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Effect of astaxanthin on hepatocellular injury following ischemia/reperfusion.

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Abstract

This study investigated the effect of astaxanthin (ASX; 3,3-dihydroxybeta, beta-carotene-4,4-dione), a water-dispersible synthetic carotenoid, on liver ischemia-reperfusion (IR) injury. Astaxanthin (5 mg/kg/day) or olive oil was administered to rats via intragastric intubation for 14 consecutive days before the induction of hepatic IR. On the 15th day, blood vessels supplying the median and left lateral hepatic lobes were occluded with an arterial clamp for 60 min, followed by 60 min reperfusion. At the end of the experimental period, blood samples were obtained from the right ventricle to determine plasma alanine aminotransferase (ALT) and xanthine oxidase (XO) activities and animals were sacrificed to obtain samples of nonischemic and postischemic liver tissue. The effects of ASX on IR injury were evaluated by assessing hepatic ultrastructure via transmission electron microscopy and by histopathological scoring. Hepatic conversion of xanthine dehydrogenase (XDH) to XO, total GSH and protein carbonyl levels were also measured as markers of oxidative stress. Expression of NOS2 was determined by immunohistochemistry and Western blot analysis while nitrate/nitrite levels were measured via spectral analysis. Total histopathological scoring of cellular damage was significantly decreased in hepatic IR injury following ASX treatment. Electron microscopy of postischemic tissue demonstrated parenchymal cell damage, swelling of mitochondria, disarrangement of rough endoplasmatic reticulum which was also partially reduced by ASX treatment. Astaxanthine treatment significantly decreased hepatic conversion of XDH to XO and tissue protein carbonyl levels following IR injury. The current results suggest that the mechanisms of action by which ASX reduces IR damage may include antioxidant protection against oxidative injury. 2009 Elsevier Ireland Ltd. All rights reserved.

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