MURTAZA WASI, Ph.D.

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ORTHOPEDIC BIOLOGY · BIOMECHANICS · PRECLINICAL EVALUATION

PROFESSIONAL SUMMARY

Research Scientist with 6+ years of experience investigating bone biology, mechanobiology, and preclinical orthopedic research. Expertise in designing hypothesis-driven in vitro and in vivo studies, biological evaluation of skeletal tissues, biomechanical testing, assay development, quantitative histology, and computational image analysis. Proven ability to develop robust experimental workflows, generate reproducible data, and collaborate across multidisciplinary teams to advance orthopedic innovation.

PROFESSIONAL EXPERIENCE

Postdoctoral Associate | Lewis Lab, Meinig School of BME, Cornell University | Sept 2024 – Aug 2026

Functional Imaging Assay Development

Utilized an *in vivo* functional imaging platform integrating localized pharmacological perturbation, intravital two-photon microscopy, controlled mechanical loading, and real-time calcium imaging to quantify osteocyte mechanosensitivity.

- Established standardized experimental workflows for localized drug delivery, physiological loading, and quantitative calcium imaging *in vivo*.
- Validated a reproducible IHC assay for functional phenotyping of osteocyte mechanotransduction at single-cell resolution.
- Demonstrated that acetylcholine maxes out osteocyte mechanosensitivity, identifying a novel potential therapeutic target for bone modeling and anabolism.

Longitudinal Therapeutic Evaluation

Developed a multidimensional preclinical evaluation platform to investigate the acute and long-term effects of sclerostin monoclonal antibody therapy on osteocyte mechanotransduction and bone development.

- Integrated calcium imaging, morphometric analysis, histology, serum biomarkers, RNA sequencing, and micro CT into a unified therapeutic evaluation workflow.
- Designed longitudinal experimental protocols linking functional cellular responses with tissue remodeling
- Identified structural and functional adaptations underlying reduced therapeutic response following prolonged treatment.
- Generated mechanistic evidence supporting improved evaluation strategies for future anabolic therapies.

3D Imaging Technology Development

Engineered an advanced whole-bone tissue-clearing platform enabling three-dimensional visualization of intact mineralized tissues.

- Redesigned conventional tissue-clearing protocol using BABB method to improve optical transparency compared to the gold standard PEGASOS method while preserving structural integrity and antigenicity.
- Optimized immunostaining, imaging, and sample preparation workflows for confocal and light-sheet microscopy.
- Optimized and validated an advanced whole-tissue clearing protocol, increasing imaging depth by 2-folds and reducing processing time/variability compared to legacy methodologies
- Created a scalable imaging platform expanding quantitative analysis of skeletal innervation.

Computational Quantitative Biology Platform

Engineered an end-to-end computational image-analysis platform transforming qualitative volumetric imaging into reproducible quantitative biological measurements.

- Developed automated Python workflows integrating segmentation, graph analysis, morphometric quantification, and quality-control algorithms.
- Reduced manual processing while improving analytical reproducibility and throughput.
- Standardized quantitative outputs including nerve density, branching architecture, and spatial organization.

- Troubleshooting laboratory instrumentation performance, manage multi-project timelines simultaneously, and mentor junior researchers on equipment use, preclinical surgeries, assay physics, data processing pipelines, and statistical analysis.
- Transgenic Mice breeding and routine colony maintenance

Graduate Research Assistant | Wang Biomechanics Lab, University of Delaware | Sept 2019 – Aug 2024

Preclinical Therapeutic Evaluation Platform

Designed progressively complex preclinical therapeutic evaluation models to investigate how biological and mechanical interventions influence skeletal adaptation across aging, chemotherapy, and metastatic breast cancer.

- Established standardized in vivo mouse models integrating tibial loading, pharmacological intervention (Yoda1), chemotherapy, and metastatic breast cancer.
- Designed longitudinal therapeutic evaluation workflows incorporating structural, cellular, molecular, and biomechanical endpoints.
- Developed scalable experimental protocols enabling quantitative assessment of therapeutic efficacy across increasingly complex disease conditions.
- Created a reproducible preclinical platform supporting mechanistic evaluation of skeletal therapeutics.

Quantitative Biomarker & Functional Assessment Platform

Built comprehensive quantitative workflows to characterize therapeutic response from whole-bone mechanics through cellular remodeling.

- Integrated microCT, histology, immunohistochemistry, flow cytometry, osteoblast differentiation assays, osteoclast functional assays, and ex vivo three-point bending into a unified evaluation strategy.
- Developed standardized quantitative assays measuring osteoblast activity, osteoclast resorption, osteocyte apoptosis, tumor burden, and bone structural integrity.
- Correlated biomechanical performance with cellular and molecular biomarkers to establish multidimensional therapeutic response profiles.
- Generated reproducible analytical workflows supporting quantitative comparison across multiple treatment modalities.

Biomechanical Performance Evaluation

Developed biomechanical testing strategies to validate the relationship between structural macro-properties (strength/stiffness) and cellular/molecular micro-biomarkers.

