

Abstract

Protective Effects of Green Shelled Mussels in Osteoarthritis [†]

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Background: Obesity-induced chronic inflammation is associated with metabolic syndrome, and often leads to the development of osteoarthritis. In osteoarthritis, inflammatory cells act on both bone cells and cartilage cells to cause destruction of the joint. Green shelled mussels (GSM), a seafood native to New Zealand, have been shown to inhibit inflammation and reduce pain in the joints of animals with arthritis.

Methods: Female Sprague-Dawley rats ($N \geq 10$ per group) were fed a normal control (CON) or high-fat/high-sugar (HFHS) diet with or without the inclusion of freeze-dried whole GSM from age 3 months to 7 months. Rats were assessed for serum levels of CTX-2, a biomarker for cartilage degradation. In addition, GSM extracts were used in vitro to treat undifferentiated bone cells (RAW 264.7 cells) and assessed for their ability to prevent the cells from differentiating into bone-destroying osteoclasts and producing tartrate-resistant acid phosphatase (TRAP).

Results: Unsurprisingly, rats fed a HFHS diet gained more weight and produced more CTX-2 compared to those fed a CON diet. However, the inclusion of GSM in both diets resulted in a reduction of cartilage degradation: CTX-2 levels in rats fed CON vs. CON + GSM were 194 ± 26 vs. 161 ± 25 pg/mL, while CTX-2 levels in rats fed HFHS vs HFHS + GSM were 241 ± 31 vs. 151 ± 19 pg/mL ($p = 0.02$). In vitro, a non-polar lipid extract of GSM significantly reduced osteoclast differentiation in a dose-dependent manner, with treatment at 20 μ g/mL reducing differentiation by 80% and TRAP production by 85%, whereas a polar lipid extract had no effect.

Conclusions: Dietary GSM significantly reduces the development of joint osteoarthritis caused by diet-induced metabolic syndrome in obese rats. Non-polar lipids in GSM in vitro significantly reduces the development of bone-resorbing osteoclast cells. Inclusion of GSM in the human diet is likely to protect both joint and bone health.

Supplementary Material: The poster is available online at www.mdpi.com/2504-3900/8/1/50/s1.



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