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Omega-3 Fatty Acid Supplementation Reduces Intervertebral Disc Degeneration

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Background: Intervertebral disc (IVD) degeneration is a common cause of lower back pain, which carries substantial morbidity and economic cost. Omega-3 fatty acids (n-3 FA) are known to reduce inflammatory processes with a relatively benign side effect profile. This study aimed to investigate the effect of n-3 FA supplementation on IVD degeneration.

Material/Methods: Two non-contiguous lumbar discs of 12 Sprague Dawley rats were needle-punctured to induce disc degeneration. Post-surgery, rats were randomly assigned to either a daily n-3 FA diet (530 mg/kg/day of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in a 2: 1 ratio, administered in sucrose solution) or control diet (sucrose solution only), which was given for the duration of the study. After 1 month, blood serum arachidonic acid/eicosapentaenoic acid (AA/EPA) ratios were analyzed. After 2 months, micro-MRI (magnetic resonance imaging) analysis and histological staining of disc explants were performed to analyze the IVD.

Results: A reduction of blood AA/EPA ratios from 40 to 20 was demonstrated after 1 month of daily supplementation with n-3 FA. Micro-MRI analysis showed an injury-induced reduction of IVD hydration, which was attenuated in rats receiving n-3 FA. Histological evaluation demonstrated the destruction of nucleus pulposus tissue in response to needle puncture injury, which was less severe in the n-3 FA diet group.

Conclusions: The results of this study suggest that n-3 FA dietary supplementation reduces systemic inflammation by lowering AA/EPA ratios in blood serum and has potential protective effects on the progression of spinal disc degeneration, as demonstrated by reduced needle injury-induced dehydration of intervertebral discs and reduced histological signs of IVD degeneration.