

研究论文

镉长期暴露对黑斑蛙的氧化胁迫和抗氧化能力的影响

汪美贞, 贾秀英*, 董爱华, 何鑫, 褚纹娇

杭州师范学院生命科学学院, 浙江杭州 310036

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摘要 在实验条件下, 将黑斑蛙暴露于12.5 mg/L和25.0 mg/L浓度的镉溶液中30d, 分别测定了黑斑蛙在暴露10、20和30d时肝、肾组织中镉(Cd)含量、过氧化产物丙二醛(MDA)的含量、还原型谷胱甘肽(GSH)含量和超氧化物歧化酶(SOD)活性, 以探讨镉对机体的脂质过氧化作用及机体的抗氧化损伤机制。实验结果表明, 不同剂量组黑斑蛙肝、肾镉含量、MDA含量均随着镉暴露时间的延长而升高, 且肝MDA含量与镉在肝中的蓄积量呈显著正相关($R^2=0.8643, n=9$)。肝脏GSH含量随镉暴露时间的延长而被显著诱导, 且与MDA含量呈显著正相关($R^2=0.5933, n=9$); 肾GSH含量则随暴露时间的延长而显著下降, 与MDA含量呈显著负相关($R^2=0.8609, n=9$)。不同剂量组肝SOD活性随镉暴露时间的延长而升高, 肾SOD活性在高剂量组随镉暴露时间的延长表现为先升高后回落下降的趋势。可见, 在镉的长期暴露下, 细胞膜过氧化增强是镉伤害机体的主要原因, 而GSH含量、SOD活性的升高则可能是机体抗过氧化的机理之一。

关键词 镉 氧化胁迫 抗氧化能力 黑斑蛙

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Effects of Cadmium on oxidative stress and antioxidative ability in the Frog *Rana nigromaculata* under a long-term exposure

WANG Mei-Zhen, JIA Xiu-Ying*, DONG Ai-Hua, HE Xin, CHU Jiao-Jiao

School of Life Sciences, Hangzhou Normal College, Hangzhou 310036, China

Abstract Amphibian populations appear to be declining around the world. Although there is no single cause, one factor may be pollution from heavy metals. Heavy metals such as cadmium (Cd) have been one of the most fundamental causes of soil and water pollution in industrial and developing countries. The liver and kidneys are the main target organs for toxic effects of Cd. We used the frog *Rana nigromaculata* as a test subject to evaluate the effect of Cd on oxidative stress and antioxidative ability under a long-term exposure. Female frogs were exposed to 12.5 and 25.0 mg/L of cadmium dissolved in water for 30 days in experiment condition. The concentration of cadmium, levels of malondialdehyde (MDA), the contents of glutathione (GSH) and the activities of superoxide dismutase(SOD) in the liver and kidneys were determined at the end of the 10th, 20th and 30th days of Cd exposure respectively. The results showed that the cadmium accumulation and the MDA contents in the liver and kidneys were increased rapidly with the prolonged time at the dosage of 12.5 and 25.0 mg/L Cd, and Cd accumulation was strongly positive correlated with the MDA contents in the liver ($R^2=0.8643, n=9$). GSH contents were induced significantly in the liver and were decreased significantly in the kidneys with increasing of exposure time, GSH contents were positively correlated with MDA contents in the liver ($R^2=0.5933, n=9$), while GSH contents were negatively correlated with MDA contents in the kidneys ($R^2=0.8609, n=9$). SOD activities in liver were increased in the dosage of 12.5 and 25.0 mg/L Cd and SOD activities in the kidneys were first raised and declined afterwards in the dosage of 25.0 mg/L Cd with increasing of exposure time. These results suggest that the enhancement of peroxidation of membrane lipid may be one of the cadmium injury mechanisms in *R. nigromaculata*. Furthermore, the increasing of GSH content and SOD activity would be part of gener

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al defense strategies to cope with oxidative stress.

Key words [cadmium](#) _ [oxidative stress](#) _ [antioxidative ability](#) _ [Rana nigromaculata](#)

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通讯作者 贾秀英 XY-Jia@163.com