Vasoactive effects of eicosapentaenoic acid on isolated vascular smooth muscle.

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Dietary intake of unsaturated fatty acid of eicosapentaenoic acid (EPA) is thought to reduce the size and incidence of myocardial infarction. These beneficial effects are postulated to be due to chronic antithrombotic properties of EPA itself. We studied the possible direct effects of EPA on vascular smooth muscle as well as the ability of EPA to modify the vasoactivity of constrictor mediators in rabbit and cat aortic rings and isolated cat coronary arteries. EPA concentration-dependently (30 to 300 microM) relaxed rabbit and cat aortic rings having an intact endothelium, while EPA did not show any significant vasodilator effects on rings without an endothelium. This EPA-induced vasorelaxation was not altered by the cyclooxygenase inhibitor ibuprofen, but was totally abolished by the guanylate cyclase inhibitor methylene blue, indicating an endothelium-dependent smooth muscle relaxation mechanism. In isolated perfused cat coronary arteries, EPA (3 to 300 microM) exerted a dilator effect which was endothelium-independent and not affected by ibuprofen. The response was attenuated by propyl gallate, a lipoxygenase inhibitor. EPA also inhibited leukotriene (LT) C4, (50 nM) and LTD4 (50 nM)-induced vasoconstriction of isolated cat coronary arteries ranging from a blockade of 10% to 15% (P less than 0.05) at 3 microM of EPA to a blockade of 89% to 93% (P less than 0.01) at 300 microM. In contrast, the thromboxane analog, CTA2, induced coronary constriction was not significantly altered by EPA. Thus, EPA produces endothelium-dependent relaxation in rabbit and cat aorta and endothelium-independent vasodilation in cat coronary arteries (i.e., intact vessels or helical strips). Moreover, EPA exerts acute anti-leukotriene actions in coronary arteries. In the case of long-term dietary intake of EPA, these actions may contribute to the protective action of EPA in myocardial ischemia.