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低剂量长期铅暴露对雄性黑斑蛙精巢组织关键酶活性的影响

Effects of low-dose and long-term lead (Pb) exposure on testicular enzymes in male *Rana nigromaculata*

关键词：铅 精巢 生殖毒性 黑斑蛙

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摘要：在实验条件下, 将健康的性成熟雄性黑斑蛙暴露于0.1、0.2、0.4、0.8和1.6 mg·L^{-1} 的Pb^{2+}溶液中30 d, 以Ca^{2+}-ATP酶、Na^{+}-K^{+}-ATP酶、Ca^{2+}-Mg^{2+}-ATP酶、β-葡萄糖醛酸苷酶(β-DG)、乳酸脱氢酶(LDH)和酸性磷酸酶(ACP)活性为指标, 进行了长期铅暴露对雄性黑斑蛙生殖毒性的研究. 结果表明:随着铅染毒剂量的增加, Ca^{2+}-ATP酶和Na^{+}-K^{+}-ATP酶活性被诱导, Ca^{2+}-Mg^{2+}-ATP酶活性被抑制, 当Ca^{2+}-Mg^{2+}-ATP酶的抑制程度超过Ca^{2+}-ATP酶和Na^{+}-K^{+}-ATP酶的代偿机制时, 会抑制精子的发生, 进而导致雄性生殖毒性; 在1.6 mg·L^{-1} Pb^{2+}处理下, ACP酶被显著抑制, 提示支持细胞受损, 精子总数受到影响; 在0.4 mg·L^{-1} Pb^{2+}处理下, LDH酶被显著抑制, 提示生精细胞受损, 精子质量受到影响.

Abstract: To evaluate the reproductive toxicity of low-dose and long-term lead (Pb) exposure in male *Rana nigromaculata*, healthy adult male frogs were exposed to 0.1, 0.2, 0.4, 0.8 and 1.6 mg·L^{-1} of lead solution for 30 d under experimental conditions. The activities of Ca^{2+}-ATPase, Na^{+}-K^{+}-ATPase, Ca^{2+}-Mg^{2+}-ATPase, β-DG, LDH and ACP were tested. The results showed that the activities of Ca^{2+}-ATPase and Na^{+}-K^{+}-ATPase were induced with the increasing lead level, while Ca^{2+}-Mg^{2+}-ATPase being inhibited. When the decrease of Ca^{2+}-Mg^{2+}-ATPase exceeded the increase of Ca^{2+}-ATPase and Na^{+}-K^{+}-ATPase, the quantity of sperm decreased and the male reproductive toxicity of the frog was induced by lead. In addition, the activities of ACP were inhibited under 1.6 mg·L^{-1} Pb^{2+}, implying decrease of the quantity of sperm because of damage of sertoli cell. Also, the activities of LDH were significantly inhibited under 0.4 mg·L^{-1} Pb^{2+}, implying decrease of the quality of sperm because of the damage of spermatogenic cells.

Key words: lead testes reproductive toxicity *Rana nigromaculata*