- Designed ex vivo three-point bending studies quantifying bone strength, stiffness, and fracture resistance following aging, chemotherapy, metastatic disease, and therapeutic intervention.
- Combined biomechanical measurements with imaging and histological analyses to establish relationships between tissue remodeling and functional bone performance.
- Demonstrated that combined Piezo1 activation and mechanical loading preserved cortical bone properties under clinically relevant disease conditions.
- Generated quantitative evidence supporting mechanobiological strategies for skeletal preservation.

Engineering Intern | Unilever Bangladesh Limited | Mar 2018 – May 2018

Manufacturing Process Optimization & Root Cause Analysis

Developed a data-driven process optimization strategy to identify and reduce excess product giveaway in a high-speed toothpaste filling line using Six Sigma DMAIC methodology

- Designed statistical process control workflows using control charts, process capability (Cp/Cpk), confidence intervals, and normal distribution modeling to evaluate manufacturing performance.
- Developed quantitative models relating machine parameters, material properties, and process settings to product fill accuracy and manufacturing variability.
- Performed systematic root-cause investigations by evaluating machine performance, batch density variation, packaging variability, operator adjustment, and process waste across multiple production shifts.
- Prioritized improvement opportunities through Pareto analysis, demonstrating that three critical variables accounted for over 80% of production losses.
- Recommended data-driven process optimization, calibration, preventive maintenance, and standardized operating procedures to improve manufacturing robustness and product consistency.

EDUCATION

Ph.D., Mechanical Engineering (Focus: Biomechanics) · University of Delaware · 2024

M.Sc., Mechanical Engineering · University of Delaware · 2022

B.Sc., Mechanical Engineering · Bangladesh University of Engineering and Technology · 2018

TECHNICAL SKILLS

Biomechanics & Orthopedic Evaluation: Ex vivo three-point bending mechanical testing, mechanical loading models, bone strength assessment, fracture resistance evaluation, Micro-CT morphometry, confocal, multiphoton, light-sheet and IVIS imaging.
Biological Evaluation & Assay Development: Quantitative immunohistochemistry, osteoblast differentiation (ALP/mineralization), TRAP staining, TUNEL, Caspase-3, MMP13, tissue characterization, protocol optimization and assay validation.
Computational Image Analysis & Software: Automated Image Processing Pipelines, Computer Vision Feature Extraction, Python (OpenCV, NumPy, Pandas), MATLAB, ImageJ/Fiji, QuPath, Data Mapping Frameworks, Workflow Optimization, Statistical Modeling (ANOVA, Hypothesis Testing)
In Vitro Complex Cell Models: Multi-step Functional Assays, Cell-Based Screenings (ALP, TRAP, Caspase3, MMP-13, TUNEL, Flow Cytometry)
Documentation & Compliance: Protocol Development and Standardization, SOP Generation, Tabular Data Validation, Experimental Workflow Design, Data Quality Control, Equipment Verification & Troubleshooting.

SELECTED PUBLICATIONS

Wasi M, et al. Moderate tibial loading and Yoda1 on breast cancer-induced osteolysis. *Bone*. 2025.
Chu T, **Wasi M**, et al. **"**Skeletal response to Yoda1 and whole-body vibration in mice varied with animal age, bone compartment, treatment duration, and radiation exposure", *Bone*. 2025
Wasi M, et al. Intravital Microscopy of Osteocytes: A New Era in Bone Cell Biology. *Current Osteoporosis Reports*. 2025.
Wasi M, et al. Mitigating Aging and Doxorubicin Induced Bone Loss. *Bone*. 2024.
Lin CY, **Wasi M**, et al. Yoda1 Enhanced Vibration on Osteocytes in Breast Cancer Cell Migration. *Cancers*. 2022.
Wang S, **Wasi M**, et al. Tibial loading and treadmill running protect murine bone from metastasized breast cancer. *Bone*. 2021.

SELECTED SCIENTIFIC PRESENTATIONS

"Investigating Local Acetylcholine Regulation of Osteocyte Mechanotransduction via Intravital Imaging." Plenary Poster, ASBMR Annual Conference, 2026.
"Interrogating the impact of sustained Sclerostin monoclonal antibody treatment on *in vivo* osteocyte mechanosensitivity." Orthopedic Research Society (ORS) Annual Meeting, 2026.
"Yoda1 augmented loading rescued bone after chemotherapy." CBER/DCMR Research Symposium, 2023.
"Yoda1 Protects Cortical Bone in Aged Mice Bearing Breast Cancer." American Society for Bone and Mineral Research (ASBMR) Annual Meeting, 2022.

AWARDS & HONORS

- Plenary Poster, ASBMR Conference (2026)
- Doctoral Fellowship for Excellence, University of Delaware (2023)
- Best Podium Talk, CBER and DCMR Symposium (2024)
- Best Poster in Micro-CT Category, PCMD Annual Symposium (2022)
- Endocrine Fellowship and Conference Travel Award (2021)
- Champion, Battle of Minds, BATB, Bangladesh (2017)