

## 论文

### 染铅大鼠铁过载致神经元损伤特殊染色法分析

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#### 摘要:

目的 探讨长期铅暴露大鼠铁过载对神经元的损伤。方法 SD大鼠母代与子代分别设对照、低、高剂量铅暴露组(母代: 800、1 500 mg/L, 子代: 300、900 mg/L 乙酸铅饮水方式染毒)连续70周; 电感耦合等离子体发射光谱仪(ICP-AES)测血液和海马元素铅及铁, 同部位海马石蜡切片分别行铁染色及硫堇染色并进行图片融合。结果 染铅后, 大鼠血和海马铅及海马铁含量均增加( $P<0.01$ ); 低、高剂量铅暴露组子代大鼠海马CA3区铁沉积IOD值分别为( $5\ 930.71\pm 2\ 517.68$ )和( $1\ 1382.43\pm 2\ 551.14$ ), 均高于对照组的( $3\ 786.78\pm 1\ 256.37$ ), 差异有统计学意义( $P<0.01$ ); 低、高剂量铅暴露组子代大鼠海马CA1区的神经元数量分别为( $70.71\pm 11.80$ )、( $70.37\pm 17.53$ )个/视野, 均低于对照组的( $83.71\pm 12.60$ )个/视野, 差异有统计学意义( $P<0.01$ ); 图像融合显示, 染铅大鼠神经元内铁沉积增加而神经元数量及层数减少, 损伤加重。结论 基于铁染色和硫堇染色图像融合可直观地观察铅暴露大鼠铁过载部位神经元损伤。

关键词: 铅暴露 铁过载 神经元损伤 图像融合

### Quantitative analysis of neuron damage caused by iron overload in lead exposure rats with special staining image method

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#### Abstract:

Objective To explore neuron damage caused by iron overload in longterm lead(Pb) exposure rats. Methods Sprague-Dawley maternal and pup rats were randomly divided into control groups(without lead exposure), low exposure groups(with 800 and 300 mg/L lead acetate in drinking water for maternal and pup rats), and high exposure groups(with 1500 and 900 mg/L lead acetate in drinking water for maternal and pup rats). The treatments lasted for 70 weeks. The contents of Pb and iron in blood and brain were determined with inductively coupled plasma atomic emission spectrometry (ICP-AES). Two adjacent hippocampus paraffin slices(3  $\mu$ m apart from each other) were stained with ferric iron and thionine, then the images were merged. Results The lead concentrations in blood and brain and Fe levels of hippocampus were significantly higher( $P<0.01$ ) after the exposure of lead. The integrated optical density(OD) for Perl's staining of CA3 of low and high lead exposure groups were  $5\ 930.71\pm 2\ 517.6$  and  $11\ 382.43\pm 2\ 551.14$ , and significantly higher than that of the control ( $3\ 786.78\pm 1\ 256.37$ ) ( $P<0.01$ ). The numbers of neurons in CA1 of low and high lead-exposure group were  $70.71\pm 11.80$  cells/view and  $70.37\pm 17.53$  and significantly lower than that of the control ( $83.71\pm 12.60$ ) ( $P<0.05$ ). Image merge by IPP6.0 indicated that the number and layer of the neurons were decreased and the injuries of the neurons were aggravated. Conclusion Image merge of Perl's and thionine staining can intuitively be used for quantitative analysis of neuron damage caused by iron overload.

Keywords: Pb exposure iron overload neuron damage image merge

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参考文献:

