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支原体肺炎患者治疗后血清 SP-A、SP-D 与 hs-CRP 的变化趋势 及临床意义 *

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摘要 目的:研究支原体肺炎(MP)患者血清肺表面活性蛋白-A(SP-A)、肺表面活性蛋白-D(SP-D)与超敏C反应蛋白(hs-CRP)的变化趋势及临床意义。**方法:**选择从2015年9月到2016年9月在我院治疗的MP患者56例纳入本次研究,将其记为观察组,给予常规治疗后,有效者49例,无效者7例。另选同期在我院进行健康体检的志愿者55例作为对照组,对比两组血清SP-A、SP-D及hs-CRP的变化趋势,比较观察组不同治疗结果患者的血清SP-A、SP-D及hs-CRP水平,并分析患者的血清SP-A、SP-D与hs-CRP的相关性。**结果:**治疗后3d及治疗后7d观察组的血清SP-A、SP-D及hs-CRP水平较治疗前依次降低,但均高于对照组($P<0.05$),在治疗后14d血清SP-A、SP-D及hs-CRP水平较治疗前降低($P<0.05$),但与对照组比较差异无统计学意义($P>0.05$)。治疗后14d有效组血清SP-A、SP-D及hs-CRP水平均明显低于无效组,差异有统计学意义($P<0.05$)。根据Spearman相关性分析结果显示,MP患者的血清SP-A、SP-D与hs-CRP均呈正相关($r=0.713, 0.699, P=0.000, 0.000$)。**结论:**MP患者的血清SP-A、SP-D及hs-CRP水平可伴随治疗过程的进行而逐渐回落,最终基本恢复至正常范围,且血清SP-A、SP-D水平与hs-CRP水平呈正相关,临床治疗时可针对上述3种指标进行监测以判断患者病情及治疗效果。

关键词:支原体肺炎;SP-A;SP-D;超敏C反应蛋白;变化趋势

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Variation Tendency and Clinical Significance of Serum SP-A, SP-D and hs-CRP in Patients with Mycoplasma Pneumonia after Treatment*

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ABSTRACT Objective: To study the variation tendency and clinical significance of serum pulmonary surfactant protein-A (SP-A), pulmonary surfactant protein-D (SP-D) and hypersensitive C reactive protein (hs-CRP) in patients with mycoplasma pneumonia (MP). **Methods:** A total of 56 patients with MP, who were treated in Central Hospital of Chongqing Three Gorges from September 2015 to September 2016, were chosen as observation group, 55 volunteers, who underwent physical examination in the hospital, were selected as control group. The variation tendency of serum SP-A, SP-D and hs-CRP was compared between the two groups. The levels of serum SP-A, SP-D and hs-CRP of different treatment results in the observation group were compared, and the correlation of serum SP-A, SP-D and hs-CRP was analyzed. **Results:** Compared with before treatment, 3 d and 7 d after treatment, the levels of serum SP-A, SP-D and hs-CRP in the observation group were decreased gradually, which were significantly higher than those in the control group ($P<0.05$); 14 d after treatment, the levels of serum SP-A, SP-D, hs-CRP in the observation group were decreased, but there was not significant difference compared with the control group ($P>0.05$). 14 d after treatment, the levels of serum SP-D, SP-A and hs-CRP of the effective group were significantly lower than those of the invalid group, the difference was statistically significant ($P<0.05$). The results of Spearman correlation analysis showed that the serum levels of SP-A and SP-D of patients with MP were positively correlated with hs-CRP ($r=0.713, 0.699, P=0.000, 0.000$). **Conclusion:** The levels of serum SP-A, SP-D and hs-CRP in patients with MP are gradually declined with the course of treatment, and they recover to the normal range finally; the serum levels of SP-A and SP-D are positively correlated with the level of hs-CRP. The above three indicators can be monitored in clinical treatment so as to judge the patient's condition and the effect of treatment.

