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论著

槲皮素对大剂量X线暴露所致PC12细胞氧化性损伤的保护作用

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摘要 目的 探讨槲皮素对PC12细胞的毒性及其对大剂量X线诱导PC12细胞氧化性损伤的保护作用。方法 槲皮素6.25, 12.5, 25, 50和100 μmol·L^{-1}分别作用于PC12细胞，于24, 48和72 h后采用MTT法检测PC12细胞增殖。槲皮素12.5, 25和50 μmol·L^{-1}分别与PC12细胞预孵育2 h, 随后采用4 Gy X线辐照PC12细胞，于24 h后，采用MTT法检测PC12细胞增殖反应，黄嘌呤氧化酶法检测细胞内超氧化物歧化酶(SOD)活性，硫代巴比妥法检测丙二醛(MDA)含量，菲啉络合法检测总抗氧化能力(T-AOC)，DCFH-DA探针法检测活性氧(ROS)含量。结果 槲皮素6.25～100 μmol·L^{-1}与PC12细胞作用24 h(r=0.887, P<0.01)和48 h(r=0.872, P<0.01)具有促细胞增殖作用，作用72 h表现出明显的细胞毒性，且随浓度增加毒性增大(r=0.942, P<0.01)。与正常对照组比较，PC12细胞受辐射后细胞增殖反应、SOD活性和T-AOC降低(P<0.01)，MDA和ROS含量增加(P<0.01)。与辐照对照组比较，槲皮素12.5, 25和50 μmol·L^{-1}防护组PC12细胞增殖反应(r=0.751, P<0.01)，SOD活性(r=0.837, P<0.01)和T-AOC(r=0.940, P<0.01)随槲皮素浓度增大而增高，MDA含量(r=0.845, P<0.01)和ROS含量(r=0.930, P<0.01)随槲皮素浓度的增高而降低。结论 槲皮素对大剂量X线诱导PC12细胞氧化性损伤具有一定的防护作用，在12.5～50 μmol·L^{-1}浓度范围内其防辐射作用与浓度呈较好的相关性。

关键词 槲皮素 X线 PC12细胞 氧化性损伤

分类号 R965

Protective effect of quercetin against oxidative damage induced by high-dose X-ray exposure in PC12 cells

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Abstract

OBJECTIVE To explore the cytotoxicity of quercetin as well as its radioprotective efficacy against high-dose X-ray exposure induced oxidative damage in PC12 cells. **METHODS** PC12 cells were incubated with quercetin 6.25, 12.5, 25, 50 and 100 μmol·L^{-1} for 24, 48 and 72 h, respectively, and cell proliferation was measured with MTT assay. PC12 cells were exposed to quercetin 12.5, 25 and 50 μmol·L^{-1} for 2 h before being irradiated to 4 Gy X-ray. Twenty-four hours later, cell proliferation was measured with MTT assay, and the levels of superoxide dismutase(SOD), malonedialdehyde(MDA), toal anti-oxidation capacity (T-AOC) and reactive oxygen species(ROS) were detected by xanthine oxidase, thiobarbituric acid, phenanthroline-complexation and DCFH-DA fluorescent probe methods.

RESULTS Quercetin 6.25-100 μmol • L^{-1} could improve PC12 cell proliferation for 24 h (r=0.887, P<0.01) and 48 h (r=0.872, P<0.01) in a concentration-dependent manner. While for 72 h, quercetin 12.5-100 μmol • L^{-1} inhibited PC12 cell proliferation in a concentration-dependent manner (r=0.942, P<0.01). Compared with normal control group, PC12 cell proliferation, SOD and T-AOC were decreased(P<0.01) while the levels of ROS and MDA were increased (P<0.01) after PC12 cell irradiation. Compared with X-ray group, quercetin 12.5, 25 and 50 μmol • L^{-1} could improve PC12 cell