药 学 学 报

第 60 卷　第 11 期　2025 年 11 月

图 文 摘 要

专题报道: 靶向蛋白降解药物前沿进展评述

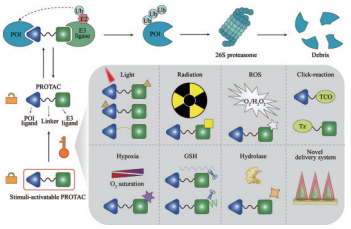
3263

刺激响应型 PROTAC 用于肿瘤精准治疗

江幸羽, 陈奕诺, 张琬絮, 徐志爱*

(华东师范大学化学与分子工程学院, 上海 200241)

PROTAC 技术通过"事件驱动"机制催化降解靶蛋白, 克服了传统抑制剂的耐药性问题并拓展了可成药靶点范围, 但其临床应用仍面临系统毒性和药代动力学缺陷的挑战。刺激响应型 PROTAC 通过肿瘤微环境或外源刺激实现时空可控的蛋白降解, 结合纳米递送系统可改善肿瘤靶向性和药代特性。这类新型 PROTAC 为肿瘤精准治疗提供了突破性策略。



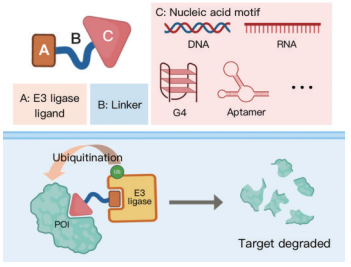
3283

基于核酸的 PROTAC 技术: 新兴策略与未来展望

许建飞#, 闫兆鹏#, 郭东阳, 王倩, 王静, 汤新景*

(北京大学药学院, 天然药物及仿生药物全国重点实验室和化学生物学中心, 北京 100191)

基于核酸的靶向蛋白降解嵌合技术构建的核酸-PROTAC 通过配体核酸特异性识别靶标蛋白, 尤其是靶向"不可成药蛋白", 显著地扩展了可降解蛋白范围, 有望为无药可医及难治性疾病开辟全新的药物研发策略。



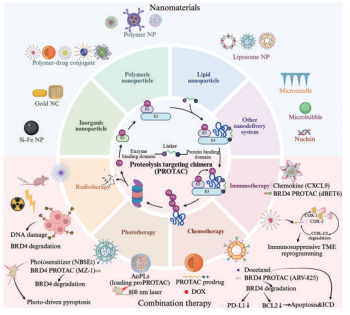
3297

纳米递送系统增效 PROTAC 乳腺癌治疗的研究进展

王婉玉, 程永忠*, 高祥*

(四川大学华西医院神经外科研究所, 四川 成都 610041)

蛋白降解靶向嵌合体 (PROTAC) 纳米技术通过多功能载体创新设计实现靶向蛋白高效降解, 协同多重疗法重塑乳腺癌精准治疗, 突破瓶颈使 PROTAC 走向临床成为可能。



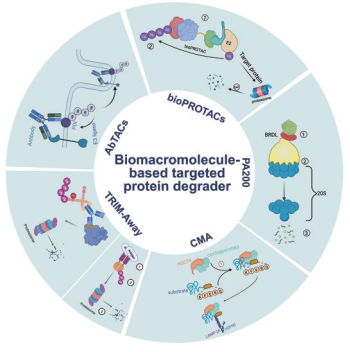
3309

基于生物大分子的靶向蛋白降解药物研究进展

叶紫玥#, 徐畅#, 张宇婷, 赵越, 徐聪聪*

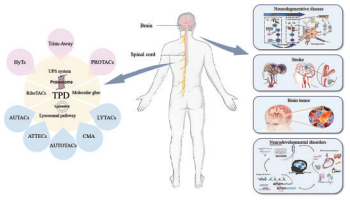
(苏州大学国际创新药学院, 江苏 苏州 215000)

本文主要关注基于生物大分子的蛋白靶向降解系统, 讨论了目前基于细胞内泛素–蛋白酶体和溶酶体两大主要降解途径开发的生物大分子蛋白靶向降解药物的研究进展, 包括 bioPROTACs、TRIM-Away、PA200、CMA、AbTACs等在内的几种蛋白靶向降解药物的创新机制, 并对基于生物大分子的蛋白靶向降解药物的未来发展方向进行了讨论和展望。



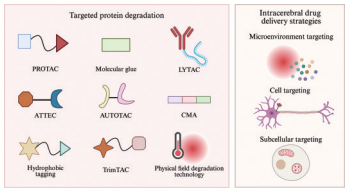
3318
靶向蛋白降解技术在中枢神经系统疾病治疗中的应用进展
张雪[1#], 冯雅煊[1#], 张柳[1], 孙璐[1*], 贺慧宁[1,2*]
(1. 天津医科大学药学院, 天津市临床药物关键技术重点实验室, 天津 300070; 2. 天津医科大学生物医学工程与技术学院, 天津 300070)

本综述系统阐述靶向蛋白降解 (TPD) 技术在中枢神经系统 (CNS) 疾病治疗中的应用进展, 深入探讨了不同TPD策略的最新进展、固有挑战及相应的优化方向, 旨在为CNS疾病的治疗开拓新的思路与策略。



