DOI: 10.19812/j.cnki.jfsq11-5956/ts.20250218001
引用格式: 孙明哲, 郝一铭, 穆慧玲, 等. 助眠类食源性中草药的应用现状及研究进展[J]. 食品安全质量检测学报, 2025, 16(16): 193–201.
SUN MZ, HAO YM, MU HL, *et al*. Current status and research progress of food-derived Chinese herbal medicines for sleep promotion [J]. Journal of Food Safety & Quality, 2025, 16(16): 193–201. (in Chinese with English abstract).

助眠类食源性中草药的应用现状及研究进展

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摘 要: 许多食源性中草药在镇静催眠方面效果良好, 且具有安全、温和、便捷等优势, 受到失眠人群、科研人员及相关从业者的广泛关注, 多应用于保健食品和普通食品中。助眠类保健食品剂型多样, 酸枣仁、灵芝、五味子等使用频次较高; 在普通食品领域, 涉及药膳、饮料、零食等多种产品, 且产品形式和制作工艺多样。研究进展方面, 不同食源性中草药改善睡眠的起效剂量有别, 助眠成分涉及萜类、生物碱及黄酮等多种成分, 作用机制涵盖神经递质调节、信号通路调节、肠道菌群改善以及抗氧化和抗炎等。然而, 食源性中草药的助眠研究和产品开发仍存不足。本文通过总结食源性中草药在助眠食品中的应用及使用规律, 回顾食源性中草药与助眠相关的现代研究, 对助眠类食源性中草药的功效成分及作用机制进行综述, 以期为食源性助眠新产品的研究与开发提供有益参考。

关键词: 食源中草药; 改善睡眠; 应用现状; 功效成分; 作用机制

Current status and research progress of food-derived Chinese herbal medicines for sleep promotion

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ABSTRACT: Many foodborne Chinese herbs exhibit significant efficacy in sedation and hypnotic effects, with the advantages of safety, mildness, and convenience. These properties have garnered widespread attention from individuals suffering from insomnia, scientific researchers, and relevant practitioners. Such herbs are predominantly utilized in health foods and ordinary foods. In the realm of health foods aimed at aiding sleep, dosage forms are diverse, and ingredients such as *Semen Ziziphi Spinosae*, *Ganoderma lucidum*, and *Schisandra chinensis* are frequently employed. Within the domain of ordinary foods, a variety of products including medicinal diets, beverages, and snacks are involved, showcasing diverse product forms and production processes. Regarding research advancements, the effective dosages of different food-derived Chinese herbs medicines for improving sleep vary, and their sleep-aid components encompass terpenoids, alkaloids, flavonoids and other constituents. The mechanisms of

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action span neurotransmitter regulation, signaling pathway modulation, gut microbiota improvement, antioxidative and anti-inflammatory activity. Nevertheless, there remain deficiencies in the research and product development of foodborne Chinese herbal medicines for sleep aid. This paper systematically summarized the applications and usage rules of foodborne Chinese herbal medicines in sleep aid foods, reviewed modern research on foodborne Chinese herbal medicines and sleep aids, and elucidated the efficacious components and mechanisms of foodborne Chinese herbal medicines for sleep enhancement, thereby providing valuable references for the research and development of sleep aid products based on foodborne Chinese herbal medicines.

KEY WORDS: food-derived Chinese herbal medicines; improve sleep; application status; functional component; action mechanism

0 引 言

食源性中草药，是指那些既可以作为食物被人们日常食用，又具有一定药用价值的中草药。这类中草药具有“药食同源”的特性，它们在满足人们基本饮食需求的同时，还能对人体起到一定的保健和治疗作用。助眠类食源性中草药，则是食源性中草药中具有改善睡眠质量、缓解失眠症状等助眠功效的一类。

