

# 中医药防治儿童肺炎支原体肺炎的分期策略与机制探析

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**摘要:** 儿童肺炎支原体肺炎(MPP)的临床防治存在诸多瓶颈问题,探索中医药防治MPP的科学内涵与有效治法尤为重要。针对儿童MPP发病率升高、耐药性、难治性及重症病例增多的现状,本文立足中医学“治未病”理论,从流行易感、感染治疗、预后康复分期阐释中医药防治的科学内涵、病因病机、辨治规律,并基于各分期病机特点,结合现代药理与临床证据,提出对应防治策略,旨在进一步开发和探索中医药在防治儿童MPP中的潜在机制与临床优势。

**关键词:** 儿童;肺炎支原体;肺炎支原体肺炎;中医药;分期防治;治未病;预防

**中图分类号:** R256.11 **文献标志码:** A **文章编号:** 1672-0482(2026)01-0036-10

**DOI:** 10.14148/j.issn.1672-0482.2026.0036

**引文格式:** 卢志远,王雨涵,林丽丽,等. 中医药防治儿童肺炎支原体肺炎的分期策略与机制探析[J]. 南京中医药大学学报, 2026,42(1):36-45.

## Exploration of Staged Strategies and Mechanisms of Traditional Chinese Medicine in the Prevention and Treatment of Pediatric *Mycoplasma Pneumoniae* Pneumonia

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**ABSTRACT:** The clinical prevention and treatment of pediatric *Mycoplasma pneumoniae* pneumonia (MPP) faces numerous challenges. Exploring the scientific basis and effective methods of traditional Chinese medicine (TCM) in preventing and treating this disease is therefore crucial. Given the increasing incidence, drug resistance, refractory nature, and increasing number of severe cases of pediatric MPP, this article, based on the TCM theory of “preventing disease before it occurs”, explains the scientific connotations, etiology, pathogenesis, and treatment principles of TCM in preventing and treating this disease across different stages of its development, from susceptibility and infection to treatment and rehabilitation. Based on the characteristics of the pathogenesis at each stage, and combining modern pharmacological and clinical evidence, corresponding prevention and treatment strategies are proposed. This aims to further develop and explore the potential mechanisms and clinical advantages of TCM in the prevention and treatment of pediatric MPP.

**KEYWORDS:** children; *Mycoplasma pneumoniae*; *Mycoplasma pneumoniae* pneumonia; traditional Chinese medicine; staged prevention and treatment; preventing disease before it occurs; prevention

肺炎支原体(*Mycoplasma pneumoniae*, MP)是一种缺乏细胞壁,介于细菌和病毒之间的微生物,主要通过呼吸道传播。MP除引起呼吸系统相关症状外,还可以引起广泛的肺外表现,包括皮肤、神经、心血管、血液、消化系统等,严重者可导致死亡<sup>[1-2]</sup>。肺炎

支原体肺炎(MP pneumonia, MPP)是学龄儿童及青少年常见的一种社区获得性肺炎,其发病机制主要涉及MP直接黏附损伤、社区获得性呼吸窘迫综合征毒素损伤、肺炎支原体脂蛋白、免疫学说、微循环障碍等多个方面<sup>[3]</sup>。儿童MPP全年均有发病,在我

收稿日期: 2025-11-11

基金项目: 国家中医药管理局全国名中医传承工作室建设项目(国中医药人教发[2018]119号);国家中医药管理局高水平中医药重点学科建设项目资助(国中医药人教函[2023]85号);江苏省中医流派研究院重点课题(LPZD2025012)

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国北方以秋冬季高发,南方以夏秋季多见<sup>[4]</sup>。在非流行年份约占儿童社区获得性肺炎的10%~30%,流行年份的发病率可增加3~5倍<sup>[5-6]</sup>。流行病学研究显示1/3以上MPP患儿存在肺外并发症,约1%~10%重症患儿可能遗留支气管扩张、肺不张、闭塞性细支气管炎等后遗症<sup>[7]</sup>。

