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论著

六价铬对肝细胞内活性氧和腺苷酸转运体1转录水平的影响

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摘要 目的 探讨重金属六价铬[Cr(Ⅵ)]的体外肝毒性。方法 L-02肝细胞经Cr(Ⅵ) 0, 2, 4, 8, 16和32 μmol·L^{-1}分别染毒12, 24或36 h后, 采用逆转录-荧光定量聚合酶链反应(RT-qPCR)和荧光光度法分别对腺苷酸转运体1(ANT1)mRNA表达水平和活性氧簇(ROS)水平进行检测。结果 Cr(Ⅵ) 32 μmol·L^{-1}处理细胞12和24 h后, ROS水平明显升高, 而处理36 h后, ROS水平明显下降。Cr(Ⅵ) 2~32 μmol·L^{-1}处理细胞12和24 h后, 细胞内ANT1 mRNA呈明显低表达水平, 而处理36 h后, 细胞内ANT1 mRNA表达水平明显增高, 达正常对照组的2倍左右。结论 Cr(Ⅵ)在早期(12, 24 h)可使L-02肝细胞内ROS水平升高, 发生氧化应激, 在后期(36 h)可诱导ANT1 mRNA表达水平升高, 发生能量代谢应激, 可能是Cr(Ⅵ)诱导细胞线粒体损伤的分子毒性机制之一。

关键词 六价铬 活性氧簇 腺苷酸转运体1 毒性

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Effect of hexavalent chromium on reactive oxygen species level and adenine nucleotide translocator mRNA expression in L-02 hepatocytes

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Abstract

OBJECTIVE To explore the interference effect of hexavalent chromium(Cr(Ⅵ)) on liver cells. METHODS Cultured L-02 hepatocytes were treated with Cr(Ⅵ) 0, 2, 4, 8, 16 and 32 μmol·L^{-1} for 12, 24 and 36 h. The level of adenine nucleotide translocator 1 (ANT1) mRNA, or reactive oxygen species (ROS) was measured by reverse transcription qualitative PCR or fluorometry, respectively. RESULTS Compared with normal control group, the level of ROS increased significantly (P<0.05) after Cr(Ⅵ) 32 μmol·L^{-1} was treated for 12 or 24 h, while the ANT1 mRNA level decreased significantly (P<0.05). Compared with 24 h treatment, Cr(Ⅵ) treatment for 36 h decreased the ROS level significantly(P<0.05) while the ANT1 mRNA level increased about two-fold compared with the normal control group. CONCLUSION At the early stage of Cr(Ⅵ) exposure (12 or 24 h), the ROS level increases significantly in cells and oxidative stress occurrence. At later stages of Cr(Ⅵ) exposure (36 h), the ANT1 mRNA level is elevated significantly, indicating an activated energy metabolism. The increased ANT1 mRNA level may be one of the molecular toxicities of mitochondrial damage induced by Cr(Ⅵ).

Key words hexavalent chromium reactive oxygen species adenine nucleotide translocator toxicity

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