失眠症是一种入睡困难、难以入睡或比预期早起并伴有日间功能障碍的病症[1]。失眠会增加患多种疾病的风险，包括心血管疾病、代谢疾病、神经退行性疾病、致癌及疼痛[2−3]。失眠症会对患者的心理和生理造成不利影响[2]，也是诱发焦虑和抑郁症状的一个危险因素[4]。目前，临床上用于治疗失眠的药物以苯二氮䓬和非苯二氮䓬类西药为主，虽能在一定程度上缓解症状，但往往伴随着日间嗜睡、头晕、乏力、记忆力减退等副作用，长期使用还可能产生药物依赖性和耐受性。此外，一些作用迅速和显著的中草药也可能伴随着较强的副作用，通常用于病情较为严重的失眠患者。

相比之下，食源性中草药的助眠功效相对较为温和，注重对身体的整体调理；且通常经过长期的食用验证，安全性较高，毒副作用相对较小，适合长期食用。且食源性中草药的应用具有便捷、多样的特点，既可以像普通食物一样经烹饪或简单处理后食用，也可以制成保健食品或功能性食品等。助眠类食源性中草药以其安全、有效及使用方便的优势，受到越来越多失眠人群的青睐。

然而，现存助眠类食源性中草药的种类繁多，面市产品纷繁多样，其助眠功效成分和作用机制不清晰。本文将国内已有的助眠类保健食品批件信息进行分类汇总，探寻助眠类食源性中草药在保健食品中的用药规律；简要整理助眠类食源性中草药的应用现状。通过文献研究，回顾助眠类食源性中草药的现代研究，对其功效成分及作用机理的研究进展进行梳理。以期为新型助眠食品的研究与开发提供有益参考。

1 助眠类食源性中草药的应用现状

1.1 在保健食品中的应用

1.1.1 中草药的助眠史

食源性中草药在助眠领域的应用历史久远，许多医学典籍都有过记载，主要以汤剂、丸剂、散剂等传统剂型为主。如《神农本草经》载酸枣仁“久服安五脏，轻身延年”，虽未明确提及助眠，但已为后世对其助眠功效的认知奠定了基础。东汉《金匮要略》中记载了“虚劳虚烦不得眠，酸枣仁汤主之”，明确指出了酸枣仁在治疗失眠方面的应用。唐代的《千金方》中，也有许多关于食源性中草药助眠的应用方剂。如“孔圣枕中丹”“归脾汤”等。

1.1.2 保健食品中的中草药

随着近现代科学技术的飞速发展，食源性中草药助眠的应用形式也更加多样化，除了传统的剂型外，还开发出了口服液、胶囊、片剂、颗粒剂等现代剂型保健食品，满足了不同消费者的需求。其中，含有中草药的改善睡眠类保健食品的品类也日渐丰富，截止到 2024 年 12 月，已取得注册批准文号的改善睡眠类保健食品共有 703 个品种，配方中出现的中草药种类超过 140 种[5]。去除非中草药类成分(如褪黑素、维生素类、矿物质类及辅料等)后，按中草药在配方中的出现频次进行排序，大于 20 次的中草药如图 1 所示，酸枣仁的使用频次最高，其次是灵芝、五味子、茯苓等。

1.1.3 助眠保健食品组方分析

众多具有助眠功能的保健食品中，配方组成各有千秋，根据组方中含有中草药的数量将助眠保健食品进行分类，结果如图 2 所示。其中，组方中含有 6 味及以下数量中草药的保健食品占比均大于 10%，合计占比 88%；4 味中草药组方占比最高，为 23%；使用中草药最多的“十八宝牌美宁片”，组方中有 17 味中草药，但组方药味数大于 12 味的保健食品数占比很低，仅为 0.39%。另外，值得注意的是，单味药保健食品中使用较多的中草药为灵芝、天麻和酸枣仁等，酸枣仁的出现频次低于灵芝和天麻；五味和六味组方保健食品