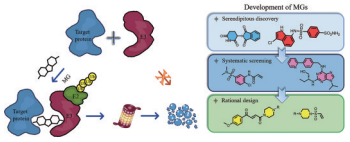
3330
靶向蛋白降解策略用于神经退行性疾病精准治疗前沿进展
杨雯芳[1#], 赵倩[1#], 彭子睿[1,2], 李卓亮[1], 潘家兴[1], 徐志爱[3], 于海军[1*], 来旖[1*]
(1. 中国科学院上海药物研究所, 上海 201203; 2. 南昌大学药学院, 江西 南昌 330006; 3. 华东师范大学化学与分子工程学院, 上海 200241)

本文围绕神经退行性疾病中蛋白稳态失衡的发病机制, 综述了当前主要的干预策略, 重点讨论了靶向蛋白降解策略的技术进展与治疗潜力, 并进一步总结了多种脑部纳米递送系统, 包括响应微环境、靶向细胞与亚细胞器的设计方案, 有望推动基于蛋白稳态调控策略的神经退行性疾病精准治疗。



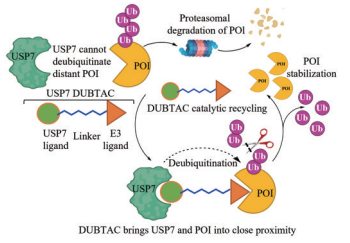
3345
分子胶的开发: 从偶然发现到合理设计
孙杰[1#], 顾明希[2#], 臧兰兰[1], 刘文启[1*], 袁佩妍[2*]
(1. 临沂市人民医院药学部, 山东 临沂 276005; 2. 中山大学药学院 (深圳), 广东 深圳 518107)

分子胶 (MGs) 可通过促进E3泛素连接酶与靶蛋白的结合, 诱导靶蛋白的蛋白酶体降解。



3355
USP7的蛋白稳态调控作用及其抗肿瘤策略研究进展
李幸[1], 何姝芬[1], 覃俊杰[1], 周慧[1], 牟伊[1], 宋娟[1], 张鑫[1], 臧永军[2*], 温小安[3*]
(1. 泰州学院药学院, 江苏 泰州 225300; 2. 皖西学院生物与制药工程学院, 安徽 六安 237012; 3. 中国药科大学多靶标天然药物全国重点实验室, 江苏 南京 210009)

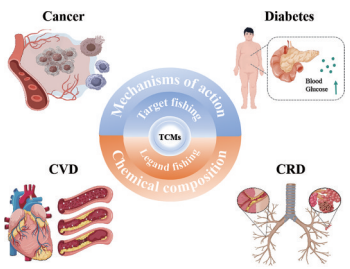
本文围绕去泛素化酶USP7的蛋白结构特征、对底物蛋白的稳态调控作用及其在肿瘤发展中的生物学功能和靶向治疗策略展开了综述。



综述

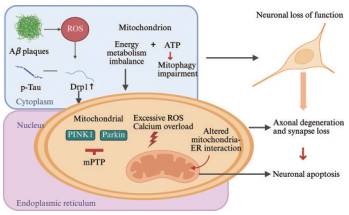
3371
基于靶向垂钓技术挖掘传统中药治疗四大慢病的作用机制研究进展
许珂嘉[1#], 刘泉[1#], 赵佳璇[1], 左晨伟[2], 曹慧[1], 李晨阳[3], 雷蕾[1], 李彩娜[1], 杜若飞[4,5], 环奕[1], 申竹芳[1], 田瑜[2*], 刘率男[1*]
(1. 中国医学科学院药物研究所, 天然药物活性物质与功能国家重点实验室, 北京 100050; 2. 中国医学科学院药用植物研究所, 道地药材品质保障与资源持续利用全国重点实验室, 北京 100193; 3. 深圳大学医学部药学院, 广东 深圳 518055; 4. 上海中医药大学创新中药研究院, 上海 201203; 5. 中药现代制剂技术教育部工程研究中心, 上海 201203)

本文系统综述了靶向垂钓技术在挖掘中药治疗四大慢病 (癌症、心脑血管疾病、糖尿病、慢性呼吸系统疾病) 作用机制中的应用, 重点总结了靶标垂钓和配体垂钓技术的最新研究进展。



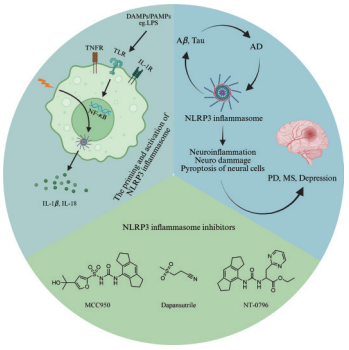
3381
线粒体功能障碍在阿尔茨海默病发病中的作用和机制研究进展
秦青青[1], 孙逸[3], 丁雯昕[2], 庄春林[1,2*]
(1. 广东药科大学药学院, 广东 广州 510006; 2. 中国人民解放军海军军医大学药学院, 上海 200433; 3. 中国药科大学药学院, 江苏 南京 210009)

