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miRNA-23a has effects to improve lung injury induced by sepsis in vitro and vivo study

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ABSTRACT

Aim: The aim of this study is to explain the effects and mechanism of miRNA-23a in lung injury which were induced by sepsis in vitro and vivo.

Methods: In the vitro study, The BEAS-2B cells were divided into 4 groups: NC, MC, miRNA and miRNA + PTEN agonist groups. The cell proliferation and apoptosis of difference groups were measured by MTT and flow cytometry, the relative proteins expression of difference groups were measured by WB assay. In the vivo study, the rats were also divided into 4 groups: NC, MC, miRNA and miRNA + PTEN agonist groups. The miRNA-23a expression of difference groups were evaluated by ISH in lung tissues of rats. The cell apoptosis of difference groups were evaluated by TUNEL assay in lung tissues; the relative proteins expression of difference groups were evaluated by IHC assay.

Results: Compared with NC group, the cell apoptosis rate of MC groups were significantly increased in vitro and vivo studies ($P < 0.05$, respectively). The relative proteins (PTEN, PI3K, AKT and P53) expressions of MC group were significantly differences ($P < 0.05$, respectively) compared with those of NC groups in vitro and vivo studies. However, with miRNA-23a infection, the cell apoptosis of miRNA group were significantly suppressed compared with MC groups, and the relative proteins (PTEN, PI3K, AKT and P53) of miRNA group were also significantly differences compared with MC groups in vitro and vivo studies ($P < 0.05$, respectively).

Conclusion: The miRNA-23a has improved lung injury induced by sepsis via PTEN/PI3K/AKT/P53 pathway in vitro and vivo studies.

1. Introduction

Sepsis is a serious and urgent disease in clinic, and it is the main cause of multiple organ dysfunction syndromes (MODS). Sepsis induced lung injury is common and has a high mortality rate [1]. It is thought that the essence of acute lung injury is the apoptosis of lung cells caused by inflammation [2]. At present, some previous studies found that lung cells apoptosis was an important factor in sepsis induced lung injury [3–6]. In this process, some proteins and genes which were correlated with cell apoptosis had changed. Those proteins and genes alteration also induced lung cell apoptosis inducing. Phosphatase and tension homolog deleted on chromosome ten (PTEN) is an important negative regulator of the PI3K/Akt pathway [7]. Meanwhile, PI3K/Akt pathway is the main pathway to promote cell proliferation, growth and survival [8]. PTEN/P13K/Akt is an important pathway to regulate a variety of biological processes such as apoptosis, metabolism, cell proliferation and cell growth [9]. microRNAs (miRNAs) are the research focus of gene regulation in recent years, and has been proved to be involved in the process of apoptosis induced by inflammation [10]. The previous studies were shown that miRNA-23a was one of important roles which targeted to PTEN [11–13]. However, It has been unclear that the correlation between miRNA-23a and PTEN in lung injury induced by sepsis. Depending on those results, we wanted to evaluate the effects and mechanism of miRNA-23a in lung injury which induced by sepsis in vitro and vivo experiments.

2. Materials and methods

2.1. Materials

BEAS-2B cell were purchased from ATCC (USA). The DMEM and fetal bovine serum (FBS) were purchased from Sigma (USA), Methylthiazolyldiphenyl-tetrazolium bromide (MTT) was purchased from Amresco (USA). The relative PTEN, PI3K, AKT and P53 antibodies were purchased from Abcam (USA). The cell apoptosis, cell cycle and TUNEL kits were purchased from Sigma (USA). ISH kit was

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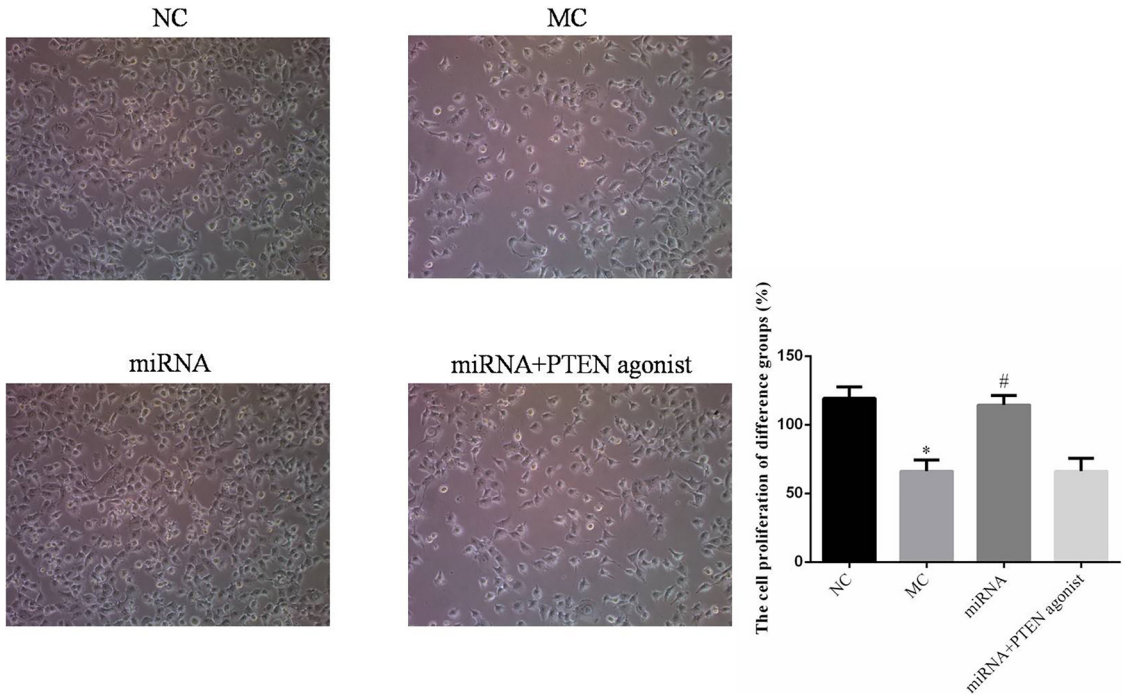