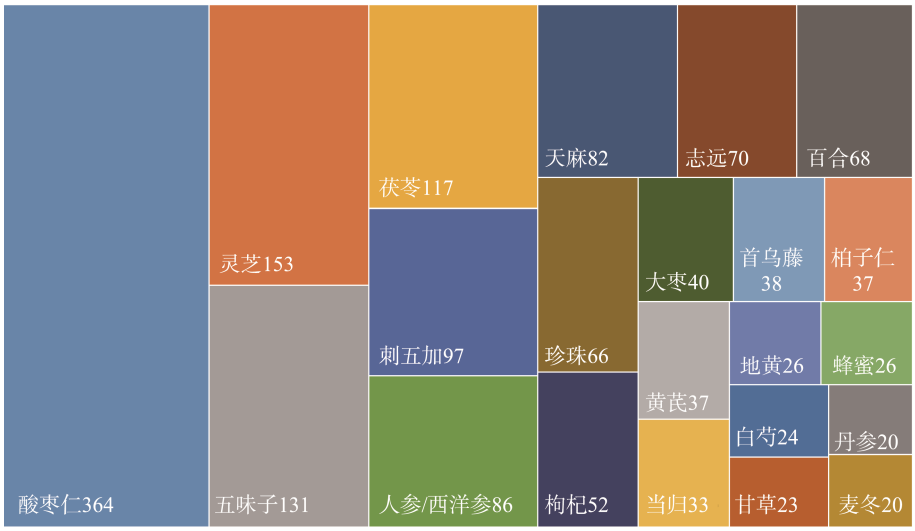

图 1　助眠类食源性中草药在保健食品中的出现频次

Fig.1　Prevalence of food- derived Chinese herbal for sleep promotion in health food

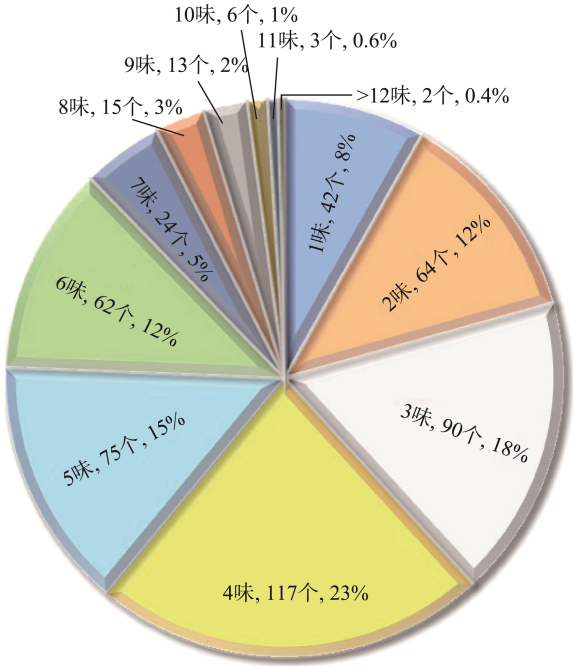

图 2　助眠类保健食品配方药味数分布

Fig.2　Herbal number distribution of health food formulations for sleep promotion

中使用较多的是酸枣仁、五味子、茯苓和灵芝等，灵芝的出现频次低于五味子和茯苓。这可能是因为科学合理的产品组方设计能使不同草药之间产生协同增效作用，低成本中草药的科学配伍也可能产生较好的助眠效果。在保健食品的研发过程中，应加强对食源性中草药化学成分、作用机制和配伍规律的研究，制定科学合理的配方，提高产品功效和质量的同时降低成本。

1.2　在普通食品中的应用

助眠类食源性中草药在药膳中的应用非常广泛，作为中医传统的养生和治疗方式，药膳将食源性中草药与食物巧妙结合，既能满足人们对美食的享受，又能发挥药物的治疗作用。通过将助眠类食源性中草药与普通食材合理搭配，能够起到调理身体、改善睡眠的效果，如百合莲子粥、酸枣仁粥、绿豆百合汤、桂圆红枣粥及助眠饼干、糕点等。此外，随着食品工业的发展、制剂工艺的创新和提高，助眠类食源性中草药的应用也越来越多地出现在功能性食品中，各种助眠功能食品不断涌现。为满足不同人群的需求，助眠功能性食品的剂型也越来越丰富，包括饮料、压片糖果、软糖、膏滋、袋泡茶等。