本文综述了阿尔茨海默病 (AD) 的核心病理特征, 重点探讨了线粒体生理功能及其在 AD 病理进程中的动态变化规律。



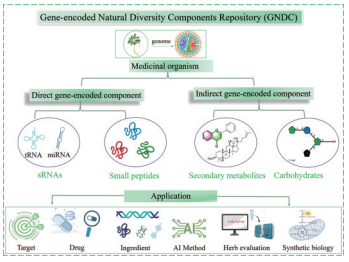
3396
NLRP3 炎症小体及其抑制剂在中枢神经系统疾病中的研究进展
罗一鸣[1#], 宋静远[1#], 杨忠金[2], 孙平[1], 邵攀霖[1*], 胡文辉[1*]
(1. 广州医科大学药学院, 广东 广州 511436; 2. 天津理工大学化学化工学院, 天津 300384)

本文围绕"机制–疾病–干预"轴展开, 综述了 NLRP3 炎症小体在中枢神经系统疾病中的枢纽作用, 以及当前 NLRP3 炎症小体抑制剂在该领域的相关药物研究进展。



3408
本草基因编码天然多样性成分库 (GNDC) 在中医药研究中的应用
余志银[1,2], 陈伟[1,2], 冷梁[1,2], 孙丹[1,2], 刘灏[1,2], 宫瑞泽[1,2], 丛朝彤[1,2], 刘成成[1,2], 杨秀萍[3], 宾华超[1,2], 鲁军[3], 张三印[1,2*], 宋驰[1,2*]
(1. 成都中医药大学本草基因组学研究院, 四川 成都 611137; 2. 成都中医药大学中医药创新研究院, 四川 成都 611137; 3. 成都中医药大学药学院, 四川 成都 611137)

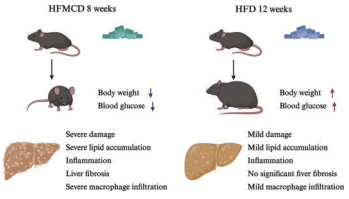
GNDC 是全球首个亿量级本草基因编码的天然多样性成分库, 通过整合多组学与 AI 技术, 对全球八大药典中 1 037 个物种核基因组及细胞器基因组进行解析, 获得了 2.34 亿个基因编码成分 (包括次级代谢产物、小肽、小 RNA 和碳水化合物), 将为中医药现代化研究带来新的范式。



研究论文

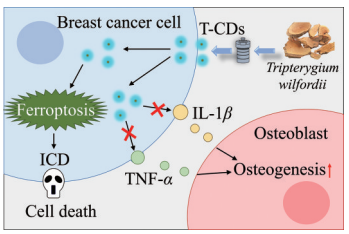
3418
高脂胆碱蛋氨酸缺乏饮食与高脂饮食诱导 NAFLD 小鼠模型的病理比较
谭元昊[1], 庄红芹[1*], 华子春[1,2,3*]
(1. 南京大学生命科学学院, 医药生物技术国家重点实验室, 江苏 南京 210023; 2. 江苏省产业技术研究院医药生物技术研究所/江苏靶标生物医药研究所有限公司, 常州南京大学高新技术研究院, 江苏 常州 213164; 3. 南京吉芮康生物科技研究院, 江苏 南京 210044)

本研究比较了两种非酒精性脂肪肝病模型——高脂胆碱蛋氨酸缺乏饮食 (HFMCD) 饲养 8 周和高脂饮食 (HFD) 饲养 12 周的表型差异, 包括体重、血糖、肝脏损伤与脂质堆积、炎症反应、纤维化程度及巨噬细胞浸润程度。



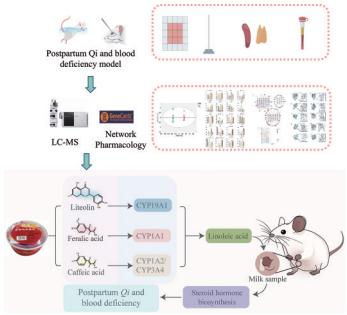
3426
雷公藤碳点抑制乳腺癌细胞并促成骨细胞分化的作用机制研究
韩东立[1], 崔君祎[3], 李肖[1], 陈子超[1], 王晓婷[1], 刘辉[1], 郑昊[2*], 张振[1*]
(1. 山东中医药大学中医药创新研究院, 山东 济南 250355; 2. 临沂市人民医院, 山东 临沂 276000; 3. 聊城大学药学与食品工程学院, 山东 聊城 252000)

雷公藤衍生的碳点 (T-CDs) 诱导乳腺癌细胞免疫原性铁死亡, 并调节炎性因子分泌促进成骨分化。



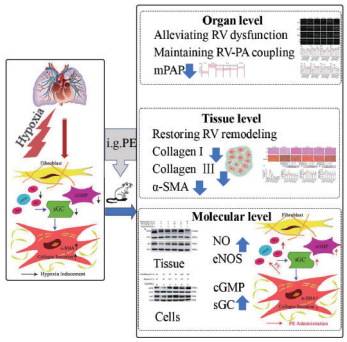
3435
乳汁代谢组学结合生物靶标网络分析探究驴胶补血颗粒改善大鼠产后气血双虚的作用机制
陈晓翌[1], 程帆[1], 颜冬兰[2], 黄胜[2], 田俊生[1*]
(1. 山西大学中医药现代研究中心, 山西 太原 030006; 2. 九芝堂股份有限公司, 湖南 长沙 410205)