近年来,随着儿童MPP发病率的升高以及阿奇霉素、红霉素等大环内酯类抗生素耐药率的增长,大环内酯类药物无反应性MPP及难治性MPP的发病率正逐渐升高<sup>[8]</sup>。此外,大环内酯类药物产生的胃肠道不适、血栓性静脉炎等不良反应问题突出,而四环素类及喹诺酮类抗生素等在临床替代应用时仍存在诸多不足,使得患者群体的依从性不断下降<sup>[9]</sup>。

越来越多的临床及基础研究表明,中医药防治儿童MPP具有独特优势<sup>[10-11]</sup>。因此,本研究立足中医学“治未病”理论,认为儿童MPP流行易感期以肺脾气虚、风温流行为关键;感染治疗期核心为热毒伤阴、痰瘀闭肺,易致重症;预后康复期则以气阴两虚、温邪内稽,引发慢性咳嗽为主。基于各分期病机特点,本文提出对应防治策略,即流行易感期补肺实卫、调和营卫以调节免疫功能;感染治疗期清肺解毒、涤痰化瘀,从直接抑制肺炎支原体、调控免疫-炎症反应、修复气道黏膜屏障、改善微循环障碍等多方面协同增效减副;预后康复期益气养阴、扶正祛邪以消除慢性咳嗽。

## 1 儿童MPP的中医药分期策略

中医学素来重视疾病的分期防治,早在《黄帝内经》就提出“未病先防、既病防变、瘥后防复”的“治未病”理论,如《素问·四气调神大论》所载:“圣人不治已病治未病,不治已乱治未乱,此之谓也。”<sup>[12]</sup><sup>[14]</sup>唐代孙思邈对《黄帝内经》的“治未病”理论进行了深化,在《备急千金要方·论诊候》提出:“古人善为医者,上医医未病之病,中医医欲病之病,下医医已病之病。”<sup>[13]</sup><sup>[3]</sup>将疾病分为未病、欲病、已病3类,与现代预防医学“早发现、早诊断、早治疗”的三级预防概念相符合。

鉴于近年来儿童MPP的发病率呈升高趋势,且大环内酯类药物无反应性、难治性及重症MPP的发生率增多,在“病证结合”“治未病”等理论的指导下,从流行易感、感染治疗、预后康复3个不同分期,探讨儿童MPP的中医分期内涵,具有重要的临床意义。小儿肺脾不足,卫外不固,易罹外感,在MPP流行期,应注重未病先防,扶正固表,增强免疫力,避免

感染。感染后,小儿体属纯阳,心肝有余,外邪乘虚入里,易于从阳化热,内陷厥阴,变生重症,治疗既强调从临床和影像学表现进行“辨病”,结合MP核酸或抗体检测明确诊断,又重视从中医学角度,辨证论治,提前干预,截断扭转,从而既病防变;治疗后,小儿脏气清灵,易趋康复,但脏体娇嫩,正虚邪恋,又易于反复,故预后康复期注重瘥后防复,祛余邪扶正气,促进肺部残余炎症吸收,消除慢性咳嗽,恢复患儿免疫功能,防止复感。

## 2 儿童MPP的病机内涵

### 2.1 流行易感期:风温流行,肺脾气虚,免疫低下易感

儿童MPP是一种传染性疾病,主要通过飞沫或接触传播,约每隔3~7年发生一次地区性流行,四季均可发病,在我国北方以冬季多发,南方以夏秋季多发,北方冬季燥寒伤肺阴,南方夏秋湿热困脾土。MPP具有传染性、流行性、季节性、地域性的特点,故将其归属于“风温”范畴<sup>[14]</sup>。风温之伊始,指春季气候温暖多风的自然现象,如《素问·六元正纪大论》曰:“风温春化同。”<sup>[12]</sup><sup>[476]</sup>王叔和在《伤寒论·伤寒例》中提出:“阳脉浮滑,阴脉濡弱者,更遇于风,变为风温。”<sup>[15]</sup><sup>[29]</sup>认为风温是余邪未尽而复感风邪,为新感引动伏邪。至叶天士明确新感风温,《临证指南医案·风温》曰:“风温者,春月受风,其气已温。”<sup>[16]</sup><sup>[242]</sup>

