Relative efficacies of omega-3 polyunsaturated fatty acids in reducing expression of key proteins in a model system for studying osteoarthritis.

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Abstract

OBJECTIVE: To assess the relative efficacy of three different omega-3 (n-3) polyunsaturated fatty acids (PUFAs) in suppressing the mRNA levels for important proteins involved in the etiology of osteoarthritis (OA).

METHODS: A model cell culture system (bovine chondrocytes) was used. Inflammatory factors and enzymes involved in OA were induced by exposure of the chondrocyte cultures to interleukin-1alpha (IL-1alpha). The effect of pre-incubating cultures with various amounts of exogenous fatty acids on subsequent levels of mRNAs was assessed by reverse transcription-polymerase chain reactions (RT-PCR).

RESULTS: Exposure of cultures to IL-1alpha induced expression of the cartilage proteinases A Disintegrin And Metalloproteinase with ThromboSpondin motifs (ADAMTS)-4 and ADAMTS-5, cyclooxygenase (COX)-2, the matrix metalloproteinase (MMP)-3 and the inflammatory cytokines IL-1alpha, interleukin-1beta (IL-1beta) and tumour necrosis factor-alpha (TNF-alpha). n-3 PUFAs were able to reduce the levels of mRNA for ADAMTS-4, ADAMTS-5, MMP-3, MMP-13, COX-2 (but not COX-1), IL-1alpha, IL-1beta and TNF-alpha. Eicosapentaenoic acid (EPA) was the most effective, followed by docosahexaenoic (DHA) and then alpha-linolenic (ALA) acid. The n-6 PUFA, arachidonic acid (AA) had no effect.

CONCLUSION: These results show that omega-3 (n-3) PUFAs cause a reduction in the mRNA levels for various proteins known to be important in the pathology of OA. They provide a molecular explanation, at least in part, for beneficial effects of dietary omega-3 PUFAs for the amelioration of symptoms of the disease. The relative efficacy of EPA suggests that this omega-3 PUFA may be especially useful for dietary supplementation in patients with OA.

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