Introduction: Osteoarthritis (OA), the most common type of joint disease, is a degenerative disorder resulting from the breakdown of articular cartilage in the synovial joints. Current treatments range from conservative options like NSAIDs and physical therapy to surgical procedures i.e., joint arthroplasty, but none of these available treatments protect articular cartilage. Previous work in our lab has shown that OP-1 has a potential protective effect on cartilage during the development of osteoarthritis.[1] The purpose of this study was to determine whether OP-1 could decrease the amount of cartilage degradation in pre-existing OA. Other studies have shown that OP-1 (BMP-7) is vital to cartilage matrix integrity and repair[2], stimulates synthesis of cartilage matrix components, proteoglycans and collagen[3], has a protective effect against catabolic mediators such as MMPs and IL-1[4,5].

Materials and Methods: The rabbit ACL T model was used in which the anterior cruciate ligament (ACL) was transected leading to osteoarthritis.[6] OP-1 was delivered to the joint surgically by implantation of an Alzet osmotic pump into the medial thigh with a catheter threaded from the pump into the knee joint. 30 rabbits (15 experimental, 15 control) had the ACLT surgery, then 4 weeks later had the pump implanted during a second surgery. These rabbits were sacrificed 9 weeks after the initial ACLT or 5 weeks after inserting the pump. The osteoarthritis was graded using the Outerbridge classification with India Ink staining. The criteria is: Grade 1 (intact surface), Grade 2 (minimal fibrillation), Grade 3 (overt fibrillation) and Grade 4 (erosion). Histological staining and histomorphometry with Hematoxylin & Eosin and Safranin O were performed to analyze OA progression and Semi-quantitative Polymerase Chain Reaction (PCR) was performed for for anabolic genes, aggrecan and type II collagen, and catabolic genes, aggrecanase, MMP-3 and MMP-13.

Results: The experimental group showed less cartilage degradation than the controls(Fig 1). The experimental group had an average Outerbridge score of 1.9 versus 2.6 for the controls(Fig 2A). In the control group, 46% of the condyles were graded 3 or 4, indicating they had a high degree of cartilage fibrillation or loss. In the OP-1 treated group, only 22% of the condyles were graded either 3 or 4(Fig 2B). Semi-quantitative PCR showed a significantly greater expression of aggrecan in the OP-1 treated cartilage when compared to controls and less expression of MMP-3 and MMP-13, important catabolic mediators(Fig 3A). The synovial tissue of the experimental group also showed a significantly decreased expression of MMP-3, MMP-13 and aggrecanase(Fig 3B).

Discussion: OP-1 may be a potential treatment for reducing the degradation or articular cartilage in OA.