《诸病源候论·养小儿候》云:“小儿始生……宜时见风日,若都不见风日,则令肌肤脆软,便易伤损……数见风日,则血凝气刚,肌肉硬密,堪耐风寒,不致疾病。”<sup>[17]</sup><sup>[766]</sup>易感患儿多肺脾气虚,肺气亏虚则腠理疏松,卫外不固,营卫不和,外邪易感;加之儿童脾胃本弱,肠道脆薄,易为药食所伤,气血生化不足,金土不能相生。此阶段虽未感邪,但风温流行,易感患儿正气亏虚,肺脾气虚,构成儿童易感之基础<sup>[18]</sup>。现代研究证实肺脾气虚的易感儿童血清IgG、sIgA水平显著降低,免疫功能低下,一有感触,病自里发,骤然起病<sup>[19]</sup>。

### 2.2 感染治疗期:热毒伤阴,痰瘀闭肺,传变易致重症

MP经飞沫传播入侵呼吸道,借助其特殊尖端结构P1、P30黏附蛋白黏附于呼吸道上皮细胞,并通过释放过氧化氢和超氧游离基造成呼吸道上皮细胞损伤破坏、死亡脱落,并释放大量炎症因子及趋化因子。同时巨噬细胞被激活后大量聚集,分泌大量促

炎因子和生长因子,进一步加重气道黏膜上皮的损伤<sup>[20-22]</sup>。《临证指南医案·风温》曰:“风温入肺,肺气不通,热渐内郁。”<sup>[16]242</sup>小儿为“纯阳”之体,风温入肺,迅速化热,形成温热邪毒,郁热损伤肺阴。

《临证指南医案·积聚》言:“初为气结在经,久则血伤入络。”<sup>[16]178</sup>感染期风温邪毒迅速化热伤阴,痰瘀互结闭肺。热毒损伤气阴、引发剧烈炎症反应及脂代谢紊乱及高凝状态,易致重症及气道闭塞。风温郁热闭肺,肺之气络不畅,则气津凝滞为痰,肺之血络不通,则营血滞涩为瘀,痰瘀胶结。现代研究发现,MP感染可引起机体脂质代谢的紊乱,导致甘油磷脂代谢、鞘脂代谢及甘油三酯代谢异常,同时易致机体凝血功能异常,与“痰瘀闭肺”的病机具有内在一致性<sup>[19,23-25]</sup>。此外,“温邪则热变最速”,极易损伤气阴,发生免疫失衡。热、毒、痰、瘀互结,则变证多端,易致重症,导致难治性及重症MPP的发生发展,临床研究表明,儿童MPP的主要风险是遗留气道闭塞,损伤肺通气功能<sup>[26]</sup>。

### 2.3 预后康复期:气阴两虚,温邪内稽,络伤致慢性咳嗽

现代研究表明,MP细胞膜表面的黏附蛋白种类较多,且容易发生变异,以保证其与宿主细胞的紧密联系,使其较难被黏液纤毛系统清除<sup>[1]</sup>。同时,MP与上皮细胞相结合可在附着处释放多种细胞毒素,破坏气道黏膜的完整性,导致肺泡上皮修复障碍,肺表面活性蛋白-D减少,气道纤毛运动减弱,免疫监视功能减弱,抗原持续刺激,导致慢性咳嗽<sup>[27]</sup>。

康复期病机以气阴两虚,温邪内稽,肺络受损为主;加之长期使用抗生素,苦寒攻伐脾胃,导致土不生金,易于慢性咳嗽,或再罹外感,正如《诸病源候论·久咳逆上气候》所言:“久咳逆气,虚则邪乘于气……少时乃定,定后复发,连滞经久也。”<sup>[17]255</sup>《小儿药证直诀·咳嗽》载:“久嗽者,肺亡津液。”<sup>[28]</sup>小儿阴常不足,“稚阴”易伤难复,风温耗气伤阴,邪热恋肺难祛,损伤肺络,临床多表现为长期刺激性干咳。《杂病源流犀烛·咳嗽哮喘源流》云:“盖肺不伤不咳,脾不伤不久咳。”<sup>[29]</sup>感染期长期应用大环内酯类抗生素,中医学认为此类药物为苦寒攻伐之品,易于损伤脾胃运化功能,脾伤则土不生金,肺伤则气怯喘嗽,此为母子同病,母不生,而成肺脾气虚之慢性咳嗽,迁延难愈,甚至短期内可再次发生感染。此外,肺卫气耗伤则腠理不固,肺热阴伤则营阴外泄,可表现为自汗、盗汗,