Key words: Mycoplasma pneumonia; SP-A; SP-D; Hypersensitivity C reactive protein; Variational tendency

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前言

支原体肺炎(Mycoplasma pneumonia, MP)是指以肺炎支

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原体作为病原体的疾病,其主要表现出散发并且伴有小范围流行的特征,各时间段均有发病的可能^[1,2]。患者呼吸道本身的先天免疫系统为抵抗病原微生物的首要防线,当其识别出病原微生物后会马上激活炎症反应,并对过度炎症反应所造成的组织损伤进行调节^[3,4]。肺炎支原体为导致该病发病的主要病原体类型,但是有关该病发病机制以及特点等问题仍需深入研究^[5,6]。有研究发现,通过对患者实施血清方面监测,掌握患者机体炎症反应产生及发展的规律特点,有助于临床治疗提供可靠依据^[7,8]。肺表面活性蛋白-A(Pulmonary surfactant protein-A, SP-A)和肺表面活性蛋白-D(Pulmonary surfactant protein-D, SP-D)均是肺表面活性物质的相关成分,二者主要发挥中和病毒和清除病原菌以及坏死细胞等作用,同时还可下调机体的免疫反应,进而消除炎症。超敏C反应蛋白(HypersensitivityC-reactive protein, hs-CRP)是重要的时相蛋白,对于机体的炎症状态具有较好的反馈作用^[9,10]。本文通过研究分析MP患者血清SP-A、SP-D与hs-CRP的变化趋势和临床意义,旨在为MP的临床诊治提供判断依据,报告整理如下。

1 资料和方法

1.1 临床资料

选择从2015年9月到2016年9月在我院治疗的MP患者56例纳入本次研究,将其记为观察组,入选标准:(1)参照1990全国肺部感染学术会议制定的诊断标准^[11];(2)均为单侧肺病变;(3)患者及其家属均对本次研究知情,治疗前均签了知情同意书。排除标准:(1)存在细菌、真菌或病毒感染者;(2)有肺结核者;(3)有哮喘或者其他种类的肺部疾病者。其中男36例,女20例;年龄18~78岁,平均(40.12±1.35)岁。病变位置:左肺29例,右肺27例。治疗结果:有效者(患者的咳嗽、发热、感染等临床症状和体征均已基本消失,体温恢复至正常)49例,无效者(患者仍有MP疾病的临床症状和体征)7例。另选同期在我院进行健康体检的志愿者55例作为对照组,男35例,女20例;年龄20~80岁,平均(41.14±1.26)岁。将两组的年龄构成及性别比例数据进行比较无明显差异($P>0.05$)。本研究经医院伦理委员会批准进行。

1.2 研究方法

观察组给予常规的抗生素对症支持、祛痰及抗感染治疗,并分别在治疗前、治疗后3d、7d、14d(对照组受试者仅在入院时)的晨间抽取其空腹静脉血约5mL,给予10min 5000 r/min的离心操作后将血清分离,并存放在-80℃条件下保存待测。其中血清hs-CRP的检测采用产自罗氏公司的Modelar P800型全自动生化分析仪及免疫增强比浊法进行,相关试剂购于北京的利德曼公司,操作步骤严格按照试剂盒说明书进行。血清SP-A及SP-D试剂盒购于美国的Santa Cruz Bio公司,检测步骤为:对标准品稀释后进行加样处理,在标准品孔中添加50μL的标准品,在待测品孔中添加40μL的样品,而后添加10μL的抗体,并添加50μL的链霉亲和素,进行振荡混匀,置于37℃下水浴1h。为每孔添加稀释约20倍的相关洗涤液,并经显色剂显色,通过酶标仪及450nm波长对各孔吸光光度值(OD值)进行检测。

1.3 观察指标

对比两组血清SP-A、SP-D及hs-CRP的变化趋势,比较观察组不同治疗结果患者的血清SP-A、SP-D及hs-CRP水平,分析MP患者血清SP-A、SP-D与hs-CRP的相关性。

1.4 统计学方法

通过SPSS21.0统计软件分析本研究数据,计数资料以(%)表示,比较采用 χ^2 检验,不同患者SP-A、SP-D与hs-CRP水平等计量资料通过($\bar{x} \pm s$)表示,其比较进行t检验,采用Spearman法分析SP-A、SP-D与hs-CRP的相关性。检验标准设置为 $\alpha=0.05$ 。

