

Summer Student Research Program  
Project Description

FACULTY SPONSOR'S NAME AND DEGREE: *Patrick O'Connor, Ph.D.*

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PROJECT TITLE (200 Characters max):

*Control of Skeletal Maintenance and Regeneration by Inflammatory Lipid Mediators*

**HYPOTHESIS:**

*Loss or inhibition of inflammatory lipid mediator synthesis enzymes, COX-2 and 5-Lipoxygenase, have divergent effects on bone regeneration (fracture healing) and maintenance of skeletal structures.*

**PROJECT DESCRIPTION** (Include design, methodology, data collection, techniques, data analysis to be employed and evaluation and interpretation methodology)

*An established mouse femur fracture model is used to measure how targeted loss of COX-2, 5LO, or other genes involved in these pathways affect bone fracture healing via radiographic, histological, molecular, and mechanical testing.*

*Established rat bone fracture models are used to measure the effect of drugs that inhibit COX-2, 5LO, and other proteins involved in these pathways on pain after fracture as well as fracture healing.*

*Primary and established cell culture models are used to identify signaling pathways that control COX-2 expression in myeloid-derived cells (macrophages and osteoclasts) and how COX-2 expression in myeloid derived cells affects the differentiation, activity, and survival or other cell types involved in skeletal maintenance and regeneration.*

**SPONSOR'S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:**

*Teitelbaum, M., Culbertson, M.D., Wetterstrand, C. and O'Connor, J.P. 2024. Impaired Fracture Healing is Associated with Callus Chondro-Osseous Junction Abnormalities in Periostin-null and Osteopontin-null Mice. Exp Biol Med (Maywood) submitted.*

*Kanjilal, D., Grieg, C., Culbertson, M. D., Lin, S. S., Vives, M., Benevenia, J. and O'Connor, J. P. 2021. Improved osteogenesis in rat femur segmental defects treated with human allograft and zinc adjuvants. Exp Biol Med (Maywood) 246(16): 1857-1868. DOI: 10.1177/15353702211019008.*

*Paglia, D. N., Kanjilal, D., Kadkoy, Y., Moskonas, S., Wetterstrand, C., Lin, A., Galloway, J., Tompson, J., Culbertson, M. D. and O'Connor, J. P. 2020. Naproxen treatment inhibits articular cartilage loss in a rat model of osteoarthritis. J Orthop Res. DOI: 10.1002/jor.24937.*

**IS THIS PROJECT SUPPORTED BY EXTRAMURAL FUNDS?**

Yes  or No

(IF YES, PLEASE SUPPLY THE GRANTING AGENCY'S NAME)

*Stryker*

*CreOsso, LLC*

*New Jersey Health Foundation*

THIS PROJECT IS:  Clinical  Laboratory  Behavioral  Other

THIS PROJECT IS CANCER-RELATED

Please explain Cancer relevance

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*Our research involves developing and testing new therapies to improve bone regeneration including improving bone regeneration in large skeletal defects associated with tumor resection.*

THIS PROJECT IS HEART, LUNG & BLOOD- RELATED

Please explain Heart, Lung, Blood relevance

THIS PROJECT EMPLOYS RADIOISOTOPES

THIS PROJECT INVOLVES THE USE OF ANIMALS

PENDING

APPROVED

IACUC PROTOCOL #201800006 and 201800021

THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS

PENDING

APPROVED

IRB PROTOCOL # M

THIS PROJECT IS SUITABLE FOR:

UNDERGRADUATE STUDENTS

ENTERING FRESHMAN

SOPHOMORES

ALL STUDENTS

THIS PROJECT IS WORK-STUDY: Yes  or No

THIS PROJECT WILL BE POSTED DURING ACADEMIC YEAR  
FOR INTERESTED VOLUNTEERS?: Yes  or No

WHAT WILL THE STUDENT LEARN FROM THIS EXPERIENCE?

*Depending upon the project, the student is expected to learn advanced animal experimental skills or advanced cell culture skills, radiographic and histological methods, basic laboratory practices and data analysis. The student is also expected to develop a significant understanding of skeletal biology.*