严重影响患儿康复期的学习与生活质量<sup>[14]</sup>。

## 3 中医药分期防治儿童MPP的临床优势与机制内涵

基于“未病先防、既病防变、瘥后防复”的分期防治原则,在儿童MPP流行易感期末病先防,补肺实卫,和调营卫以调节免疫功能;感染治疗期既病防变,清肺涤痰,化痰解毒以协同增效减副;预后康复期瘥后防复,补气养阴,扶正祛邪以消除慢性咳嗽的独特优势。

### 3.1 流行易感期:补肺实卫,和调营卫以调节免疫功能

易感儿病机关键不在邪多而在正虚,MPP流行易感之期,重在预防,扶正御邪,调节机体免疫功能,临床多选用玉屏风散、黄芪桂枝五物汤、四君子汤等经典方剂,常用黄芪、白术、防风、桂枝、白芍、党参、太子参、茯苓、甘草、陈皮、焦山楂、焦六神曲、炒麦芽、煅龙骨、煅牡蛎、浮小麦等药。若肺卫气虚,反复易感者,首选益气固表、扶正御邪之代表方玉屏风散;营卫不和,卫阳偏虚,汗出不温者,选用仲景经方黄芪桂枝五物汤,该方内蕴桂枝汤调和营卫之义,又增黄芪以助补气固表、温阳实卫之功;脾气虚弱,纳运失健,土不生金者,则合用四君子汤,该方原治“荣卫气虚,脏腑怯弱”,具有益气健脾,培土生金之功。

临床研究表明玉屏风散/颗粒具有防治结合的独特优势,既可以明显提高MPP患儿体液免疫功能,又能够有效降低MPP感染后反复呼吸道感染的发生率<sup>[30-33]</sup>。现代药理研究发现玉屏风散/颗粒能够调控机体免疫反应,调节淋巴细胞亚群Th1/Th2比例,提高呼吸道免疫球蛋白sIgA及血清IgG水平,调节机体免疫功能,提高易感儿童抗病能力,临床常用于MP流行期的预防<sup>[34-35]</sup>。临床研究表明黄芪桂枝五物汤可以明显提高机体CD3<sup>+</sup>、CD4<sup>+</sup>、IgG、IgA、IgM水平,具有调节免疫平衡,增强机体免疫力,防治呼吸道感染的功能<sup>[36-37]</sup>。动物实验发现黄芪桂枝五物汤能够调节Th1/Th2和Th17/Treg细胞免疫失衡<sup>[38]</sup>。动物实验与临床研究发现四君子汤可以通过调控肠道菌群,提高肠道sIgA水平以及血清IgG、IgA、IgM水平,改善脾虚症状,同时具有调节胃肠运动功能和胃肠激素的作用,调控神经内分泌免疫(NEI)网络功能,助脾运化,培土生金,以达“四季脾旺不受邪”之效<sup>[39-41]</sup>。详见表1。