- [1] Castellani RJ, Moreira PI, Liu G, et al.Iron:the redox-active center of oxidative stress in Alzheimer disease[J].Neurochem Res, 2007, 32(10):1640-1645.
- [2] Gebril OH, Simpson JE, Kirby J, et al.Brain iron dysregulation and the risk of ageing white matter lesions[J].Neuromolecular Med, 2011, 13(4):289-299.
- [3] Bartzokis G, Sultzer D, Cummings J, et al.*In vivo* evaluation of brain iron in Alzheimer disease using magnetic resonance imaging[J].Arch Gen Psychiatry, 2000, 57(1):47-53.
- [4] Ding AS, Wu Y, Ma ZM, et al.Effects of oxygen-glucose deprivation on cultured rat hippocampal neurons[J].Zhongguo Ying Yong Sheng Li Xue Za Zhi, 2003, 19(4):313-317.
- [5] 胡前胜,董胜璋,陈学敏,等.低剂量铅对原代培养的海马神经元的影响[J].中国公共卫生, 2003, 19(5):518-520.
- [6] 伍风云,冯昶,叶薇薇,等.蛋氨酸胆碱对染铅大鼠海马神经元影响[J].中国公共卫生, 2011, 27(2):206-207.
- [7] Hamed EA, Meki AR, Abd El-Mottaleb NA.Protective effect of green tea on lead-induced oxidative damage in rat's blood and brain tissue homogenates[J].J Physiol Biochem, 2010, 66(2):143-151.
- [8] Neal AP, Guilarte TR.Molecular neurobiology of lead (Pb(2+)):effects on synaptic function[J].Mol Neurobiol, 2010, 42(3):151-160.
- [9] Xu SZ, Shan CJ, Bullock L, et al.Pb<sup>2+</sup> reduces PKCs and NF-kappa B *in vitro*[J].Cell Biol Toxicol, 2006.22(3):189-198.
- [10] Liu J, Han D, Li Y, et al.Lead affects apoptosis and related gene XIAP and Smac expression in the hippocampus of developing rats[J].Neurochem Res, 2010, 35(3):473-479.
- [11] Quintana C, Bellefqih S, Laval JY, et al.Study of the localization of iron, ferritin, and hemosiderin in Alzheimer's disease hippocampus by analytical microscopy at the subcellular level[J].J Struct Biol, 2006, 153(1):42-54.
- [12] Youdim MB, Buccafusco JJ.Multi-functional drugs for various CNS targets in the treatment of neurodegenerative disorders[J].Trends Pharmacol Sci, 2005, 26(1):27-35.
- [13] Zheng H, Youdim MB, Fridkin M.Site-activated chelators targeting acetylcholinesterase and monoamine oxidase for Alzheimer's therapy[J].ACS Chem Biol, 2010, 5(6):603-610.

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1. 沈彤,朱中平,俞翠莲,刘俊玲,邹武庆,姜玉屏,章习斌,朱启星.铅暴露对婴幼儿发育商数影响的队列研究[J].中国公共卫生, 2006,22(8): 906-908
2. 唐振柱,刘展华,司国爱,黄柯,黎勇,黄江平,宋悦华,吴祖军,李裕生.某冶炼厂周围农村居民膳食铅镉暴露水平评价[J].中国公共卫生, 2011,27(5): 529-530
3. 杨东梅,董晓斌,王敏,白薇,王义,李常惠.新生儿脐血血铅含量与神经行为发育关系[J].中国公共卫生, 2010,26(11): 1462-1462
4. 王筱金,施蓉,王沛,高宇,王敏敏,龚燕,李秋娟,田英.低水平铅暴露与新生儿生长发育关系[J].中国公共卫生, 2010,26(1): 1-2
5. 王齐,赵焕虎,陈建伟,谷康定,朱业湘,周宜开,叶临湘.南方某地16~60岁人群环境铅暴露现况调查[J].中国公共卫生, 2010,26(1): 109-111
6. 王齐,赵焕虎,陈建伟,谷康定,朱业湘,郝巧玲,张裕增,周宜开,叶临湘.铅暴露对6~12岁儿童健康状况影响[J].中国公共卫生, 2009,25(3): 339-341
7. 熊伟,赵英,万炜,雷德亮,伍效琼,孔杏云.铅暴露对生长期大鼠回肠氮能神经元影响[J].中国公共卫生, 2008,24(10): 1230-1232
8. 沈彤,朱中平,俞翠莲,刘俊玲,邹武庆,姜玉屏,章习斌,朱启星.出生前后铅暴露对婴幼儿体格发育的影响[J].中国公共卫生, 2005,21(10): 1156-1158
9. 刘建安,刘德华,张太强,静进,易欢琼.子宫内铅暴露对仔鼠学习能力的影响及预防[J].中国公共卫生, 2003,19(9): 1093-1095
10. 李光,井立滨,郭郁芳,王晓斌,王海鸥,刘建荣,骆红,徐肇翊.环境铅污染对新婚育龄夫妇及其婴幼儿血铅水平的影响[J].中国公共卫生, 2000,16(7): 617-619
11. 沈彤,朱中平,俞翠莲,刘俊玲,邹武庆,姜玉屏,章习斌,朱启星.铅暴露对婴幼儿发育商数影响的队列研究[J].中国公共卫生, 2006,22(8): 906-908
12. 杨东梅,董晓斌,王敏,白薇,王义,李常惠.新生儿脐血血铅含量与神经行为发育关系[J].中国公共卫生, 2010,26(11): 1462-1462
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14. 杨东梅,董晓斌,王敏,白薇,王义,李常惠.新生儿脐血血铅含量与神经行为发育关系[J].中国公共卫生, 2010,26(11): 1462-1462
15. 韩松,梁多宏,张莹,史新竹,王凤芝,刘伟,张莉,陈立新,袁媛,顾英姿.宫内低水平铅暴露对新生儿神经行为及体格发育影响[J].中国公共卫生, 2013,29(9): 1283-1285
16. 韦远欢,施文祥,任源.EGCG对酒精性肝病小鼠肝脏铁调素表达影响[J].中国公共卫生, 0,(): 0-0

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