2 结果

2.1 两组血清SP-A、SP-D及hs-CRP的变化趋势对比

治疗前观察组的血清SP-A、SP-D及hs-CRP水平均明显高于对照组,差异有统计学意义($P<0.05$)。治疗后3d及治疗后7d观察组的血清SP-A、SP-D及hs-CRP水平较治疗前依次降低,且均高于对照组($P<0.05$),在治疗后14d血清SP-A、SP-D及hs-CRP水平低于治疗前($P<0.05$),但与对照组比较差异无统计学意义($P>0.05$),见表1。

表1 两组血清SP-A、SP-D及hs-CRP的变化趋势对比($\bar{x} \pm s$)

Table 1 Comparison of Variation tendency of serum SP-A, SP-D and hs-CRP in two groups($\bar{x} \pm s$)

Groups	Time	SP-A(ng/mL)	SP-D(ng/mL)	hs-CRP(mg/L)
Observation group(n=56)	Before treatment	65.24±10.32 ^a	56.78±11.36 ^a	24.87±10.39 ^a
	3d after treatment	61.18±9.46 ^{ab}	51.17±10.8 ^{ab}	19.83±8.26 ^{ab}
	7d after treatment	42.63±5.94 ^{ab}	42.25±8.97 ^{ab}	8.27±1.34 ^{ab}
	14d after treatment	22.82±4.11 ^b	24.09±7.83 ^b	1.75±0.39 ^b
Control group(n=55)	On admission	22.12±3.06	24.18±3.19	1.72±0.45

Note: Compared with the control group on admission, ^a $P<0.05$; Compared with the observation group before treatment, ^b $P<0.05$.

2.2 观察组不同治疗结果对应的血清SP-A、SP-D及hs-CRP水平对比

治疗后14d的有效组血清SP-A、SP-D及hs-CRP水平低于无效组,差异有统计学意义($P<0.05$),见表2。

2.3 血清SP-A、SP-D与hs-CRP的相关性分析

根据Spearman法相关性分析结果显示,MP患者血清

SP-A、SP-D水平与hs-CRP水平均呈正相关($r=0.713$ 、 0.699 , $P=0.000$ 、 0.000)。

3 讨论

MP易导致患者出现发热、咳嗽以及呼吸困难等症状,该病会引发肺器官发生实质性病变,甚至出现胸腔积液以及肺组织

表 2 观察组不同治疗结果对应的血清 SP-A、SP-D 及 hs-CRP 水平对比($\bar{x} \pm s$)

Table 2 Comparison of serum SP-A,SP-D and hs-CRP of different treatment results in observation group($\bar{x} \pm s$)

Groups	SP-A(ng/mL)	SP-D(ng/mL)	hs-CRP(mg/L)
Effective group(n=49)	22.97± 3.46	25.42± 5.35	1.94± 0.36
Invalid group(n=7)	56.32± 8.74	55.29± 6.18	21.96± 3.77
t	18.871	13.568	38.063
P	0.000	0.000	0.000

空洞等严重情况,对患者的生命健康造成严重影响^[12,13]。临床对于 MP 患者通常采取的监测项目多数仅可以反映出患者全身炎症状态,但是无法准确表达出肺组织具体炎症状况以及细胞受损情况^[14,15]。因此,寻找出可以详细反应患者肺组织受到感染之后受损情况,并用于评价患者肺受损程度以及预测治疗效果等的新指标的工作显得十分重要。有研究显示,通过对 MP 患者进行血清 SP-A、SP-D 等进行检测发现,二者均出现异常表达,可能与患者肺组织受感染程度有关^[16,17]。同时,hs-CRP 作为介导炎症反应的一项重要因子,其在细菌感染类型 MP 患者体内呈高表达,可将其作为一项能够反应该病患者炎症情况的标志物^[18,19]。