表1 流行易感期经典方剂的现代机制及其临床优势

代表方剂	功效主治	现代机制	临床优势
玉屏风散/颗粒	益气固表,扶正御邪	调节淋巴细胞亚群Th1/Th2比例,抑制Th2细胞的过度表达,减轻炎症反应 <sup>[34]</sup> 提高呼吸道免疫球蛋白sIgA及血清IgG水平,降低IgE、C3和C4水平,增强免疫力 <sup>[35]</sup>	防治结合,能够减少MPP并发症与后遗症的发生,有效预防MPP感染后反复呼吸道感染的发生率 <sup>[30-33]</sup>
黄芪桂枝五物汤	调和营卫,补气固表	调节Th1/Th2和Th17/Treg免疫平衡,抑制炎症反应 <sup>[36]</sup> 提高CD3 <sup>+</sup> 、CD4 <sup>+</sup> 、IgG、IgA、IgM水平,调节免疫功能 <sup>[37]</sup> 提高胃泌素、胃动素、IL-4、IL-8、ALD水平,调控NEI网络功能 <sup>[39]</sup>	调和营卫,能够改善反复呼吸道感染患儿厌食、自汗的临床症状,降低呼吸道感染发生率 <sup>[37-38]</sup>
四君子汤	益气健脾,培土生金	调控肠道菌群稳态,提高肠道sIgA以及血清IgG、IgA、IgM水平,调节免疫功能 <sup>[40]</sup> 平衡胃机电紊乱,调控胃肠运动,调节消化道内局部CCK和MTL含量,促进消化吸收 <sup>[41]</sup>	运脾防感,培土生金,能够促进胃肠消化吸收,改善脾虚症状,防治呼吸道感染 <sup>[41]</sup>

3.2 感染治疗期:清肺解毒,涤痰化瘀以协同增效减副

MPP属“风湿”范畴,热、毒、痰、瘀互结,肺气郁闭,闭阻肺络,易致难治性及重症MPP的发生发展。此期治以清肺解毒、涤痰化瘀为主,临床常以麻黄杏仁甘草石膏汤为基础方,常用炙麻黄、苦杏仁、生石膏、黄芩、虎杖、金银花、连翘、桑白皮、瓜蒌皮、浙贝母、法半夏、葶苈子、桔梗、芦根、丹参、地龙、桃仁、红景天等药。其中喉中漉漉,有痰难咳,痰阻肺络明显者,合用清金化痰汤加减,以增强化痰止咳平喘之功;针对难治性及重症MPP,痰阻肺络明显者,合用千金苇茎汤加减,以加强化痰祛瘀、活血通络之力。莲花清瘟颗粒以麻黄杏仁甘草石膏汤与银翘散为基础方,汲取明代吴又可《温疫论》所载治疫病用大黄的用药经验,合用广藿香、红景天扶正祛邪,攻补兼施,功擅清瘟解毒、宣肺泄热,是临床治疗MPP常用中成药<sup>[42]</sup>。

感染期为中医药治疗的关键时期,与大环内酯类抗生素联合治疗儿童MPP,能够发挥中西医优势互补、协同增效的独特优势,并可以有效减轻西药的不良反应,防治并发症,减少后遗症的发生<sup>[43]</sup>。中医药通过祛除病邪以直接抑制MP黏附定植、破坏其生物膜;清热解毒以调控调节免疫-炎症反应;清肺涤痰以上调修复相关因子、抑制上皮间质转化,修复气道黏膜屏障;活血化瘀以改善微循环障碍,调节血液流变学,促进肺部炎症吸收。详见图1。

3.2.1 祛除病邪,直接抑制病原体

MP经飞沫传播入侵呼吸道,通过P1、P30黏附蛋白侵袭呼吸道上皮,并通过释放过氧化氢和超氧游离基,损伤呼吸道上皮细胞<sup>[44-45]</sup>。祛除风湿病邪在此过程中发挥关键作用,其科学内涵主要体现在对MP的直接作用,减轻黏膜定植,阻断感染级联反应。通过测定有效成分对MP的最小抑菌浓度,从而评估其抑制MP的能力。研究显示,有效单体如黄芩苷<sup>[46]</sup>和黄芩素<sup>[47]</sup>、单味药如苦参和麦冬<sup>[48]</sup>可破坏MP细胞膜完整性,显著降低其生物膜形成能力,阻断其黏附定植。网络药理学结合临床研究发现,麻杏石甘汤可有效降低MP病菌含量,显著减少患儿皮疹、胃肠道反应的发生,异病同治MPP合并支气管哮喘,临床有效率高<sup>[49-50]</sup>。

