

# Abstract

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## Long-chain (n-3) polyunsaturated fatty acids prevent metabolic and vascular disorders in fructose-fed rats.

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**BACKGROUND:** The crossover relationship between cardiometabolic risk, in terms of insulin resistance and vascular dysfunction, and the fatty acid (FA) profile of insulin-sensitive tissues as well as the dietary FA impact has almost never been explored in the same experiment.

**OBJECTIVE:** In this study, the intake of alpha-linolenic acid (ALA) alone and/or with its higher metabolites, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) were evaluated in a nonobese, hypertriglyceridemic and insulin-resistant rat model, that exhibits the 2 main characteristics of metabolic syndrome.

**METHODS:** Wistar rats were fed either a cornstarch and (n-6) PUFA-based diet (C-N6) or a 66% fructose diet over a 10-wk period. Fructose-fed rats received a diet containing ALA alone (F-ALA group) or ALA plus EPA and DHA (F-LC3 group) or no (n-3) PUFA (F-N6 group).

**RESULTS:** The 10-wk high-fructose diet (F-N6) induced an insulin-resistant state, as assessed by glucose and insulin tolerance tests. Insulin resistance was linked to a specific FA pattern in insulin-sensitive tissues, which probably involved modifications of Delta9, Delta6, and Delta5-desaturases. This pathological status was related to high cardiovascular risk as assessed by increases in systolic and diastolic blood pressures and particularly by the increase of pulse pressure, an index of vascular stiffness obtained from telemetry investigations.

**CONCLUSION:** The (n-3) experimental diets prevented changes in the FA patterns in insulin-sensitive tissues, insulin resistance, and vascular dysfunction. This beneficial effect was large with an intake of long chain (n-3) PUFA (ALA+EPA+DHA) and to a lesser extent with dietary ALA alone.

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