2　助眠类食源性中草药的研究进展

2.1　食源性中草药的改善睡眠活性

食源性中草药助眠的研究历史悠久，中医古籍中记载了众多具有安神助眠功效的食源性中草药，如酸枣仁、百合、茯苓等；国内外学者也从化学成分、药理作用、临床应用等多个角度对食源性中草药的助眠功能进行了广泛而深入的研究。常见助眠类食源性中草在实验动物中的起效剂量如表 1 所示。其中，炒酸枣仁 14.55 g/(kg • d)给药 7 d 的睡眠延长率最大为 286%[6]；紫花前胡醇当归酯 0.025 g/(kg •d)给药 1 d 的睡眠潜伏期缩短率最大为 86%[22]。整体来看，已报道的对不同改善睡眠中草药的活性评价研究中，给药时间为 1~30 d、睡眠延长率为 25%~286%、睡眠潜伏期缩短率为 13%~86%。此外，相同剂量的炒酸枣仁比生酸枣仁的睡眠延长率大，说明酸枣仁经炮制后效果更好[6]；五味子[10−12]和百合[16]的醇提物比水提物具有更低的起效剂量，并表现出更高的睡眠延长率；柏子仁油的起效剂量远低于柏子仁皂苷[20]。据此推测，这些中草药中较低极性的成分可能在其发挥助眠活性时起着更关键的作用。

表 1 助眠类食源性中草药起效剂量统计表

Table 1 Statistical table of effective dose of food-derived Chinese herbal medicines for sleep promotion

药材名称	使用部位	评价动物	起效剂量	给药时间/d	睡眠延长率/%	睡眠潜伏期缩短率/%	参考文献
酸枣仁	生酸枣仁	昆明小鼠	14.55 g/(kg·d)	7	214	13	[6]
	炒酸枣仁	昆明小鼠	14.55 g/(kg·d)	7	286	21	
灵芝	灵芝粉(25%)、灵芝提取物(50%)、孢子粉(25%)	ICR 小鼠	0.506 g/(kg·d)	14	32	31	[7]
	灵芝孢子粉提取物	Wistar 大鼠	1.5 g/(kg·d)	8	68	-	[8]
五味子	五味子水煎剂	Wistar 大鼠	2.25 g/(kg·d)	7	27	-	[9]
	五味子醇提物	ICR 小鼠	0.025 g/(kg·d)	1	106	38	[10]
	五味子水煎剂	昆明小鼠	10 g/(kg·d)	3	33	-	[11]
茯苓	茯苓醇提物	ICR 小鼠	0.2 g/(kg·d)	1	117	-	[12]
刺五加	刺五加注射液	ICR 小鼠	0.12 g/(kg·d)	7	55	37	[13]
人参	鲜人参膏	ICR 小鼠	0.2 g/(kg·d)	22	-	73	[14]
天麻	天麻粉	昆明小鼠	1.2 g/(kg·d)	20	100	25	[15]
百合	百合水提物	昆明小鼠	1.25 g/(kg·d)	30	53	29	[16]
	百合醇提物	昆明小鼠	1.25 g/(kg·d)	30	63	20	
枸杞	枸杞醋	ICR 小鼠	10 mL	7	102	37	[17]
大枣	大枣果醋	ICR 小鼠	8.5 mL	7	43	23	[18]
首乌藤	30%乙醇部位	昆明小鼠	6.1 g/(kg·d)	3	48	-	[19]
	60%乙醇部位	昆明小鼠	6.1 g/(kg·d)	3	54	-	
柏子仁	柏子仁皂苷	昆明小鼠	0.6 g/(kg·d)	5	86	-	[20]
	柏子仁油	昆明小鼠	0.066 g/(kg·d)	5	52	-	
黄芪	黄芪水煎液	昆明小鼠	3 g/(kg·d)	3	39	23	[21]
当归	紫花前胡醇当归酯	ICR 小鼠	0.025 g/(kg·d)	1	121	86	[22]
地黄	生地黄水提物	SD 大鼠	0.3 g/(kg·d)	30	25	42	[23]
白芍	白芍提水煎剂	ICR 小鼠	0.3 g/(kg·d)	30	32	15	[24]
丹参	丹参醇提物	叙利亚小鼠	0.1 g/(kg·d)	1	68	36	[25]
麦冬	麦冬水煎剂	昆明小鼠	20 g/(kg·d)	5	175	-	[26]

