[1]唐兆华,廖正步,谢延风,等.氧糖剥夺、复氧后损伤星形胶质细胞中MMP-9的表达变化与意义[J].第三军医大学学报,2012,34(05):387-390.

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氧糖剥夺、复氧后损伤星形胶质细胞中MMP-9的表达变化与意义(PDF)

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Title: Significance of MMP-9 expression in astrocytes after oxygen-glucose deprivation/reoxygenation *in vitro*

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关键词: 基质金属蛋白酶-9; 星形胶质细胞; 氧糖剥夺、复氧

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摘要: 目的　通过观察金属蛋白酶-9（matrix metalloproteinase-9，MMP-9）在氧糖剥夺、复氧培养后损伤星形胶质细胞中基质的表达变化并抑制其活性，探讨其在氧糖剥夺、复氧后细胞损伤中的意义。　方法　将星形胶质细胞分为正常组、模型组和GM6001组。模型组细胞在无糖DMEM培养基，1%O_2的培养条件下行3、5、7 h时长的氧糖剥夺后复氧至24 h。GM6001组细胞在5 h氧糖剥夺、复氧的过程中加入外源性基质金属蛋白酶抑制剂（GM6001，10 μmol/ml），复氧至24 h。用RT-PCR测定不同时长氧糖剥夺后星形胶质细胞MMP-9 mRNA表达变化，ELISA法测定细胞培养上清液中MMP-9蛋白的浓度变化；用光学显微镜观察各组的细胞形态变化，LDH漏出率、CCK-8法检测细胞的损伤情况及存活率。　结果　①RT-PCR及ELISA法检测示：与正常组相比，氧糖剥夺、复氧后，模型组细胞MMP-9 mRNA表达量和细胞培养上清液中MMP-9蛋白的浓度均有所增加（$P<0.05$），随着氧糖剥夺时间的延长，均呈现不断上升趋势；②与正常组相比，氧糖剥夺、复氧后，模型组细胞明显损伤，随着氧糖剥夺时间的延长，细胞损伤加重，光镜下细胞出现明显肿胀，并有部分细胞呈凝固性坏死，LDH漏出率不断增高（$P<0.01$）、存活率则逐渐下降（$P<0.05$, $P<0.01$），且培养上清MMP-9蛋白浓度与细胞LDH漏出率的增高程度呈正相关（$r=0.693$，$P<0.05$）；与模型组相比，5 h氧糖剥夺、复氧后，GM6001组细胞形态学损伤表现明显减轻，LDH漏出率水平也有明显下降（$P<0.01$），细胞存活率则显著上升（$P<0.05$）。　结论　MMP-9过表达可能是氧糖剥夺、复氧后引起细胞损伤的重要因素之一。

Abstract: Objective　To investigate the significance of matrix metalloproteinase-9 (MMP-9) expression in astrocytes after oxygen-glucose deprivation/reoxygenation (OGD/R) *in vitro*.　Methods　Astrocytes were divided into control group, OGD/R group and GM6001 group. Astrocytes in OGD/R group were treated with OGD for 3, 5, and 7 h, respectively, and then reoxygenated for 24 h. In GM6001 group, astroctyes were treated with the inhibitor of matrix metalloproteinase (GM6001, 10 μmol/ml) during 5 hours' OGD/R. The expression of MMP-9 at mRNA and protein levels in the astrocytes were detected after 24 hours' reoxygenation by RT-PCR and ELISA. The morphological alterations of cells in each group were observed by light microscopy. The cell injury was inspected by LDH activity (LDH %) and Cell Counting Kit-8 (CCK-8).　Results　Compared with normal group, as the OGD time prolonged, the expression of MMP-9 at mRNA and protein levels were increased gradually ($P<0.05$) after OGD/R, which were further increase with time elapse. OGD resulted in in significant swelling astrocytes and obviously injured with time prolonged, and some cells seemed to be coagulation necrosis, the LDH % was increased ($P<0.01$) and the survival rate was decreased severely ($P<0.05$, $P<0.01$). Protein level of MMP-9 in the supernatant was positively correlated with LDH % ($r=0.693$, $P<0.05$). Compared with OGD/R group, cell injury following 5 hours' OGD/R was remarkably decreased, as survival rate was raised significantly.　Conclusion　Over-expression of MMP-9 might be a important factor in OGD/R-induced cell injury.

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