中国药理学与毒理学杂志 2011 25 (4): 349-353 ISSN: 1000-3002 CN: 11-1115/R

论著

代森锰锌对PC-12细胞凋亡的影响

张劲松[1], 栾春业[2], 王 强[3], 徐 艳[3], 张 晶[1], 环 飞[3], 程 洁[3], 肖 杭[3]
(1. 南京医科大学第一附属医院急诊中心, 江苏 南京 210029; 2. 滨州医学院附属医院急诊科, 山东 滨州 256603; 3. 南京医科大学公共卫生学院神经毒理研究室, 江苏 南京 210029)

收稿日期 2010-11-10 **修回日期** **网络版发布日期** 2011-8-30 **接受日期** 2011-4-2

摘要 **目的** 探讨代森锰锌对PC-12细胞凋亡的影响及其机制。**方法** 采用体外细胞培养方法，PC-12细胞加入代森锰锌0, 1, 10, 30, 60和120 μmol·L^{-1}, 培养24 h后，应用WST-8法检测PC-12细胞增殖；PC-12细胞中加入代森锰锌0, 1, 30和120 μmol·L^{-1}, 培养24 h后，流式细胞术FITC-Annexin Ⅴ/PI 双染检测细胞凋亡率；Hoechst33258染色及倒置荧光显微镜观察细胞形态学改变；Western印迹法检测Bcl-2和Bax的表达以及ERK蛋白磷酸化水平。**结果** 与正常对照组相比，随着代森锰锌浓度增加，代森锰锌组晚期凋亡率升高，呈浓度依赖关系，IC_{50}为49.95 μmol·L^{-1}。代森锰锌120 μmol·L^{-1}组细胞晚期凋亡率为(90±4)%（P<0.05）；Hoechst33258染色可见细胞核膨大、染色质边集浓染等凋亡特征；与正常对照组相比，Bcl-2逐渐降低，Bax和p-ERK1/2表达增高（P<0.05），代森锰锌120 μmol·L^{-1}组p-ERK1/2积分吸光度分别为128.0±2.5和178.4±4.0。**结论** 代森锰锌能够诱导PC-12细胞凋亡，ERK信号通路可能在此过程中发挥作用。

关键词 内分泌干扰物 代森锰锌 细胞凋亡
分类号 R994.6

Effects of mancozeb on apoptosis of PC-12 cells

ZHANG Jin-song[1], LUAN Chun-ye[2], WANG Qiang[3], XU Yan[3], ZHANG Jing[1], HUAN Fei[3], CHENG Jie[3], XIAO Hang[3]

(1. Department of Emergency, the First Affiliated Hospital, Nanjing Medical University, Nanjing 210029, China; 2. Department of Emergency, affiliated Hospital, Binzhou Medical University, Binzhou 56603 china; 3. Laboratory of Neurotoxicology, School of Public Health, Nanjing Medical niversity, Nanjing 210029, China)

Abstract

OBJECTIVE To investigate the effect of mancozeb on the apoptosis of PC-12 cells. **METHODS** The PC-12 cells were cultured for 24 h after mancozeb 0, 1, 10, 30, 60 and 120 μmol·L^{-1} were added. Cell Counting Kit-8 was used to assess the proliferation and toxicity induced by mancozeb. Twenty-four hours after mancozeb 0, 50 μmol·L^{-1} was added to PC-12 cells, the morphological changes of PC-12 cells were observed by a microscope, and cell apoptosis rates were detected by FITC-Annexin Ⅴ/PI flow cytometry. The expression of Bcl-2, Bax and p- ERK1/2 was determined by Western blot. **RESULTS** Compared with normal control group, PC-12 cells in mancozeb groups showed higher apoptosis rates and evident morphological changes that became more evident with the dose of mancozeb. The IC_{50} was 49.95 μmol·L^{-1}, the apoptosis rate of PC-12 cells in mancozeb 120 μmol·L^{-1} group was (90±4)%. The Bax protein levels increased and the Bcl- 2 protein levels in mancozeb groups were decreased. Compared with normal control group, the p-ERK1/2 expression was significantly up-regulated. The grey value of p-ERK1/2 in mancozeb 120 μmol·L^{-1} group was 128.0±2.5 and 178.4±4.0. **CONCLUSION** Mancozeb can induce apoptosis of PC-12 cells, in which the expression of p-ERK1/ 2 proteins may play a role in PC-12 apoptosis.

Key words endocrine disruptors mancozeb apoptosis

DOI: 10.3867/j.issn.1000-3002.2011.04.004

通讯作者 张劲松,肖 杭 zhangjso@sina.com,hxiao@njmu.edu.cn