Dr. Diane Nam

"The molecular and cellular mediation of fracture healing: from the bench to the bedside"

Fractures are frequent orthopaedic injuries afflicting millions of individuals globally. Accelerating fracture healing and/or decreasing nonunions could greatly reduce the burden of injury to restore early functional recovery. Dr. Nam's research investigates the cellular and molecular effects of bone regeneration within the immune system. She established that T helper cell (Th17) mediated secretion of the pro-inflammatory cytokine, interleukin-17F (IL-17F), directly activates osteoblasts. This novel finding of interactions between T-lymphocytes, IL-17F and osteoblast biology revealed new molecular targets with the potential for clinical applications to improve bone healing. The signal transduction of IL-17F within the osteoblast was found to promote osteoblast differentiation which was independent of the established canonical Wingless (Wnt) pathway and β-catenin signaling. This generated new insights on the immune modulation of fracture healing which was temporally distinct from the reparative and remodeling phases. Knowing that lithium (Li) was an inexpensive modulator of the Wnt signaling system, Dr. Nam and her research team determined the specific oral dosing, timing and duration of Li treatment for fracture management and demonstrated a significant increase in strength of healing femoral fractures using a preclinical animal fracture model. The eventual clinical translation of this work has led her to conduct a randomized controlled clinical trial using Li for fracture treatment (LiFT). Similar translational research related to the positive impact of probiotics and the modulation of the gut microbiome on fracture healing has been an area of recent study that may further provide a low-risk adjunctive therapy to improve the biomechanical properties of healing bone. Dr. Nam's research aims to redefine how fracture healing is managed and hopes to bring low cost, widely accessible treatments to orthopaedic patients.