

# Collagen Research

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# A COLLAGEN DOMAIN-DERIVED SHORT ADIPONECTIN PEPTIDE ACTIVATES APPL1 AND AMPK SIGNALING PATHWAYS AND IMPROVES GLUCOSE AND FATTY ACID METABOLISMS

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## SEQUENTIAL EXTRACTION OF GEL FORMING PROTEINS, COLLAGEN AND COLLAGEN HYDROLYSATE FROM GUTTED SILVER CARP (HYPOPHTHALMICHTHYS MOLTRIX) A BIOREFINERY APPROACH

- Collagen and collagen hydrolysate (CH) was recovered from the bone and skin containing sediment residue emerging during pH-shift-based protein isolation from silver carp. Hydrolysis resulted in higher yield (15.1-15.4%) compared to collagen isolation by acid or pepsin (3.1-5.9%) ( $p < 0.05$ ). Isolated collagens were characterized as type I and maintained their triple-helical structure, confirmed by SDS-PAGE and FTIR. Pepsin-hydrolysis and sequential hydrolysis by pepsin and trypsin hydrolyzed all heavy molecular weight chains of collagen but sequential hydrolysis yielded higher degree of hydrolysis. When CH was added to a silver carp protein isolate prior to gelation, the gel behavior was dependent on molecular weight of the added CH. More hydrolyzed collagen emerging from sequential hydrolysis improved water holding capacity of the gel while reducing its breaking force. Thus, residue from pH-shift processing of fish can be used for isolation of high quality collagen/CH and provides a promising basis for a multiple-product fish biorefinery.

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# DAILY ORAL CONSUMPTION OF HYDROLYZED TYPE 1 COLLAGEN IS CHONDROPROTECTIVE AND ANTI-INFLAMMATORY IN MURINE POST TRAUMATIC OSTEOARTHRITIS.

Osteoarthritis (OA) is a degenerative joint disease for which there are no disease modifying therapies. Thus, strategies that offer chondroprotective or regenerative capability represent a critical unmet need. Recently, oral consumption of a hydrolyzed type 1 collagen (hCol1) preparation has been reported to reduce pain in human OA and support a positive influence on chondrocyte function. To evaluate the tissue and cellular basis for these effects, we examined the impact of orally administered hCol1 in a model of posttraumatic OA (PTOA). In addition to standard chow, male C57BL/6J mice were provided a daily oral dietary supplement of hCol1 and a meniscal-ligamentous injury was induced on the right knee. At various time points post-injury, hydroxyproline (hProline) assays were performed on blood samples to confirm hCol1 delivery, and joints were harvested for tissue and molecular analyses were performed, including histomorphometry, OARSI and synovial scoring, immunohistochemistry and mRNA expression studies. Confirming ingestion of the supplements, serum hProline levels were elevated in experimental mice administered hCol1. In the hCol1 supplemented mice, chondroprotective effects were observed in injured knee joints, with dose-dependent increases in cartilage area, chondrocyte number and proteoglycan matrix at 3 and 12 weeks post-injury. Preservation of cartilage and increased chondrocyte numbers correlated with reductions in MMP13 protein levels and apoptosis, respectively. Supplemented mice also displayed reduced synovial hyperplasia that paralleled a reduction in Tnf mRNA, suggesting an anti-inflammatory effect. These findings establish that in the context of murine knee PTOA, daily oral consumption of hCol1 is chondroprotective, anti-apoptotic in articular chondrocytes, and anti-inflammatory. While the underlying mechanism driving these effects is yet to be determined, these findings provide the first tissue and cellular level information explaining the already published evidence of symptom relief supported by hCol1 in human knee OA. These results suggest that oral consumption of hCol1 is disease modifying in the context of PTOA.

# Collagen Protein

## **Arginine L-alpha-ketoglutarate, methylsulfonylmethane, hydrolyzed type I collagen and bromelain in rotator cuff tear repair: a prospective randomized study.**

[Gumina S<sup>1</sup>](#), [Passaretti D](#), [Gurzi MD](#), [Candela V](#).

### ⊕ Author information

#### **Abstract**

**OBJECTIVE:** Arthroscopic rotator cuff repair generally provides satisfactory result, in terms of decreasing shoulder pain, resulting in improvement in range of motion. Unfortunately, imaging studies have shown that after surgical repair re-rupture rate is potentially high. Literature data indicate that each of the components present in a commercial supplement sold in Italy as Tenosan \* (arginine L-alpha-ketoglutarate, methylsulfonylmethane, hydrolyzed type I collagen and bromelain) have a potential role in tendon healing and mitigating the pain due to tendonitis. We evaluated the clinical and MRI results of rotator cuff repair with and without the employment of this oral supplement in patients with a large, postero-superior rotator cuff tear (RCT).

**RESEARCH DESIGN AND METHODS:** We enrolled 90 consecutive patients who had a large, postero-superior RCT. All the lesions were managed with an arthroscopic repair. Patients were randomized and treated either with (Group I) or without (Group II) the supplement. The primary outcomes were the difference between the pre- and post-operative Constant score and repair integrity assessed by MRI according to Sugaya's classification. The secondary outcome was the pre- and post-operative Simple Shoulder Test.

**RESULTS:** No statistically significant differences were identified between the two groups for each considered variable, except for shoulder pain (follow-up: 6 months) and repair integrity (final follow-up). Intensity of shoulder pain was lower in the Group I patients ( $p < 0.001$ ). Analogously, in Group I, the percentage of patients with a better repair integrity result was significantly higher than Group II.

**CONCLUSION:** The use of the supplement for 3 months after cuff repair decreases shoulder post-operative pain and leads to a slight improvement in repair integrity. This improvement does not seem to correlate with an better objective functional outcome. However, these effects could facilitate and abbreviate the post-operative rehabilitation program and reduce re-rupture rate. The main limitations of this study are the relative short follow-up period and small number of patients studied.

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