通过检测行为学指标、血常规参数、免疫器官指数及乳汁免疫球蛋白G评价驴胶补血颗粒 (LBG) 改善大鼠产后气血双虚的作用, 结合LC-MS乳汁代谢组学筛选差异代谢物, 运用生物靶标网络分析预测关键成分–靶点–通路关系, 并通过分子对接验证相互作用。本研究表明LBG通过多成分协同调控CYP酶介导的亚油酸代谢重编程及类固醇激素生物合成通路改善大鼠产后气血双虚。



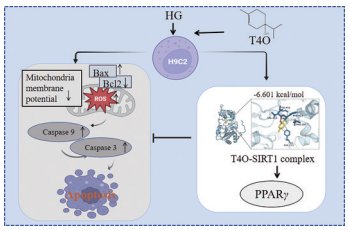
3447
α-水芹烯通过NO-sGC-cGMP通路保护低氧性肺动脉高压大鼠的右心室结构和功能
王义文[1], 潘旭[1], 白古月[1], 白海军[1], 李占强[2], 芦殿香[3], 杨占婷[1*]
(1. 青海大学医学院公共卫生系, 青海 西宁 810001; 2. 青海大学高原医学研究中心, 高原医学教育部重点实验室, 青海高原医学实验室, 青海 西宁 810001; 3. 成都大学附属医院, 四川 成都 610081)

α-水芹烯 (PE) 能够通过增加eNOS的蛋白表达, 刺激NO分泌, 并通过上调其下游sGC蛋白的表达水平, 增加cGMP合成, 降低I型、III型胶原及α-SMA的蛋白表达, 减轻胶原沉积和纤维化, 改善低氧性肺动脉高压 (HPH) 大鼠右心室 (RV) 结构与功能。



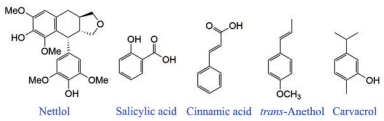
3457
松油烯-4-醇通过调控SIRT1/PPARγ信号通路减轻高糖诱导心肌细胞损伤的实验研究
何丽[1,2], 王宇庭[2], 毕俊[2], 何永祥[1], 肖红[1], 冷栋国[1*], 张彦燕[2*]
(1. 黔西市人民医院, 贵州 黔西 551500; 2. 贵州医科大学天然药物资源优效利用重点实验室, 贵州 贵安新区 561113)

基于SIRT1/PPARγ信号的松油烯-4-醇调节线粒体功能改善高糖 (HG) 诱导的H9C2细胞损伤的实验研究。



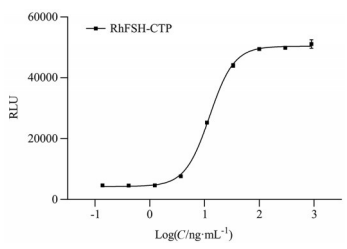
3467
荨麻致接触性皮炎成分研究
方博文, 李晓波, 成欢欢, 彭颖, 陈艳, 王梦月*
(上海交通大学药学院, 上海 200240)

运用转录组学、UPLC-IM-Q-TOF-MS、小鼠皮肤开放涂布等方法从荨麻中分离、鉴定了多个致炎成分及1个新的木脂素。



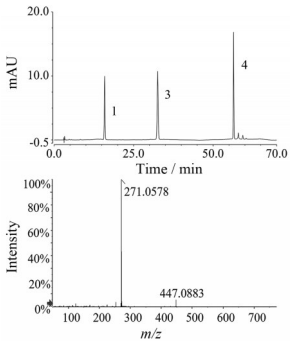
3476
报告基因法测定重组人促卵泡激素-CTP融合蛋白生物学活性
许凯心[1,2#], 王绿音[1#], 白璧炜[3], 孙铭健[1], 吕萍[1], 李晶[1*], 高向东[2*], 梁成罡[1*]
(1. 中国食品药品检定研究院 药品监管科学全国重点实验室 国家卫生健康委生物技术产品检定方法及其标准化重点实验室 国家药品监督管理局生物制品质量研究与评价重点实验室, 北京 102629; 2. 中国药科大学, 江苏 南京 211198; 3. 黑龙江省药品检验研究院, 黑龙江 哈尔滨 150088)

本研究旨在建立重组人促卵泡激素-CTP融合蛋白 (rhFSH-CTP) 生物学活性的检测方法。利用CHO-K1-FSHR-CRE-Luc转基因细胞, 经优化实验参数, 建立报告基因法。该方法专属性强、准确度和精密度良好, 通过可靠性检验, 可替代传统方法用于rhFSH-CTP质量控制。



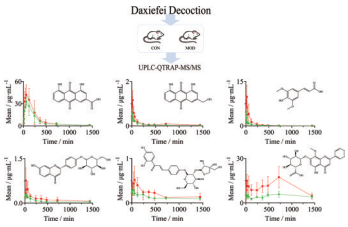
3483
黄芩苷滴眼液中有关物质的定性与定量分析
赵红芳[1], 陈悦[1], 吴涛[2], 潘可欣[2], 卢骏[2], 李清[1*]
(1. 沈阳药科大学药学院, 辽宁 沈阳 110016; 2. 北京汇诚瑞祥医药生物科技有限公司, 北京 101102)

本品通过LC-Q/TOF-MS/MS初步鉴定出黄芩苷滴眼液中含有7种有关物质, 并采用HPLC法对木蝴蝶苷A、野黄芩苷和千层纸素A-7-*O*-*β*-*D*-葡萄糖醛酸苷进行定量分析研究, 这为保障黄芩苷滴眼液的质量提供了依据。



