Novel Innovations for Tissue Regeneration in Osteoarthritis charged: Colorado State veterinary scientists partner on impactful osteoarthritis research

Christopher Outcalt, BA; Sarah Nesbella, MA; Sue VandeWoude, DVM; Kristen Browning-Blas, BA*

College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO

*Corresponding author: Kristen Browning-Blas (Kristen.Browning-Blas@colostate.edu)
doi.org/10.2460/ajvr.24.06.0168

Colorado State University (CSU) is a key partner in 2 multimillion-dollar projects aimed at producing new regenerative therapies for patients struggling with osteoarthritis, a degenerative joint disease that impacts millions of patients a year.

In March, the Advanced Research Projects Agency for Health (ARPA-H) announced the Novel Innovations for Tissue Regeneration in Osteoarthritis (NITRO) program’s 5 performer teams. The ARPA-H, an agency within the U.S. Department of Health and Human Services, supports “high-impact solutions to society’s most challenging health problems.”

The NITRO project aims to create new osteoarthritis therapeutics. The goal is to develop and leverage innovative forms of regenerative medicine to create therapeutics that fully regenerate damaged joints.

Colorado State University laboratories in the College of Veterinary Medicine and Biomedical Sciences are providing critical roles in 2 of the 5 recently awarded NITRO projects.

Preclinical Support for Joint Replacement

Laboratories in the CSU Translational Medicine Institute will contribute to “OMEGA: Orchestrating Multifaceted Engineering for Growing Artificial Joints.” This up-to-$47-million project aims to engineer, grow, and commercialize “live” replacement joints to treat osteoarthritis.

The OMEGA team is a multicenter group led by Case Western Reserve University and includes CSU, The Ohio State University, Rice University, and Washington State University. Jeremiah Easley, DVM, director of the CSU Preclinical Surgical Research Laboratory, and Ben Gadomski, PhD, associate research professor at CSU’s Orthopedic Bioengineering Research Laboratory, will serve as coprincipal investigators for the CSU subaward on this project.

The labs will conduct high-resolution imaging for custom implant creation and will provide the necessary biological cell types for tissue regrowth. Pilot studies will perform a crucial study to test devices that will ultimately replace joint components with absorbable and biological materials. Ultimately, CSU will conduct Good Laboratory Practice studies for FDA regulatory submission.

The aims of this project are to restore patient mobility and alleviate the burden of joint-related disabilities worldwide, with the goal of reshaping the landscape of musculoskeletal healthcare. The hope is to pave the way for a future where joint regeneration is a tangible reality.

Gene Therapy Clinical Trials on the Horizon

This NITRO award includes a team of engineers, medical scientists, and veterinarians from Colorado University-Boulder, the Colorado University-Anschutz Medical Campus, and CSU. “NITRO-mBMAT: A minimally invasive Multimodal BioMAterial approach to tissue regeneration in osteoarthritis,” hopes to commercialize 3 innovations: a healing injection, an injury-patching hydrogel, and an annual infusion, each providing a systemic treatment for osteoarthritis. Colorado State University is lending its expertise in translational medicine on the up-to-$39-million effort.

Colorado State University’s coprincipal investigators, Kelly Santangelo, DVM, PhD, veterinary clinical pathologist and professor, Department of Microbiology, Immunology, and Pathology; and Laurie Goodrich, DVM, PhD, professor and director of CSU’s Orthopedic Research Center, will develop the gene therapy and cellular components that will be integral to controlling inflammation and delivering important factors that will restore cartilage and bone health. One task will be to develop nanoparticles that could be administered IV, travel to inflamed sites, and restore joint structure and function.

The first step will be tested in vitro and translated to validated animal models that represent diseases of both veterinary and human patients.

The team plans to conduct trials in human patients within 5 years. This project aims to enhance accessibility of patient care and minimize costs for treatment of osteoarthritis in humans. Results would be applicable to animals as well.

The CSU Translational Medicine Institute was founded in 2019 with the vision of “Leading the way in discovery and implementation of the body’s therapeutics to improve the lives of animals and their humans.” Participation in these 2 prestigious awards will provide opportunities for robust early success toward these goals.