Karen A. Hasty, PhD
Wilhelm Professor of Orthopaedic Surgery

Research Areas

Osteoarthritis
Regulation of matrix metalloproteinases in cartilage degradation
Theranostic nanosomes
Tissue engineering of cartilage and bone for orthopaedic applications
Intracellular Pathways Downregulating Matrix Metalloproteinase Production

Peripheral blood mononuclear cells
Membrane Receptors

LPA, S1P, Cytokines

Pre-IL1α

IclILra

No inducible MMP1

Type I Collagen

CELL

1

2

3
IVIS Imaging of XenoFluor-labeled antibody targeting OA in guinea pig joints.

Increased binding of antibody in knees of older guinea pigs

Early detection of OA at 5 months

Joint dissection

Tibia plateaus
Meniscus
Patella
Femoral Condyles
### ASTC collagen scaffold carrier for platelets for implantation around tendinous insertion in rat tibia.

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Collagen+PRP</th>
<th>Collagen+PRP+TCP</th>
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<tbody>
<tr>
<td>Volume of calcified tissue in tendinous insertion site (5 wks after transplantation)</td>
<td><img src="image" alt="Graph" /></td>
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- Increased bone surrounding tendinous insertion at 5 wks.
- Increased vascularity of tendinous insertion at 5 wks.
The DNA Discovery Core-Dr Weikuan Gu, Director
UTHSC-Campbell Clinic, Department of Orthopaedic Surgery

- **Service:** The core provides microarray analysis, genome screening and polymorphic detection for research and education in UT and other institutions in Tennessee. The core is continuously developing and modifying protocols for faster processing and lower cost of services.

- **Research:** The core serves as a resource for the development of research projects that gene profiling, genetic mapping, fine mapping, genome screening, DNA sequencing, and positional cloning.

- **Education:** The core serves as an education and training base for genetic and genomic analyses. Training currently includes genomic analysis and genome comparison, genome screening, simple sequence repeat length polymorphism (SSLP) analysis, single nucleotide polymorphism (SNP) detection, and DNA sequencing.
Mouse model for spontaneous fracture of bones

We have discovered a deletion of the Gulo gene in the sfx mouse, a strain characterized by spontaneous bone fractures. Gulo is a gene encoding a key enzyme in the synthesis of ascorbic acid (Vitamin C). By supplying different amounts of Vitamin C to the sfx mouse at different ages, we can use this model to study pathways relevant to bone fracture.

Pathology of the sfx mouse

Positional cloning of the mutated gene

Expression profiles of different genes in mutated and wild type mice
The long bone abnormality (Lbab) mouse is an autosomal recessive mutant characterized by overall smaller body size with proportionate dwarfing of all organs and shorter long bones, a useful model for hereditary human achondroplasia.
Dr. Richard A. Smith
UTHSC-Campbell Clinic
Department of Orthopaedic Surgery

Research Interests:

In vitro studies
- Cellular responses to biomaterials
- Osteocalcium and cellular metabolism
- Inflammatory and reparative cells in wound healing
- Regulation of host cell function by factors in tick saliva

In vivo studies
- Biocompatibility of polymers and metals
- Enhancement of bone repair (biologics, ultrasound, scaffolds)
- Drug modulation and effect of growth factors on periprosthetic osteolysis
- Tissue engineering and treatment for intervertebral disc degeneration
Periprosthetic Osteolysis in a Rat Femur  
Effect of Wear Debris Adjacent to a Titanium implant

MicroCT Analysis of Bone  
Formation Around a Titanium Pin

Bone Attachment to Metal Implant

Yellow = bone, Gray = titanium pin
Mechanical Testing of Bone Adherence to Titanium pin

Wear debris significantly reduces bone attachment to the prosthesis mechanically destabilizing and shortening time before revision is needed.
Macrophage Reaction to Titanium Particles

Large numbers of particles are toxic to the cells and increase PGE₂ production.

- TNF-alpha production is LPS-dose dependent.
- Large numbers of particles are toxic to the cells and increase PGE₂ production.

**Graphs:**
- PGE₂ (pg/ml) vs cell number.
- TNF-alpha (pg/ml) vs [LPS] on particles vs clean particles (µg/ml).

**Legend:**
- 1 Titanium particle/cell
- Only cells: clean, 1:10, 1:100, 1:500, 1:1000, 1:1 LPS
- Cell:particle #