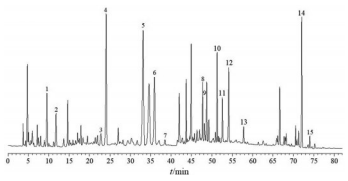
3491
敦煌医方大泻肺汤中6种有效成分的UPLC-QTRAP-MS/MS分析方法建立及其在正常与COPD模型大鼠体内药代动力学研究
罗月月[1], 韩昱[1], 黄圣如[1], 宿树兰[1*], 刘培[1], 尚尔鑫[1], 刘永琦[2], 段金廒[1]
(1. 南京中医药大学, 江苏省方剂功效物质与创新药物发现重点实验室; 中药资源产业化与方剂创新药物国家地方联合工程研究中心; 江苏省中药资源产业化过程协同创新中心; 中药制药过程与智能制造技术全国重点实验室, 江苏 南京 210023; 2. 甘肃中医药大学, 敦煌医学与转化教育部重点实验室, 甘肃 兰州 730050)

本研究建立了一种灵敏、准确的同时测定口服大泻肺汤后大鼠血浆中6种功效成分的UPLC-QTRAP-MS/MS含量分析方法, 并考察其在正常及慢性阻塞性肺疾病 (chronic obstructive pulmonary disease, COPD) 大鼠体内药代动力学特征。



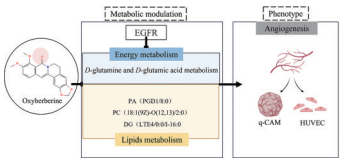
3499
HPLC-QAMS法评价小儿咳喘灵口服液质量一致性研究
王媛[1], 杨元硕[2], 师煜军[2], 李思治[1*]
(1. 中国人民解放军联勤保障部队第九八三医院药剂科, 天津 300142; 2. 天津医科大学药学院, 天津 300070)

本文采用高效液相色谱–一测多评法 (HPLC-QAMS) 检测了小儿咳喘灵口服液中15种成分, 与传统方法进行比较, 结果具有一致性。



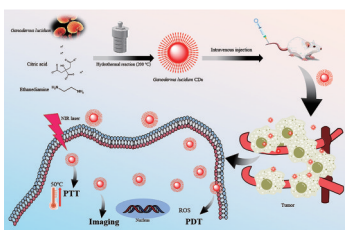
3507
原小檗碱型生物碱干预血管生成活性评价与代谢调控机制研究
陈可点[1,2], 崔鹤蓉[1*], 雷海民[1*]
(1. 北京中医药大学中药学院, 北京 102488; 2. 中国中医科学院中药研究所, 北京 100700)

黄连中氧化小檗碱通过调节氨基酸合成与代谢通路改变代谢轮廓, 且引起脂质代谢抑制、信号传导异常、氧化应激进而抑制血管生成。



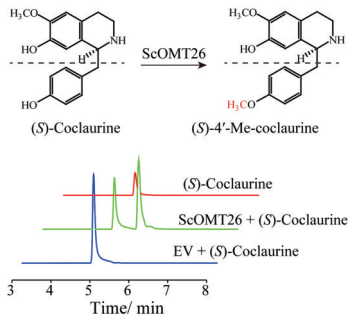
3518
中药灵芝碳点的制备及其对胰腺癌细胞的体外光动力/光热治疗研究
余欢[1,2#], 罗坤顺[1#], 朱月[1,2], 陈滕[1,2], 陈智勇[1,2], 俸婷婷[1,2*], 汪祖华[1,2*]
(1. 贵州中医药大学药学院, 贵州 贵阳 550025; 2. 贵州省现代中药创制全省重点实验室, 贵州 贵阳 550025)

本研究通过水热法一步合成中药灵芝碳量子点, 该碳点具有良好的荧光成像能力, 并展示出了一定的肿瘤靶向性, 可在近红外激光的介导下实现光热与光动力协同作用高效杀灭胰腺癌细胞。



3527
金线吊乌龟乌药碱-*O*-甲基转移酶 (*ScOMT26*) 基因的克隆与功能表征
唐汀薇[1], 蔡玲[1], 刘柏梅[2], 彭红英[2], 王灿[3,4*]
(1. 成都中医药大学医学技术学院, 四川 成都 611137; 2. 成都中医药大学药学院, 四川 成都 611137; 3. 成都中医药大学中医药创新研究院, 四川 成都 611137; 4. 成都中医药大学本草基因组学研究院, 四川 成都 611137)

本研究从金线吊乌龟中克隆鉴定氧甲基转移酶基因 *ScOMT26*, 发现其能催化乌药碱C4′位甲基化生成4′-甲基乌药碱, 揭示了该酶在苄基异喹啉生物碱合成中的功能。



新药发现与研究实例简析

3535
第三代*β*-内酰胺酶抑制剂杜洛巴坦的研制
郭宗儒
(中国医学科学院、北京协和医学院药物研究所, 北京 100050)

3540
首创性补体旁路途径B因子抑制剂伊普可泮的研制
郭宗儒
(中国医学科学院、北京协和医学院药物研究所, 北京 100050)

