EuroSciCon

July 08-09, 2019
Vienna, Austria

4th Edition of International Conference on
Agriculture & Food Chemistry

Kai Wang, J Food Nutr Popul Health 2019, Volume 03

Antarctic krill oil improves articular cartilage degeneration *via* activating chondrocyte autophagy and inhibiting apoptosis in osteoarthritis mice

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Osteoarthritis (OA) is a major debilitating disease characterized by cartilage degeneration. In the current study, the in vivo effects of Antarctic krill oil (AKO) on cartilage degeneration in destabilization of the medial meniscus (DMM) model mouse were investigated. Results showed that AKO clearly improved the cartilage structure as evidenced by increased cartilage thickness and cartilage area and decreased histological OARSI scores. Safranin O/Fast Green staining showed that AKO remarkably inhibited the loss of cartilage matrix in mice with OA. Chondrocytes play important roles in regulation of cartilage homeostasis. AKO maintained normal chondrocyte phenotype by down regulating hypertrophy markers such as *Ihh, Col10α1, Runx2*, and MMP-13 restoring the expression of chondrocyte-specific genes, including *Acan, Col2α1, and Sox9*. Terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) staining analysis showed that AKO significantly inhibited abnormal apoptosis in articular cartilage. Autophagy is a self-protective metabolic process required for maintaining cartilage homeostasis. We observed that mTOR (negative regulator of autophagy) transcription was reduced, which was consist with high PPAR-γ levels. In addition, expression of key genes related to autophagy, including *LC-3b, Beclin-1, ATG-5*, and BNIP-3 were significantly enhanced after treatment with AKO. The p53-dependent mitochondrial apoptotic pathway plays an important role in regulating chondrocyte apoptosis. We observed that AKO suppressed the expression of key genes expression in this pathway, such as p^{53}, *Bax, Bid, cytochrome c, caspase-9*, and *caspase-3*. Furthermore, AKO enhanced the expression of anti-apoptotic genes, including *Bcl-2 and Bcl-xl*. These findings might provide a theoretical basis for the application of AKO as a potential chondroprotective bioactive compound or functional food.

Biography

Kai Wang has completed his Master's degree in Food Nutrition and Food Bio-Actives at Ocean University of China and continued to pursue the PhD of Food Science and Engineering at China Agricultural University. He has worked as an Assistant Researcher at China Ocean High-tech Innovation Center. He has published two papers on high value utilization of krill oil and fish egg glycoprotein in Journal of Functional Foods and Food Science and Biotechnology, respectively. He is now focusing on the high value utilization of aquatic protein and the study of new functional peptides.

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