

Abstract

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Effect of dietary fatty acids on inflammatory gene expression in healthy humans.

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BACKGROUND: Over the past 100 years, changes in the food supply in Western nations have resulted in alterations in dietary fatty acid consumption, leading to a dramatic increase in the ratio of omega-6 (omega6) to omega3 polyunsaturated fatty acids (PUFA) in circulation and in tissues. Increased omega6/omega3 ratios are hypothesized to increase inflammatory mediator production, leading to higher incidence of inflammatory diseases, and may impact inflammatory gene expression.

OBJECTIVE AND METHODS: To determine the effect of reducing the omega6/omega3 ratio on expression of inflammatory pathway genes in mononuclear cells, healthy humans were placed on a controlled diet for 1 week, then given fish oil and borage oil for an additional 4 weeks. Serum and neutrophil fatty acid composition and ex vivo leukotriene B(4) production from stimulated neutrophils were measured at the start and end of the supplementation period and after a 2-week washout. RNA was isolated from mononuclear cells and expression of PI3K, Akt, NFkappaB, and inflammatory cytokines was measured by real-time PCR.

RESULTS: A marked increase was seen in serum and neutrophil levels of long-chain omega3 PUFA concomitant with a reduction in the omega6/omega3 PUFA ratio (40%). The ex vivo capacity of stimulated neutrophils to produce leukotriene B(4) was decreased by 31%. Expression of PI3Kalpha and PI3Kgamma and the quantity of PI3Kalpha protein in mononuclear cells was reduced after supplementation, as was the expression of several proinflammatory cytokines.

CONCLUSION: These data reveal that PUFA may exert their clinical effects via their capacity to regulate the expression of signal transduction genes and genes for proinflammatory cytokines.

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