3.2.2 清热解毒,调控免疫

MP感染引起肺组织炎症反应的严重程度与免疫功能紊乱、免疫抑制及多种细胞因子水平相关<sup>[3]</sup>。清热解毒法能够实现MPP过度炎症与免疫抑制的双向调节,如活性成分黄芩苷可通过调节细胞因子表达,调控TLR4/NF-κB信号的传递,抑制NLRP3炎症小体活化与细胞焦亡,增强白细胞吞噬能力,实现调控免疫-炎症反应的作用<sup>[51-53]</sup>。虎杖苷可通过抑制NLRP3炎症小体实现抑制MP感染后诱导的炎症反应<sup>[54]</sup>。莲花清瘟颗粒能够有效提高CD4<sup>+</sup>、CD3<sup>+</sup>细胞数量,降低TNF-α、IL-8、IL-6水平,改善MPP肺损伤<sup>[55-56]</sup>。对于合并咳嗽变异性哮喘、肺不张的患者,莲花清瘟颗粒能够

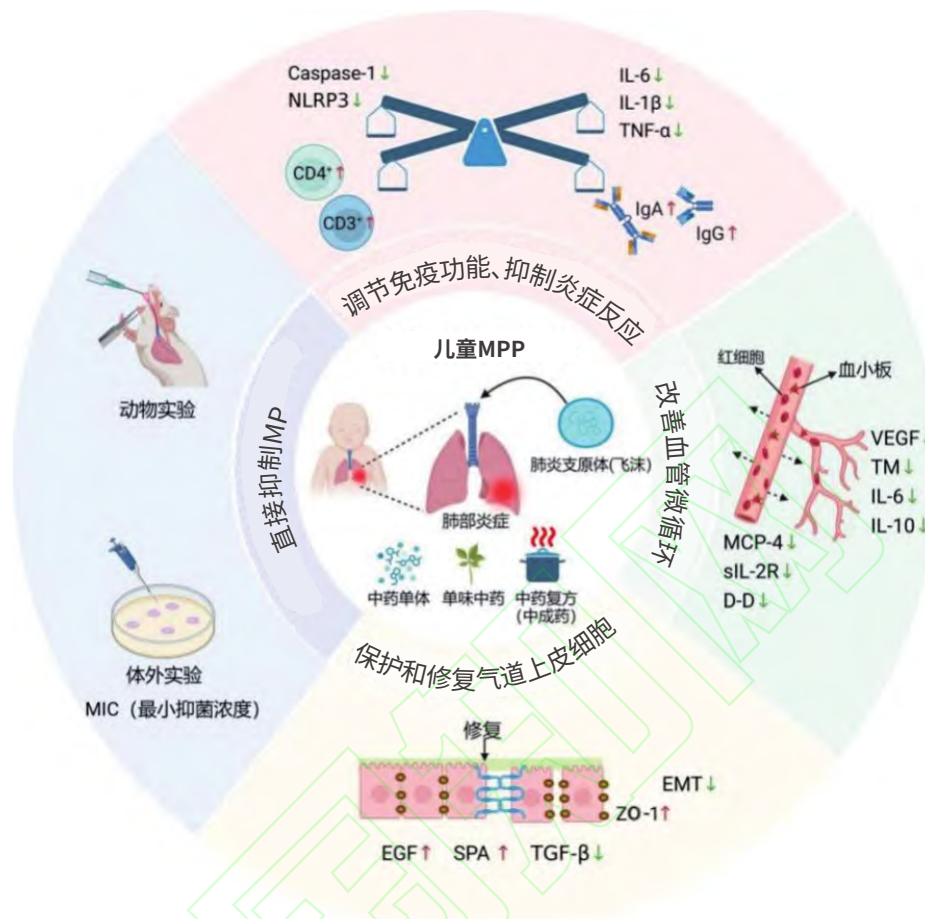


图1 中医药治疗儿童MPP的作用机制

Fig. 1 Scientific elucidation of the action mechanisms of traditional Chinese medicine for pediatric MPP