ACTA PHARMACEUTICA SINICA

Volume 60 Number 11 2025 November

Graphical Abstracts

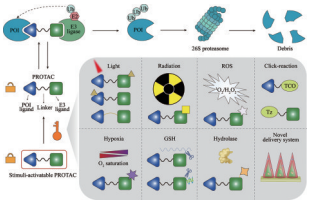
Special Reports: Recent advances in targeted protein degradation therapeutics

3263

Stimuli-activatable PROTAC for precise cancer therapy

JIANG Xing-yu, CHEN Yi-nuo, ZHANG Wan-xu, XU Zhi-ai*

(School of Chemistry and Molecular Engineering, East China Normal University, Shanghai 200241, China)



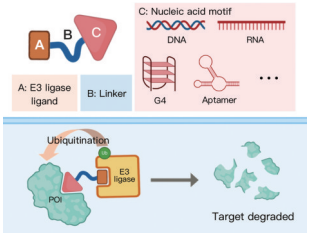
PROTAC technology utilizes an event-driven catalytic mechanism to degrade target proteins, overcoming traditional inhibitors' drug resistance while expanding the druggable proteome. However, its clinical application is constrained by systemic toxicity and suboptimal pharmacokinetics. Emerging stimuli-responsive PROTACs achieve precise spatiotemporal degradation control through tumor microenvironment triggers or external stimuli, with nanoparticle delivery systems optimizing targeting and pharmacokinetic profiles. Such approaches establish a transformative paradigm for precision cancer therapy.

3283

Nucleic acid-based PROTACs: emerging strategies and future perspectives

XU Jian-fei#, YAN Zhao-peng#, GUO Dong-yang, WANG Qian, WANG Jing, TANG Xin-jing*

(State Key Laboratory of Natural and Biomimetic Drugs, Chemical Biology Center and School of Pharmaceutical Sciences, Peking University, Beijing 100191, China)



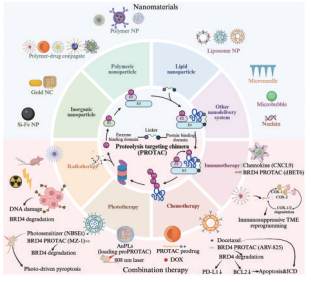
Nucleic acid PROTACs based on target protein degradation chimera technology specifically recognizes target proteins, particularly "undruggable proteins", through ligand nucleic acids, significantly expanding the range of degradable proteins and is expected to pioneer novel drug development strategies for untreatable and refractory diseases.

3297

Advances in nanoparticle delivery systems for enhanced PROTAC therapy of breast cancer

WANG Wan-yu, CHENG Yong-zhong*, GAO Xiang*

(Institute of Neurosurgical Research, West China Hospital, Sichuan University, Chengdu 610041, China)



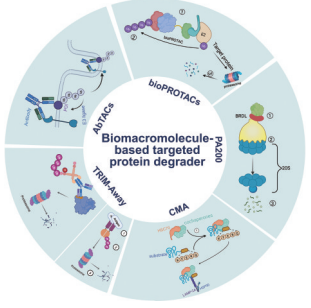
Proteolysis-targeting chimera (PROTAC) nanotechnology enables efficient targeted protein degradation through innovative multifunctional nanocarriers, synergizing with multiple therapies to reshape precision breast cancer treatment, overcoming critical bottlenecks and paving the way for clinical translation of PROTACs.

3309

Targeted protein degraders based on biomacromolecules: current progress and challenges

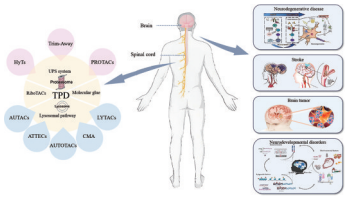
YE Zi-yue#, XU Chang#, ZHANG Yu-ting, ZHAO Yue, XU Cong-cong*

(International College of Pharmaceutical Innovation, Soochow University, Suzhou 215000, China)



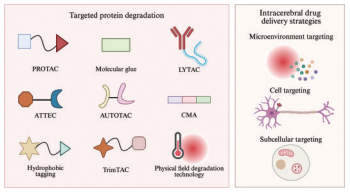
This review focused on biomacromolecule-based targeted protein degradation systems. We mainly discussed the research progress of biomacromolecule-based protein degraders based on two major intracellular degradation pathways: ubiquitin-proteasome system and the lysosomal pathway, including the novel mechanisms of several protein degraders such as bioPROTACs, TRIM-Away, PA200, CMA, and AbTACs. At the end, this review further discussed current challenges and future directions of biomacromolecule-based targeted protein degradation.

3318
Progress in targeted protein degradation for central nervous system diseases therapy
ZHANG Xue[1#], FENG Ya-xuan[1#], ZHANG Liu[1], SUN Lu[1*], HE Hui-ning[1,2*]
(1. Tianjin Key Laboratory on Technologies Enabling Development of Clinical Therapeutics and Diagnostics, School of Pharmacy, Tianjin Medical University, Tianjin 300070, China; 2. School of Biomedical Engineering and Technology, Tianjin Medical University, Tianjin 300070, China)



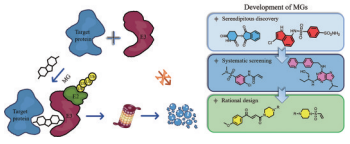
This review systematically elaborates on the application progress of targeted protein degradation (TPD) technologies in the treatment of central nervous system (CNS) diseases. It deeply explores the latest advancements, inherent challenges, and corresponding optimization strategies of various TPD approaches, aiming to pioneer new ideas and strategies for the treatment of CNS diseases.

