Queen Mary Innovation

Opportunity 2019050
Investment opportunity

A molecule to promote cartilage regeneration and treat osteoarthritis

A novel engineered protein ligand, offering a multi-faceted solution for osteoarthritis treatment by preserving cartilage, eliminating pain, and promoting stable cartilage formation.

Background

Osteoarthritis (OA) is a is debilitating joint disease characterised by breakdown of the articular cartilage and bone changes, including thickening of the bone supporting the cartilage and excessive bone formation at the margins of the joint (osteophytes). Cartilage regeneration and symptomatic relief in these patients will restore quality of life and revert disability.

The Problem

Current therapies for osteoarthritis (OA) primarily focus on symptom management using non-steroidal anti-inflammatory drugs and, in advanced cases, joint replacement, rather than addressing the underlying disease. This approach lacks disease-modifying effects, leaving a critical unmet need for treatments that target and protect cartilage, as OA progression continues. Additionally, the neglect of therapeutically targeting chondrocyte hypertrophy, a key driver of OA, underscores the inadequacies of current interventions, and addressing the persistent pain associated with OA remains another unmet challenge in the field of OA treatment.

Invention: Benefits & Application

CXCR1 and CXCR2 are receptors that play a crucial role in maintaining cartilage homeostasis. They promote chondrocyte phenotypic stability and articular chondrogenesis while preventing chondrocyte hypertrophy and osteogenesis. However, their activation can also lead to detrimental inflammation by promoting the migration and infiltration of immune cells. Protein Z is an engineered secreted protein ligand of these receptors developed by QMUL researchers. When repeatedly injected into joints, it offers protection against cartilage degeneration in osteoarthritis models. Notably, it eliminates pain in a mouse osteoarthritis model, making it a potential treatment for pain relief. Since Protein Z is a modified protein that naturally occurs in the human body, there is a reduced risk of rejection when used therapeutically. Furthermore, unlike other proteins that can induce cartilage formation, Protein Z supports the creation of stable cartilage without the risk of transforming into bone, making it a promising candidate for osteoarthritis treatment. Its mechanisms of action have been thoroughly characterised, enhancing its potential in clinical applications.

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Molecule Z enhances expression of cartilage specific markers and reduced chondrocyte hypertrophy.

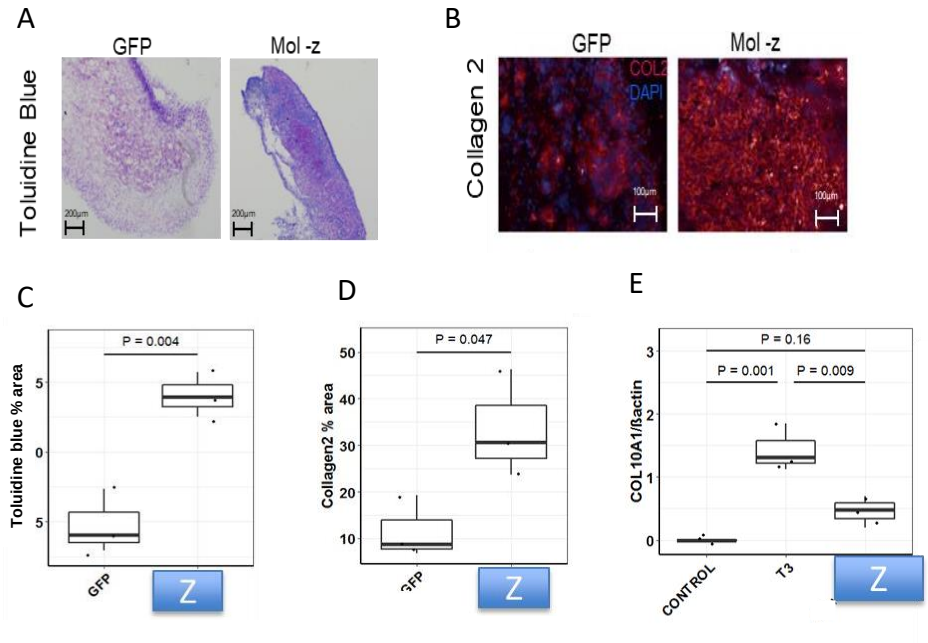

Fig.1 Human osteoarthritic chondrocytes were implanted ectopically in nude mice and formed human cartilage organoids. Exogenous protein Z enhanced the production of cartilage-specific, proteoglycan-rich extracellular matrix (A, C), the expression of the mature cartilage marker collagen type II (B, D) and reduced the capacity of thyroid hormone to induce chondrocyte hypertrophy (a driver of osteoarthritis) (E).

Molecule Z reduced cartilage loss and pain in murine model of osteoarthritis.

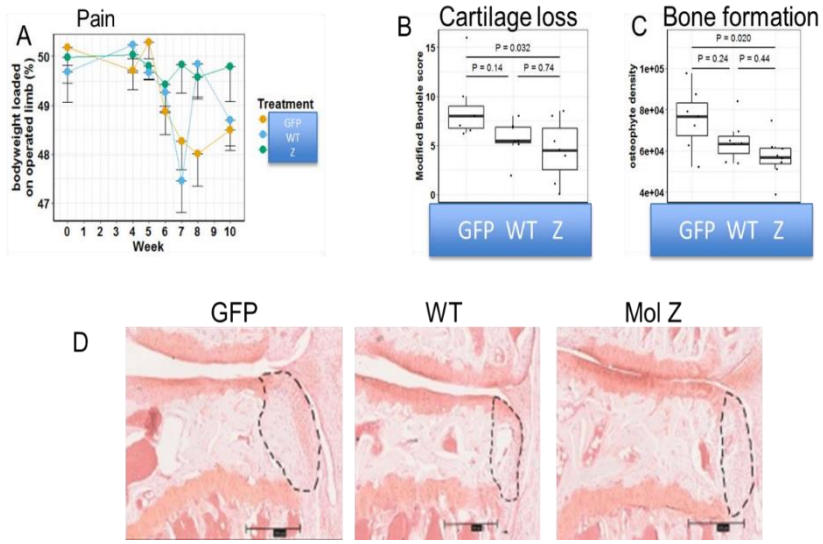

Fig.2 The administration of molecule Z in therapeutic regime in a mouse model of osteoarthritis (resection of the medial collateral ligament and of the anterior portion of the medial meniscus) resulted in pain relief (percent of body weight loaded on the operated limb - A), less cartilage loss (B) and less osteophyte formation (C-D).

Patent

A PCT patent application has been filed.

Lead Inventor

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