注: -表示未有此项。

综合来看，不同中草药改善睡眠的起效剂量存在差异，这与中草药的化学成分、作用机制以及药物动力学特性等因素密切相关。例如，酸枣仁中含有多种活性成分，如酸枣仁皂苷、黄酮类等，这些成分的协同作用可能需要一定的剂量才能达到有效调节神经系统、改善睡眠的效果。百合中的生物碱和黄酮类化合物通过调节神经递质和抗氧化应激来改善睡眠，其起效剂量可能与这些成分在体内的代谢和作用靶点的亲和力有关。在临床应用中，应充分考虑这些因素，根据患者的具体情况，合理选择中草药及其剂量，以提高治疗效果，确保用药安全。

2.2 食源性中草药中的助眠成分

现代科学运用先进的分析技术，如高效液相色谱法、串联质谱法等，对食源性中草药中的化学成分进行了深入分析，明确了许多具有助眠作用的活性成分。表 2 汇总了常见的几种助眠类食源性中草药中功效成分，主要有萜类、生物碱类、黄酮类、苯丙素类及油酯类等。统计结果可见，中草药的改善睡眠功能呈现既有多组分协同效应特征，也有单一组分效应的特征。多组分发挥功效的有，酸枣仁(萜类、生物碱类、黄酮类及油、酯类)[27–29]；五味子(萜类、苯丙素类及多糖)[31,41–44,47]；茯苓(萜类及多糖)[32,48]；人参(萜类及人参糖蛋白)[33–34,55]；甘草(萜类、黄酮类及光甘草定)[36,39,54]；远志(萜类及油、酯类)[38,45]；刺五加(苯丙素类及绿原酸)[40]。这说明中草药在发挥改善睡眠作用时以多组分协同为主，其作用机制也必然呈现多靶点、多通路的特性。因此，改善睡眠类新产品的组方设计也必然朝着多味组合的方向发展。

2.3 食源性中草药的助眠机制

2.3.1 神经递质调节

神经递质在睡眠调控中扮演核心角色，根据作用效果的不同分为促眠递质和促觉醒递质。促眠递质主要包括 γ-氨基丁酸(γ-aminobutyric acid, GABA)、腺苷和 5-羟色胺(5-hydroxytryptamine, 5-HT)；促觉醒递质主要包括去甲肾上腺素、组胺、多巴胺、谷氨酸和食欲素。促眠递质与促觉醒递质的动态平衡与睡眠阶段的转换密切相关，通过兴奋-抑制的动态平衡精确调控睡眠-觉醒周期。酸枣仁总皂苷[57]、灵芝发酵产物[58]、五味子醇提物[59]、五味子醋[60]、酒制五味子[61]、刺五加[62]、刺五加提取物[63]、百合提取物[64]、芍药苷[35]及远志[65]等均可通过调节动物脑内神经递质的动态平衡来达到改善睡眠的目的。

表 2　助眠类食源性中草药功效成分统计表

Table 2　Statistical table of functional component of food-derived Chinese herbal for sleep promotion