3330
Advances of targeted protein degradation strategies for precision therapy of neurodegenerative diseases
YANG Wen-fang[1#], ZHAO Qian[1#], PENG Zi-rui[1,2], LI Zhuo-liang[1], PAN Jia-xing[1], XU Zhi-ai[3], YU Hai-jun[1*], LAI Yi[1*]
(1. Shanghai Institute of Materia Medica, Chinese Academy of Sciences, Shanghai 201203, China; 2. School of Pharmacy, Nanchang University, Nanchang 330006, China; 3. School of Chemistry and Molecular Engineering, East China Normal University, Shanghai 200241, China)



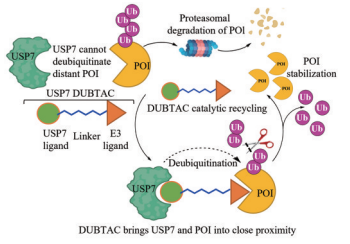
This article focuses on the pathogenesis of protein homeostasis imbalance in neurodegenerative diseases, reviews the current major intervention strategies, and highlights the technological advances and therapeutic potential of targeted protein degradation approaches. Furthermore, it summarizes various brain-targeted nanodelivery systems, including designs responsive to the microenvironment and those targeting specific cells and subcellular organelles, providing support for the precise regulation of protein homeostasis in therapeutic applications.

3345
Development of molecular glue: from serendipitous discovery to rational design
SUN Jie[1#], GU Ming-xi[2#], ZANG Lan-lan[1], LIU Wen-qi[1*], YUAN Pei-yan[2*]
(1. Department of Pharmacy, Linyi People's Hospital, Linyi 276005, China; 2. School of Pharmaceutical Sciences Shenzhen, Shenzhen Campus of Sun Yat-Sen University, Shenzhen 518107, China)



Molecular glues (MGs) induce the proteasomal degradation of target proteins by facilitating the binding between E3 ubiquitin ligases and target proteins.

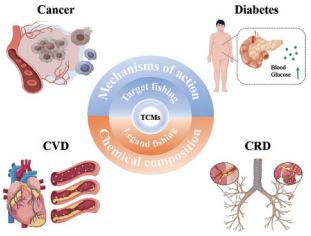
3355
Advances in research on USP7-mediated regulation of protein homeostasis and associated antitumor strategies
LI Xing[1], HE Shu-fen[1], QIN Jun-jie[1], ZHOU Hui[1], MOU Yi[1], SONG Juan[1], ZHANG Xin[1], ZANG Yong-jun[2*], WEN Xiao-an[3*]
(1. School of Pharmacy, Taizhou University, Taizhou 225300, China; 2. School of Biology and Pharmaceutical Engineering, West Anhui University, Lu'an 237012, China; 3. State Key Laboratory of Natural Medicines, China Pharmaceutical University, Nanjing 210009, China)



This article reviews the protein structural characteristics of the deubiquitinating enzyme USP7, its regulatory role in the homeostasis of substrate proteins, as well as its biological functions and targeted therapeutic strategies in tumor development.

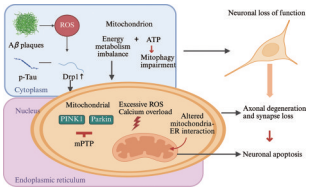
Reviews

3371
Target fishing technologies in traditional Chinese medicines: mechanisms and applications for four chronic diseases
XU Ke-jia[1#], LIU Quan[1#], ZHAO Jia-xuan[1], ZUO Chen-wei[2], CAO Hui[1], LI Chen-yang[3], LEI Lei[1], LI Cai-na[1], DU Ruo-fei[4,5], HUAN Yi[1], SHEN Zhu-fang[1], TIAN Yu[2*], LIU Shuai-nan[1*]
(1. State Key Laboratory of Bioactive Substance and Function of Natural Medicines, Institute of Materia Medica, Chinese Academy of Medical Sciences, Beijing 100050, China; 2. State Key Laboratory for Quality Ensurance and Sustainable Use of Dao-Di Herbs, Institute of Medicinal Plant Development, Chinese Academy of Medical Sciences, Beijing 100193, China; 3. School of Pharmacy, Shenzhen University Health Science Center, Shenzhen 518055, China; 4. Innovation Research Institute of Traditional Chinese Medicine, Shanghai University of Traditional Chinese Medicine, Shanghai 201203, China; 5. Engineering Research Center of Modern Preparation of Traditional Chinese Medicine, Ministry of Education, Shanghai 201203, China)



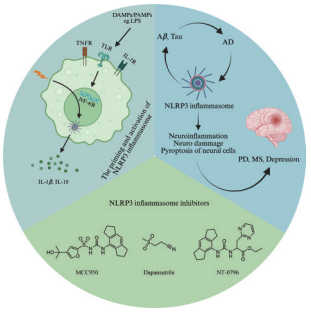
This review systematically summarizes the application of target fishing technology in elucidating the mechanisms by which traditional Chinese medicines (TCMs) treats four major chronic diseases, including cancer, cardiovascular diseases (CVD), diabetes, and chronic respiratory diseases (CRD), with a focus on the latest advancements in target identification and ligand fishing techniques.