本研究结果显示,治疗后 3 d 及治疗后 7 d 观察组的血清 SP-A、SP-D 及 hs-CRP 水平较治疗前依次降低,但均高于对照组,在治疗后 14 d 血清 SP-A、SP-D 及 hs-CRP 水平较治疗前降低,但与对照组相当,这符合 Lu A 等人^[20-22]的报道结果,提示 MP 患者经过相应的治疗后,血清 SP-A、SP-D 及 hs-CRP 水平均表现出下降的变化趋势,最终接近正常水平。分析原因,可能与治疗后患者机体的免疫功能改善及炎症症状缓解等因素有关。其中 SP-A 及 SP-D 均属于肺表面活性蛋白,二者均是从肺泡 II 型上皮细胞以及气道 Clara 细胞所合成并分泌至人体肺泡腔内的胶原糖蛋白,且均可对肺内局部的先天性免疫发挥重要作用^[23]。同时,SP-A 及 SP-D 能够抑制肺内革兰氏阴性菌及支原体等病原菌的繁殖和生长,还可和病原菌表面的配体相结合,加速肺泡巨噬细胞针对病原菌的清除。CRP 作为比较典型的一类急性时相反应性蛋白,其可和致病细菌细胞壁上的磷酸胆碱亦或是炎症损伤细胞所含的磷脂等相关配体发生结合,进而启动了免疫应答,其也是对炎症反应进行介导的一种重要炎症分子^[24,25]。由于 hs-CRP 能够检测出较低水平的 CRP(0.1~10 mg/L),因此其具有更加敏感的诊断价值^[26]。而经过治疗后,患者肺部的炎症反应及机体免疫机能均得到了有效改善,从而调节了 SP-A、SP-D 及 hs-CRP 水平,使之迅速下降。此外,本研究还发现,观察组治疗后 14 d 的有效组血清 SP-A、SP-D 及 hs-CRP 水平均明显低于无效组,这提示治疗有效的患者机体的炎症水平得到了较好的控制,但治疗无效的患者则仍处于一定程度的炎症状态。这可能是因为治疗有效的患者机体的康复缓解了肺部的炎症反应,促进了病原菌的清除,最终改善了免疫机能^[27-29]。本文根据 Spearman 法分析相关性后发现,MP 患者血清 SP-A、SP-D 与 hs-CRP 均呈正相关,这也证实了 hs-CRP 与 MP 患者的血清 SP-A 及 SP-D 均具有紧密联系,原因主要是与 hs-CRP 及血清 SP-A、SP-D 水平受到病原菌等相关因素影响后机体内生化机制的协同性改变有关。舒林华等人^[30]报道证

实,MP 患者的 SP-A 及 SP-D 水平与其肺组织的感染严重度有关。因此,随着感染的严重度加剧,炎症症状也趋于严重,因此从 hs-CRP 等指标上也可较为客观地呈现。

综上所述,MP 患者的血清 SP-A、SP-D 及 hs-CRP 水平随治疗时间的变化而变化,最终接近正常水平,且治疗有效者的血清 SP-A、SP-D 及 hs-CRP 水平降低,SP-A、SP-D 水平与 hs-CRP 水平均呈正相关,临床治疗时可根据其水平变化判断 MP 患者的病情。

参考文献(References)

- [1] Yoon IA, Hong KB, Lee HJ, et al. Radiologic findings as a determinant and no effect of macrolide resistance on clinical course of *Mycoplasma pneumoniae pneumonia*[J]. BMC Infect Dis, 2017, 17(1): 402
- [2] Ishiguro N, Koseki N, Kaiho M, et al. Therapeutic efficacy of azithromycin, clarithromycin, minocycline and tosufloxacin against macrolide-resistant and macrolide-sensitive *Mycoplasma pneumoniae pneumonia* in pediatric patients[J]. PLoS One, 2017, 12(3): e0173635
- [3] Ledford JG, Voelker DR, Addison KJ, et al. Genetic variation in SP-A2 leads to differential binding to *Mycoplasma pneumoniae* membranes and regulation of host responses[J]. J Immunol, 2015, 194(12): 6123-6132
- [4] Shan LS, Liu X, Kang XY, et al. Effects of methylprednisolone or immunoglobulin when added to standard treatment with intravenous azithromycin for refractory *Mycoplasma pneumoniae pneumonia* in children[J]. World J Pediatr, 2017, 13(4): 321-327
- [5] Dong Y, Lv W, Lin Z. Value of serum *Mycoplasma pneumoniae* immunoglobulin in the diagnosis of mycoplasma-related pneumonia in newborns[J]. Exp Ther Med, 2017, 14(2): 1445-1449
- [6] Wang L, Feng Z, Zhao M, et al. A comparison study between GeXP-based multiplex-PCR and serology assay for *Mycoplasma pneumoniae* detection in children with community acquired pneumonia[J]. BMC Infect Dis, 2017, 17(1): 518
- [7] 刘金荣,赵顺英.难治性肺炎支原体肺炎的发病机制[J].临床儿科杂志, 2013, 31(12): 1186-1188
Liu Jin-rong, Zhao Shun-ying. Pathogenesis of Refractory *Mycoplasma Pneumoniae* Pneumonia [J]. The Journal of Clinical Pediatrics, 2013, 31(12): 1186-1188
- [8] Hsia BJ, Ledford JG, Potts-Kant EN, et al. Mast cell TNF receptors regulate responses to *Mycoplasma pneumoniae* in surfactant protein A(SP-A)-/-mice[J]. J Allergy Clin Immunol, 2012, 130(1): 205-214, e2
- [9] Gao D, Chen X, Wu H, et al. The levels of serum pro-calcitonin and high-sensitivity C-reactive protein in the early diagnosis of chronic obstructive pulmonary disease during acute exacerbation[J]. Exp Ther Med, 2017, 14(1): 193-198

