and PET scans – have revolutionized the diagnosis and treatment of orthopaedic disease by providing high resolution 3D imaging of tissues.
- Current imaging research is directed at providing physicians with better tools to diagnose and quantify disease, which will lead to earlier and more accurate diagnosis and, ultimately, more successful treatment.

OSTEOPOROSIS & ANTI-RESORPTION THERAPIES

Healthy Bone



Osteoporotic Bone



Changes in bone density with osteoporosis

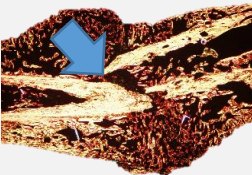
- Osteoporosis is the bone disease, producing brittle bones due to bone resorption (loss)
- 1 in 3 women and 1 in 5 men suffer an osteoporotic fracture
- Orthopaedic research and validated therapies for osteoporosis have been shown to reduce the risk in patients by 50%
- Continued research is needed to understand the underlying mechanisms of the disease and to develop new treatment options.

FRACTURE HEALING

Radiograph



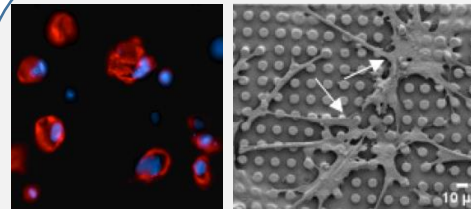
Histology



Healing of long bone fractures in pre-clinical models

- There are ~15 million fractures per year in the US, and up to 20% will not heal properly.
- Bone healing is negatively impacted by factors, such as, complexity of the injury, older age, diabetes, smoking, infection
- Research efforts have improved healing by developing better ways of stabilizing bones and new drugs
- Continued research will aim to accelerate bone repair for the ~3 million fractures with impaired healing and create new bone to treat large bone defects

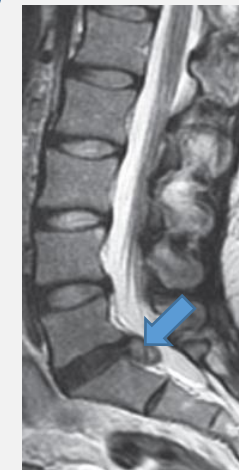
STEM CELLS THERAPIES



Stem cells grown in scaffolds for bone and cartilage engineering

- Tissue resident stem cells have been discovered in many skeletal tissues, including the bone marrow, outer surface of the bone, the joint lining, muscle, fat, and possibly cartilage tissues.
- NIH funding has enabled the discovery of these cells along with a study of their normal tissue repair and potential regenerative applications.
- Cross-disciplinary research lead by ORS teams continues to pioneer new therapeutic applications for stem cells that will revolutionize orthopaedic care.

BACK & NECK PAIN



Herniated disk compresses nerve and causes pain

- ~80% Americans with chronic back pain during their lifetime, with 31 million at any given time
- Advancements in minimally-invasive surgery and bioactive substrates for bone fusion between injured vertebrae has led to reduced pain
- Ongoing orthopaedic research aims to understand the underlying mechanisms of degeneration of the spine by injury and disease
- Stem cell therapies, combined with engineering strategies and drugs are being investigated as future ways to eliminate pain