类别	功效成分	来源	参考文献	类别	功效成分	来源	参考文献
萜	白桦脂酸	酸枣仁	[27–29]	生物碱	莲心季铵碱	酸枣仁	[27–28]
	酸枣仁皂苷 A				去甲异紫堇定		
	酸枣仁皂苷 B				酸枣仁碱 F		
	酸枣仁皂苷元				乌药碱		
	灵芝酸	灵芝	[30]		N-去甲荷叶碱		
	黑五味子酸	五味子	[31]		山矾碱		
	茯苓酸	茯苓	[32]		木兰花碱		
	原人参二醇型人参皂苷 Rb1	人参	[33–34]	油、酯	前胡醇当归酸酯	当归	[22]
	原人参二醇型人参皂苷 Rg3				棕榈酸	酸枣仁	[28]
	原人参二醇型人参皂苷 Rg5				3,4,5-三甲氧基肉桂酸	远志	[45]
	原人参二醇型人参皂苷 Rk1				花生四烯酸	柏子仁	[46]
	原人参三醇型人参皂苷 Rh1				亚麻酸		
	原人参三醇型人参皂苷 Rh4				二高亚麻酸		
	原人参三醇型人参皂苷 Rk5				二十碳五烯酸		
	原人参三醇型人参皂苷 Rg1				11,14-二十碳四烯酸		
	芍药苷	芍药	[35]		谷甾醇		
	甘草次酸	甘草	[36]		油酸		
	香紫苏醇	丹参	[37]		油酸甲酯		
	瓜子金皂苷	远志	[38]		顺式-5-二十碳烯酸		
黄酮	斯皮诺素	酸枣仁	[27]		顺式-11-二十碳烯酸甲酯		
	山茶苷 B			其他	大黄素-8-O-*β*-*D*-葡萄糖苷	首乌藤	[20]
	6‴-阿魏酰斯皮诺素				绿原酸	刺五加	[40]
	维采宁-2				北五味子多糖	五味子	[47]
	异甘草素	甘草	[39]		茯苓多糖	茯苓	[48]
苯丙素	刺五加苷 B	刺五加	[40]		4-羟基苄基醇	天麻	[49–50]
	刺五加苷 E				天麻素	/	/
	异嗪皮啶				4-羟基苯甲醛	天麻	[51]
	刺五加苷 C				N^6-(4-羟基苄基)腺苷	天麻	[52–53]
	刺五加酮				N^6-(3-甲氧基-4-羟基苄基)腺苷	/	/
	戈米辛 N	五味子	[41–44]		光甘草定	甘草	[54]
	五味子素				人参糖蛋白	人参	[55]
	五味子乙素				百合肽 A	百合	[56]
	五味子酯甲						

注: /表示未有相关内容。

2.3.2　信号通路的调节

助眠类食源性中草药不仅对神经递质产生调节作用, 还会对神经细胞及神经通路产生影响。睡眠信号通路涉及多层次调控机制, 包括中枢神经系统的关键核团、神经递质系统、分子信号转导及基因表达网络。其中, GABA 是促眠的核心递质, 通过增强抑制性信号降低觉醒, GABA 能信号通路是抑制性调控的核心。酸枣仁皂苷 B[66]、五味子木脂素[67]、百合[64]、茯苓[68]、刺五加[69]、人参[70]、远志[71]、柏子仁[46]、蜂蜜[72]、甘草[73]和丹参[74]能通过上调 GABA 受体的表达, 增强 GABA 信号传导, 从而发挥改善睡眠的作用。

5-HT 受体是一群出现于中枢神经系统中央处和末梢神经系统周边的 G 蛋白偶联受体及配体门控离子通道。它们同时调节兴奋性和抑制性神经传导物质的传递。斯皮诺

素[75]、五味子木脂素[67]、百合[64]和刺五加[69]均对 5-HT 受体的表达有调节作用，以此实现兴奋性和抑制性神经传导物质的传递调节，改善睡眠。

此外，五味子[61]上调褪黑素受体的表达；人参[70]减少下丘脑食欲素分泌，并与食欲素受体相互作用，抑制磷脂酰肌醇 3-激酶/蛋白激酶 B/哺乳动物雷帕霉素靶蛋白信号网络；灵芝[58]显著升高脑源性神经营养因子的水平，起到神经保护作用；炒酸枣仁[76]通过调节下丘脑生物钟基因的表达，恢复昼夜节律障碍小鼠的睡眠觉醒节律。以上均为改善睡眠类中草药与调节信号通路相关的改善睡眠作用机制。