- [10] Jiang W, Qian L, Liang H, et al. Relationships between the varied ciliated respiratory epithelium abnormalities and severity of Mycoplasma pneumoniae pneumonia [J]. Scand J Infect Dis, 2014, 46 (7): 486-492
- [11] 李新成,孙洁民.中西医结合治疗支原体肺炎 48 例[J].湖北中医杂志, 2000, 22(4): 19
Li Xin-cheng, Sun Jie-min. Treatment of 48 Cases of Mycoplasma Pneumonia with Combination of TCM and Western Medicine [J]. Hubei Journal of Traditional Chinese Medicine, 2000, 22(4): 19
- [12] Li W, Ban C, Zhang J, et al. Correlation study of cough variant asthma and mycoplasma pneumonia infection in children [J]. Pak J Pharm Sci, 2017, 30(3(Special)): 1099-1102
- [13] Mayor-Ibarguren A, Feito-Rodriguez M, González-Ramos J, et al. Mucositis Secondary to Chlamydia pneumoniae Infection: Expanding the Mycoplasma pneumoniae-Induced Rash and Mucositis Concept [J]. Pediatr Dermatol, 2017, 34(4): 465-472
- [14] 倪莎莎,吕菊红,李雪琴,等.支原体肺炎患儿细胞免疫功能及肺功能状态变化的临床研究 [J]. 现代生物医学进展, 2016, 16(25): 4896-4898
Ni Sha-sha, Lv Ju-hong, Li Xue-qin, et al. Clinical Study of Cellular Immune Function and Pulmonary Function in Children with Mycoplasma Pneumonia [J]. Progress in Modern Biomedicine, 2016, 16 (25): 4896-4898
- [15] Ma YJ, Wang SM, Cho YH, et al. Clinical and epidemiological characteristics in children with community-acquired mycoplasma pneumonia in Taiwan: A nationwide surveillance[J]. J Microbiol Immunol Infect, 2015, 48(6): 632-638
- [16] Ma Z, Zheng Y, Deng J, et al. Characterization of macrolide resistance of Mycoplasma pneumoniae in children in Shenzhen, China[J]. Pediatr Pulmonol, 2014, 49(7): 695-700
- [17] 黄霞,赵德育,王全,等.肺炎支原体肺炎与肺表面活性物质相关蛋白 A 的相关性研究[J].南京医科大学学报(自然科学版), 2017, 37 (6): 719-722
Huang Xia, Zhao De-yu, Wang Quan, et al. Study on the Correlation between Mycoplasma Pneumoniae Pneumonia and Surfactant Associated Protein A [J]. Journal of Nanjing Medical University (Natural Science Edition), 2017, 37(6): 719-722
- [18] 姜文涛,褚亚苏,王剑,等.百蕊胶囊联合阿奇霉素治疗支原体肺炎的疗效及对患儿血清 hs-CRP、EC、SIL-2R 的影响[J].中国生化药物杂志, 2017, 37(3): 128-130
Jiang Wen-tao, Chu Ya-su, Wang Jian, et al. Effect of Bairui capsule combined with azithromycin in the treatment of mycoplasma pneumonia and its effect on serum hs-CRP, EC and SIL-2R [J]. Chinese Journal of Biochemical Pharmaceutics, 2017, 37(3): 128-130
- [19] 陆芳.醒脑静注射液对老年支原体肺炎患者血清肿瘤坏死因子- α 、C 反应蛋白水平及免疫功能的影响[J].中国老年学杂志, 2017, 37(13): 3268-3270
Lu Fang. Effects of Xingnaojing Injection on the Levels of Serum Tumor Necrosis Factor- α , C-reactive Protein and Immune Function in Elderly Patients with Mycoplasma Pneumonia [J]. Chinese Journal of Gerontology, 2017, 37(13): 3268-3270