Fig. 1. The cell proliferation of difference groups by MTT assay. *: P < 0.05, compared with NC group. #: P < 0.05, compared with MC group.

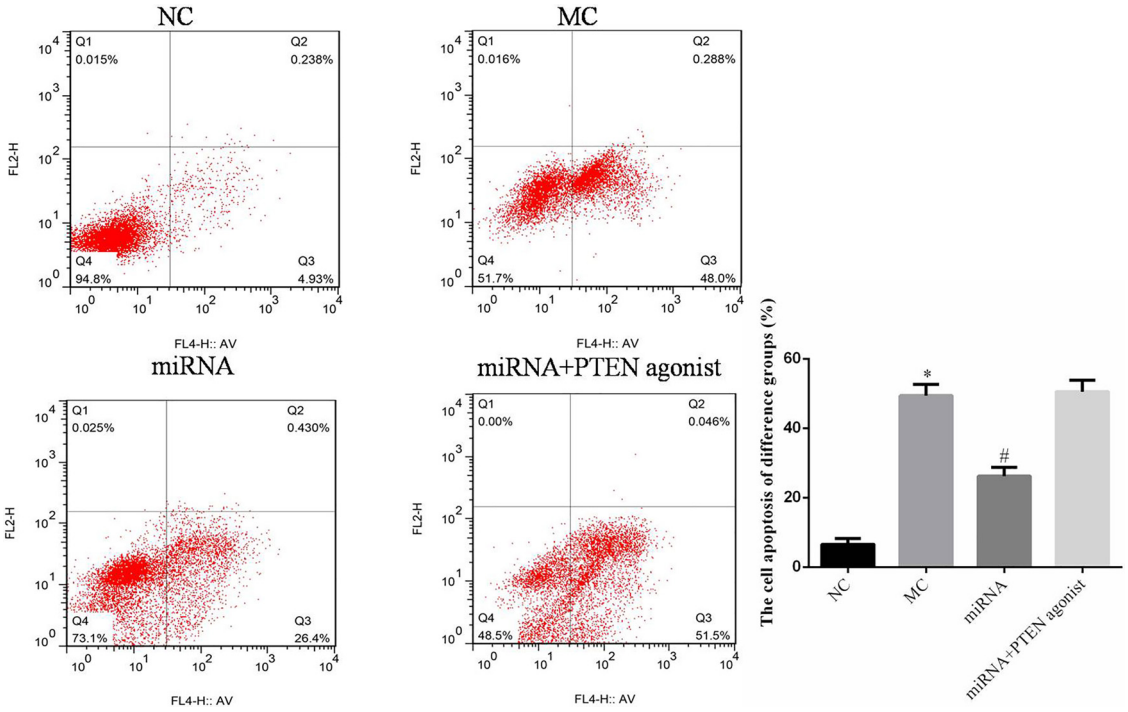

Fig. 2. The cell apoptosis rate of difference groups. *: P < 0.05, compared with NC group. #: P < 0.05, compared with MC group.

purchased from BOSTER Biological Technology co.ltd (Wuhan, China). Other relative reagents were purchased from GenScript (Nanjing) Co., Ltd (Nanjing, China).

2.2. Cell cultured and grouping

The BEAS-2B which was a kind of human normal lung epithelial cells was cultured by DMEM. The BEAS-2B cells were divided into 4 groups: Normal control (NC) group were treated with normal treatment; Model control (MC) group were treated with LPS (1 mg/L); miRNA-375 (miRNA) group were tranfected with miRNA-375 based on model group treatment and miRNA-375 and PTEN agonist (miRNA + PTEN agonist) group were tranfected with miRNA-375 and PTEN agonist which based on the model group treatment. The cell of every groups continued next step, after treatment for 48 h.

2.3. The cell proliferation rate by MTT assay

Cell suspension (1×10^9/L) was inoculated in 96-hole culture plate, there were 0.5×10^4 cell in every holes. There were 4 groups (NC, MC,

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