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Atherosclerosis and Lipoproteins

Hyperbaric Oxygen Reduces the Progression and Accelerates the Regression of Atherosclerosis in Rabbits

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Abstract—We studied the effect of hyperbaric oxygen (HBO) treatment on the extent of diet-induced accumulation of lipid oxidation products in rabbit plasma and tissues, on plasma paraoxonase activity, and on the extent of progression and regression of atherosclerotic lesions in the rabbit aorta. HBO treatment of cholesterol-fed rabbits dramatically reduces the development of arterial lesions despite having little or no effect on plasma or individual lipoprotein cholesterol concentrations. Compared with no treatment in cholesterol-fed animals, HBO treatment also substantially reduces the accumulation of lipid oxidation products (conjugated dienes, trienes, and thiobarbituric acid—

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reactive substances) in plasma, in the low density lipoprotein and high density lipoprotein fractions of plasma, in the liver, and in the aortic tissues. In addition, HBO treatment prevents the decrease in plasma paraoxonase activity observed in rabbits fed cholesterol-rich diets. Similarly, in regression studies, HBO treatment has no effect on the rate of plasma (or lipoprotein) cholesterol decline but significantly accelerates aortic lesion regression compared with no treatment. Direct measures of aortic cholesterol content support these morphological observations. On the basis of these results, we conclude that repeated, but relatively short, exposure to HBO induces an antioxidant defense mechanism(s) that is responsible for retarding the development or accelerating the regression of atherosclerotic lesions.

Key Words: hyperbolic oxygen • atherosclerosis • paraoxonase • hypercholesterolemia • lipid oxidation

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