显著提高机体 IgA 水平,调节 T 淋巴细胞亚群平衡,有效抑制气道炎症反应,改善氧合功能及肺功能<sup>[57-59]</sup>。

3.2.3 清肺涤痰,修复屏障 MP 入侵患儿呼吸道后黏附于上皮细胞,发生生物膜融合的相互作用,造成呼吸道黏膜上皮的损伤<sup>[27]</sup>。清肺涤痰法能够改善呼吸道黏膜免疫,调控组织再生关键靶点,促进上皮屏障修复。药理研究发现,汉黄芩素能够通过上调 EGF 和 E-钙黏蛋白的表达,下调 TGF-β1 和波形蛋白的表达,促进肺组织修复<sup>[60]</sup>。桔梗总皂苷能够通过上调 SP-A 的表达,减轻肺部炎症反应及肺组织损伤<sup>[61]</sup>。网络药理学研究及分子对接验证实验发现,清金化痰汤含有槲皮素、柚皮素、汉黄芩素等活性成分,可能通过调节 IL-6、TP53、IL-1β 等靶点和 AMPK、NF-κB、JAK-STAT 等关键信号通路,提高乳酸清除率,缓解炎症反应,调节免疫功能,修复气道黏膜屏障<sup>[62-63]</sup>。莲花清瘟颗粒联合阿

奇霉素治疗儿童 MPP 不仅能够提高 MP-IgM 转阴率,而且可以改善肺功能,提高支气管镜下黏膜修复率<sup>[64]</sup>。

3.2.4 活血化瘀,改善微循环 MP 感染可导致血液流变学的改变及微血管的损伤,MPP 急性期可能存在的凝血异常及微循环障碍又反过来加重病情<sup>[65]</sup>。药理研究发现活血化瘀类中药具有改善微循环障碍的作用,在清除痰瘀等病理产物的同时促进肺络组织修复。应用丹参、桃仁、虎杖等活血化瘀药,采用清肺止咳活血法治疗儿童 MPP,可改善 MPP 后的高凝状态,消除微循环障碍<sup>[66]</sup>。临床研究发现,在清热宣肺的基础上加用活血化瘀通络药治疗儿童 MPP,能够有效地降低 VEGF、TM、IL-6 和 IL-10 的表达水平,调节 MPP 患儿的全血低切黏度、血浆黏度、聚集指数、红细胞压积,降低血管通透性,改善肺微循环,疗效更优<sup>[67-69]</sup>。千金苇茎汤加减可有效降低痰热壅肺兼血瘀证 MPP 患儿

MCP-4、sIL-2R、D-D、IL-2、IL-4水平,调节机体免疫功能,改善血液流变学状态,防治肺纤维化<sup>[70]</sup>。

### 3.3 预后康复期——益气养阴,扶正祛邪以消除慢性咳嗽

MP较难被黏液纤毛系统清除,且能够破坏气道黏膜的完整性,导致肺络受损,临床治愈后尚存在温邪内潜,气阴耗伤,可见较长时间的刺激性干咳,并易于再次感染。治疗多选用沙参麦冬汤、清燥救肺汤、参苓白术散等经典方剂,以益气养阴,扶正祛邪,消除慢性咳嗽。常用药物包括北沙参、南沙参、麦冬、百合、玉竹、桑叶、枇杷叶、蜜百部、苦杏仁、桔梗、茯苓、白术、五味子、防风、山药、甘草等。肺胃阴虚,燥热未清,慢性干咳为主者,首选沙参麦冬汤,生津润燥,清热润肺;高热病后,燥热未清,症见低热汗出者,选用清燥救肺汤,益气养阴,清燥润燥;脾肺气虚,痰湿内阻,而见慢性湿咳者,选用参苓白术散,健脾化湿,补气益肺。

临床研究发现沙参麦冬汤加减能够通过下调IL-6、TNF- $\alpha$ 、PCT水平,升高CD3<sup>+</sup>、CD4<sup>+</sup>、CD4<sup>+</sup>/CD8<sup>+</sup>