- [20] Lu A, Wang C, Zhang X, et al. Lactate Dehydrogenase as a Biomarker for Prediction of Refractory Mycoplasma pneumoniae Pneumonia in Children[J]. Respir Care, 2015, 60(10): 1469-1475
- [21] Shu LH, Lu Q, Han LY, et al. SP-D, KL-6, and HTI-56 levels in children with mycoplasma pneumoniae pneumonia [J]. Int J Clin Exp Pathol, 2015, 8(9): 11185-11191
- [22] Seo YH, Kim JS, Seo SC, et al. Predictive value of C-reactive protein in response to macrolides in children with macrolide-resistant Mycoplasma pneumoniae pneumonia [J]. Korean J Pediatr, 2014, 57(4): 186-192
- [23] 柴玲彦,赵红,刘连凤,等.肺炎支原体肺炎患儿血清及支气管肺泡灌洗液中 SP-A、SP-D 和 KL-6 含量变化及意义[J].陕西医学杂志, 2015, 44(7): 806-809
Chai Ling-yan, Zhao Hong, Liu Lian-feng, et al. Changes and Significance of SP-A, SP-D and KL-6 in Serum and Bronchoalveolar Lavage Fluid in Children with Mycoplasma Pneumoniae Pneumonia [J]. Shaanxi Medical Journal, 2015, 44(7): 806-809
- [24] Çolak A, Yılmaz C, Toprak B, et al. Procalcitonin and CRP as Biomarkers in Discrimination of Community-acquired Pneumonia and Exacerbation of COPD[J]. J Med Biochem, 2017, 36(2): 122-126
- [25] Alcoba G, Keitel K, Maspoli V, et al. A three-step diagnosis of pediatric pneumonia at the emergency department using clinical predictors, C-reactive protein, and pneumococcal PCR [J]. Eur J Pediatr, 2017, 176(6): 815-824
- [26] 金瑄.肺炎支原体抗体联合超敏 C 反应蛋白检测在小儿支原体肺炎感染诊断中的临床价值 [J]. 标记免疫分析与临床, 2015, 22(8): 744-746
Jin Xuan. Clinical Value of Mycoplasma Pneumoniae Antibody Combined with Hypersensitive C Reactive Protein Test in the Diagnosis of Mycoplasma Pneumoniae Infection in Children [J]. Marker Immunoassay and Clinical, 2015, 22(8): 744-746
- [27] Ueda N, Minami S, Akimoto M. Mycoplasma pneumoniae-associated mild encephalitis/encephalopathy with a reversible splenic lesion: report of two pediatric cases and a comprehensive literature review[J]. BMC Infect Dis, 2016, 16(1): 671
- [28] Ledford JG, Mukherjee S, Kislán MM, et al. Surfactant protein-A suppresses eosinophil-mediated killing of Mycoplasma pneumoniae in allergic lungs[J]. PLoS One, 2012, 7(2): e32436
- [29] Esposito S, Bianchini S, Gambino M, et al. Measurement of lipocalin-2 and syndecan-4 levels to differentiate bacterial from viral infection in children with community-acquired pneumonia [J]. BMC Pulm Med, 2016, 16(1): 103
- [30] 舒林华,尚云晓,蔡栩栩,等.肺表面活性蛋白 A、D 和 KL-6 在肺炎支原体肺炎患儿血清和支气管肺泡灌洗液中的变化及意义 [J]. 中华儿科杂志, 2013, 51(10): 779-782
Shu Lin-hua, Shang Yun-xiao, Cai Xu-xu, et al. The Changes and Significance of Pulmonary Surfactant Protein A, D and KL-6 in Serum and Bronchoalveolar Lavage Fluid of Children with Mycoplasma Pneumoniae Pneumonia [J]. Chinese Journal of Pediatrics, 2013, 51 (10): 779-782