2.3.3 肠道菌群的改善

睡眠障碍与肠道菌群之间存在复杂的双向关系，这种联系主要通过“微生物-肠-脑轴”实现，肠道菌群的调节也是助眠类食源性中草药发挥药效的途径之一。生酸枣仁和炒酸枣仁均可上调对氯苯丙氨酸(*p*-chlorophenylalanine, PCPA)所致失眠小鼠肠道菌群中拟杆菌属和阿克曼菌属相对丰度的下降，并下调普雷沃氏菌属相对丰度上升[77]。百合则能上调 PCPA 所致失眠大鼠肠道菌群中卟啉单胞菌科、拉氏梭菌科和罗斯氏菌属的比例的下降，并下调乳杆菌属和大肠杆菌属比例的上升[78]。珍珠水解物增加了慢性睡眠剥夺小鼠肠道菌群中大肠杆菌、拟杆菌、双歧杆菌和乳杆菌的占比，并减少了产气荚膜梭菌的比例[79]。茯苓多糖在改善睡眠剥夺大鼠肠道菌群失调方面效果显著，但不同的茯苓多糖调节的菌群种类有所不同。茯苓水溶性多糖可调节睡眠剥夺大鼠肠道菌群中的理研菌科、瘤胃球菌属、普雷沃氏菌属及梭状杆菌属的丰度恢复至接近正常组；而茯苓酸性多糖则对睡眠剥夺大鼠的厚壁菌门、杆菌纲、乳杆菌目、普雷沃氏菌属及梭状杆菌属等菌群有回调作用[48,80]。

2.3.4 抗氧化和抗炎作用

此外，有研究表明，睡眠剥夺会导致大脑的氧化应激损伤及神经炎症反应。蜂蜜能够降低睡眠剥夺大鼠脑中丙二醛的浓度，升高还原型谷胱甘肽浓度，并升高谷胱甘肽还原酶、超氧化物歧化酶和过氧化氢酶活性[81–82]。珍珠水解物对睡眠剥夺小鼠的海马氧化损伤具有一定的改善作用，能显著降低睡眠剥夺小鼠海马丙二醛含量，增加还原型谷胱甘肽含量，增加超氧化物歧化酶、谷胱甘肽过氧化物酶和细胞凋亡蛋白-2 表达，并清除过量的活性氧自由基[79]。灵芝孢子提取物可通过抑制内侧前额叶皮质的炎症通路，并改善臂旁核中 GABA 能神经元的活性，预防阿尔茨海默病模型大鼠的睡眠障碍[83]。

3 结束语

尽管国内外在食源性中草药助眠研究方面取得了一定的成果，但仍存在一些空白与不足。首先，虽然已经鉴定出许多食源性中草药中的化学成分，但对于这些成分之间的协同作用机制研究还不够深入，难以全面揭示其助眠的本质。其次，食源性中草药改善睡眠的作用机制仍不清晰，但对于各个途径之间的相互关系以及它们在不同类型失眠症中的作用差异，还缺乏系统的研究。此外，在产品开发方面，助眠产品配方的设计的理论依据不够充分，且产品的质量标准和安全性评价体系还不够完善，限制了食源性中草药助眠产品的进一步发展。

随着科技的不断进步和消费者需求的日益多样化，食源性中草药助眠产品也呈现出多元化的发展趋势，主要体现在剂型创新和新产品研发方面。新颖剂型将不断涌现，如睡眠软糖、睡眠饮料及助眠口香糖等，以满足不同消费者的需求和使用场景。新产品的研发也将更加注重个性化和精准化。针对不同年龄段、性别、身体状况和睡眠问题的消费者，开发具有针对性的助眠产品。助眠类食源性中草药与其他成分的复配也是未来产品创新的重要方向。将助眠类食源性中草药与益生菌、维生素及矿物质等营养素复配，能够在改善睡眠的同时，为身体提供全面的营养支持。除了保健食品、药膳、饮料、零食等常见形式，未来还可能出现更多与日常生活紧密结合的产品形式，如助眠香薰、助眠喷雾、助眠面膜等。这些多元化的产品形式将满足不同消费者的需求和使用习惯，为助眠类食源性中草药的应用拓展更广阔的市场空间。

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