

加味小青龙汤联合 BMSCs 对寒性哮喘大鼠鼻-肺-肠黏膜免疫的影响及机制^Δ

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摘要 **目的** 探讨加味小青龙汤联合骨髓间充质干细胞(BMSCs)对寒性哮喘大鼠鼻-肺-肠黏膜免疫的影响及机制。**方法** 将SD大鼠随机分为空白组、模型组、BMSCs组、BMSCs+加味小青龙汤(6.39 g/kg)组、BMSCs+地塞米松(0.125 mg/kg)组,每组10只。采用卵清蛋白联合氢氧化铝致敏及雾化激发,并结合空调冷风吹袭建立寒性哮喘大鼠模型。初次雾化激发前1 h,除空白组和模型组外,其余各组大鼠尾静脉注射BMSCs混悬液;实验第15天起,各组大鼠灌胃相应药液/生理盐水,每日1次,连续7 d。末次给药后,评估大鼠哮喘行为学和肺组织病理学形态变化,检测鼻咽冲洗液、肺泡灌洗液(BALF)和肠黏液中白细胞介素6(IL-6)、IL-10水平;检测鼻、肺、肠组织中磷脂酰肌醇3-激酶(PI3K)/蛋白激酶B(Akt)信号通路相关蛋白表达水平。**结果** 与空白组比较,模型组大鼠哮喘行为学评分、肺组织损伤程度评分,鼻咽冲洗液、BALF和肠黏液中IL-6水平,鼻、肺、肠组织中PI3K蛋白表达水平和Akt蛋白磷酸化水平均显著升高($P<0.05$);鼻咽冲洗液、BALF和肠黏液中IL-10水平均显著降低($P<0.05$);肺泡萎缩、塌陷甚至融合,支气管管壁平滑肌异常增生肥厚,可见大量炎症细胞浸润。与模型组比较,BMSCs组、BMSCs+加味小青龙汤组、BMSCs+地塞米松组上述大部分定量指标均显著逆转($P<0.05$);肺组织病理学损伤均明显减轻。与BMSCs组比较,BMSCs+加味小青龙汤组上述大部分定量指标均进一步改善($P<0.05$)。**结论** 加味小青龙汤联合BMSCs能有效改善寒性哮喘大鼠鼻-肺-肠黏膜免疫,缓解哮喘症状,其作用机制可能与抑制PI3K/Akt信号通路激活有关。

关键词 寒性哮喘;加味小青龙汤;骨髓间充质干细胞;鼻-肺-肠黏膜免疫;PI3K/Akt信号通路

Effects and mechanisms of modified Xiaoqinglong decoction combined with BMSCs on nasal-pulmonary-intestinal mucosal immunity in cold asthma rats

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ABSTRACT **OBJECTIVE** To investigate the effects and mechanism of modified Xiaoqinglong decoction combined with bone marrow mesenchymal stem cells (BMSCs) on nasal-pulmonary-intestinal mucosal immunity in rats with cold asthma. **METHODS** SD rats were randomly divided into blank group, model group, BMSCs group, BMSCs+modified Xiaoqinglong decoction (6.39 g/kg) group, and BMSCs+dexamethasone (0.125 mg/kg) group, with 10 rats in each group. The cold asthma rat model was established by sensitization and atomization challenge with ovalbumin combined with aluminum hydroxide, together with cold air stimulation from air conditioners. One hour before the initial atomization challenge, rats in all groups except the blank group and model group were injected with BMSCs suspension via the tail vein. Starting from the 15th day of the experiment, rats in each

group were intragastrically administered corresponding liquid medicine or normal saline once a day for 7 consecutive days. After the last administration, the asthmatic behavioral changes and pathological morphological changes of lung tissues in rats were evaluated. The levels of interleukin-6 (IL-6) and IL-10 in nasopharyngeal lavage fluid, bronchoalveolar lavage fluid (BALF) and intestinal mucus were detected. The expression

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