リノレン酸を取り込んだ培養肝細胞における重金属イオンの脂質過酸化作用

古野浩二、末次達也、杉原成美

J. Toxicol. Environ. Health 48 121–129 (1996)

Effects of Metal Ions on Lipid peroxidation in Cultured Rat Hepatocytes Loaded with α-Linolenic Acid.

Koji Furuno, Tatsuya Suetsugu, Narumi Sugihara

ABSTRACT We investigated the ability of various redox-active metal ions to induce lipid peroxidation in normal and LNA-loaded cultured rat hepatocytes. At low concentrations, induction was highest with ferrous ions (Fe) , whereas at high concentrations, vanadium (V) and copper ions (Cu) had the greatest effect on both groups of hepatocytes. With either one of the three metal ions, the extent of lipid peroxidation in LNA-loaded hepatocytes was several times greater compared to normal cells. The prevention of lipid peroxidation in LNA-loaded hepatocytes by addition of an antioxidant like DPPD almost completely prevented Fe-and V−induced cell injury, and reduced Cu-induced cell injury. α-tocopherol behaved in a similar but less effectively way as DPPD. Addition of cadmium ions (Cd), which required the lowest concentration to cause cell injury, induced a slight increase in lipid peroxidation in normal hepatocytes, but did not induce lipid peroxidation to the same extent as seen in LNA-loaded cells treated with any of the three above mentioned metal ions. The inhibition of lipid peroxidation by DPPD scarcely protected LNA-loaded hepatocytes from Cd-induced cell injury. None of other metal ions including Al, Cr, Mn, Ni, Pb and Sn ions except Co which had a peroxidative effect in LNA-loaded cells only, effectively induced lipid peroxidation in either group of hepatocytes.

抄録　正常肝細胞において、Feイオンは他の重金属イオンに比較して低濃度から脂質過酸化を誘発し、一方CuイオンやVイオンは高濃度においてはFeイオンより強い脂質過酸化作用を示した。脂肪肝細胞においては、上記のイオンはいずれも脂質過酸化を正常肝細胞より数倍強く誘発した。抗酸化剤添加により脂質過酸化を抑制すると、細胞傷害はFeイオンとVイオンでは効果的に防止され、Cuイオンでは部分的に改善された。脂質過酸化を誘起するとされているCdイオンは正常肝細胞では僅かに脂質過酸化を誘起したが、脂肪肝細胞において更に強く脂質過酸化を誘起することがなかった。Al, Cr, Mn, Ni, Pb, Snイオンにはいずれの肝細胞においても脂質過酸化作用が認められなく、Coイオンは脂肪肝細胞においてのみ僅かに脂質過酸化作用を示した。