水平,改善炎性损伤,减轻咳嗽程度,缩短咳嗽时间,降低咳嗽敏感性,提高MPP恢复期患儿生活质量<sup>[71-72]</sup>。系统评价与Meta分析表明,沙参麦冬汤加减能够有效缩短退热、咳嗽消失和肺部啰音消失时间,提高MPP患儿的临床总有效率,并在降低复发率与不良反应发生率等方面具有显著优势<sup>[73]</sup>。清燥救肺汤加减可显著下调TNF- $\alpha$ 、IL-6及CRP水平,减轻气道炎症反应,改善MPP患儿肺功能,控制MPP引发的哮喘,消除慢性干咳<sup>[74-76]</sup>;动物验证实验发现,清燥救肺汤可有效下调MP感染小鼠血清caspase-1、caspase-3、NLRP3、Bax、Bcl-2及IL-1 $\beta$ 水平<sup>[77-78]</sup>。加味参苓白术散治疗迁延型难治性MPP患儿的临床疗效确切,能够显著降低hs-CRP水平及外周血中性粒细胞百分比,明显改善胸部影像学表现,缓解大环内酯类药物所产生的消化系统不良反应<sup>[79]</sup>;同时能够通过调控Nrf2/Keap1/NLRP3信号通路介导的细胞焦亡,发挥防治MPP并发肺纤维化的作用<sup>[80]</sup>。详见表2。

表2 预后康复期经典方剂的现代机制及临床优势

Table 2 Modern mechanisms and clinical benefits of classical formulas for the convalescence stage

代表方剂	功效主治	现代机制	临床优势
沙参麦冬汤	生津润燥, 清热润肺	下调IL-6、TNF- $\alpha$ 、PCT、CRP水平,减轻气道炎性损伤 <sup>[71]</sup> 提高CD3 <sup>+</sup> 、CD4 <sup>+</sup> 、CD4 <sup>+</sup> /CD8 <sup>+</sup> 水平,增强机体免疫力 <sup>[72]</sup>	减少咳嗽频数,缩短咳嗽时间及肺部啰音消失时间,降低咳嗽敏感性,改善MPP患儿恢复期生活质量 <sup>[71-73]</sup>
清燥救肺汤	养阴益气, 清燥润肺	下调TNF- $\alpha$ 、IL-6及CRP水平,改善肺功能,提高MP-IgM转阴率 <sup>[74-76]</sup> 下调caspase-1、NLRP3及IL-1 $\beta$ 水平,抑制炎症反应 <sup>[77-78]</sup>	减轻干咳,减轻儿童MPP临床症状,兼治支气管哮喘,改善气阴两虚状态 <sup>[76-77]</sup>
参苓白术散	健脾化湿, 补气益肺	降低hs-CRP水平及外周血中性粒细胞百分比,改善胸部影像学表现 <sup>[79]</sup> 调控Nrf2/Keap1/NLRP3信号通路介导的细胞焦亡,干预肺纤维化 <sup>[80]</sup>	消除湿咳,适用于迁延型难治性MPP患儿,可改善胸部影像学表现,缓解西药引起的消化系统不良反应,防治后遗症 <sup>[79]</sup>

## 4 总结

中医药防治儿童MPP遵循“治未病”理论,分流行易感、感染治疗、预后康复三期辨证防治儿童MPP临床疗效显著。流行易感期通过补肺实卫、调和营卫,增强免疫以预防感染;感染治疗期清肺解毒、涤痰化瘀,增效减副以遏制重症发展,减少后遗症的发生率;预后康复期益气养阴、扶正祛邪,减少复发并消除慢性咳嗽。

然而,当前临床研究大多缺乏高质量循证证据支持,同时,大多数的基础研究虽然是源于临床疗效的经验总结,但是大部分的基础研究成果并未被转化到临床应用上,尚未能够实现基础研究服务临床应用的研究目的。未来需强化临床分期防治的循证证据积累,基础研究则应注重汲取临床经验,凭借网络药理学、分子对接、多组学等现代科学技术,筛选抗MP中药有效活性成分,阐释中医药防治机制,推

动基础研究与临床应用深度融合,进一步发挥中医药防治优势。

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(编辑:董盈妹)