3381
Research progress on the role and mechanisms of mitochondrial dysfunction in the pathogenesis of Alzheimer's disease
QIN Qing-qing[1], SUN Yi[3], DING Wen-xin[2], ZHUANG Chun-lin[1,2*]
(1. School of Pharmacy, Guangdong Pharmaceutical University, Guangzhou 510006, China; 2. School of Pharmacy, Naval Medical University, Shanghai 200433, China; 3. School of Pharmacy, China Pharmaceutical University, Nanjing 210009, China)



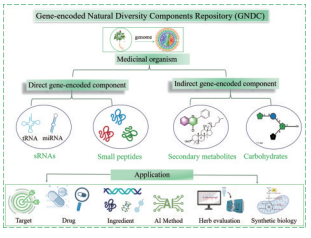
This article reviews the core pathological features of Alzheimer's disease (AD), focusing on the physiological functions of mitochondria and their dynamic changes in the pathological process of AD.

3396
Research advances on the NLRP3 inflammasome and its inhibitors in central nervous system diseases
LUO Yi-ming[1#], SONG Jing-yuan[1#], YANG Zhong-jin[2], SUN Ping[1], SHAO Pan-lin[1*], HU Wen-hui[1*]
(1. School of Pharmaceutical Sciences, Guangzhou Medical University, Guangzhou 511436, China; 2. School of Chemistry and Chemical Engineering, Tianjin University of Technology, Tianjin 300384, China)



Centered on the axe of "mechanism, disease, and intervention", this article reviews the pivotal role of the NLRP3 inflammasome in central nervous system diseases, as well as the current research progress of NLRP3 inflammasome inhibitors in relevant drug development for this field.

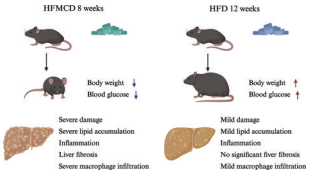
3408
Application of the gene-encoded natural diversity components repository (GNDC) in traditional Chinese medicine research
YU Zhi-yin[1,2], CHEN Wei[1,2], LENG Liang[1,2], SUN Dan[1,2], LIU Hao[1,2], GONG Rui-ze[1,2], CONG Zhao-tong[1,2], LIU Cheng-cheng[1,2], YANG Xiu-ping[3], BIN Hua-chao[1,2], LU Jun[3], ZHANG San-yin[1,2*], SONG Chi[1,2*]
(1. Institute of Herbgenomics, Chengdu University of Traditional Chinese Medicine, Chengdu 611137, China; 2. Innovative Institute of Chinese Medicine and Pharmacy, Chengdu University of Traditional Chinese Medicine, Chengdu 611137, China; 3. School of Pharmacy, Chengdu University of Traditional Chinese Medicine, Chengdu 611137, China)



GNDC is the world's primary and most extensive database focused on gene-encoded diverse natural components. By integrating multi-omics and AI technologies, it analyzes the nuclear and organelle genomes of 1 037 species from the eight major pharmacopoeias worldwide, resulting in the acquisition of 234 million gene-encoded components (including secondary metabolites, small peptides, small RNAs, and carbohydrates), which will bring a new paradigm for the modernization research of traditional Chinese medicine.

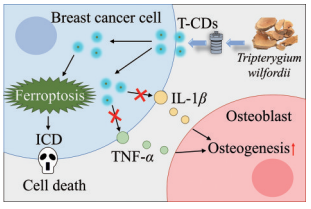
Original Articles

3418
Pathological comparison of NAFLD mouse models induced by high-fat methionine- and choline-deficient diet and high-fat diet
TAN Yuan-hao[1], ZHUANG Hong-qin[1*], HUA Zi-chun[1,2,3*]
(1. The State Key Laboratory of Pharmaceutical Biotechnology, College of Life Sciences, Nanjing University, Nanjing 210023, China; 2. Institute of Pharmaceutical Biotechnology, Jiangsu Industrial Technology Research Institute/Jiangsu Target Biopharma Research Co., Ltd., Changzhou Nanjing University High-Tech Research Institute, Changzhou 213164, China; 3. Nanjing Jiruikang Biotechnology Research Institute, Nanjing 210044, China)



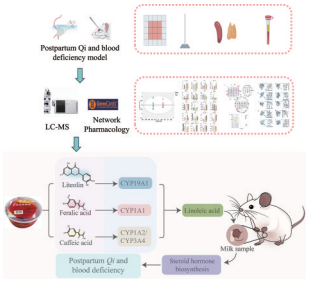
This study compared the phenotypic differences between two non-alcoholic fatty liver disease (NAFLD) models — 8 weeks of high-fat, methionine- and choline-deficient diet (HFMCD) feeding and 12 weeks of high-fat diet (HFD) feeding including body weight, blood glucose levels, hepatic injury and lipid accumulation, inflammatory responses, degree of fibrosis, and extent of macrophage infiltration.

3426
The mechanism of *Tripterygium wilfordii* carbon dots in inhibiting breast cancer cells and promoting osteogenic differentiation
HAN Dong-li[1], CUI Jun-yi[3], LI Xiao[1], CHEN Zi-chao[1], WANG Xiao-ting[1], LIU Hui[1], ZHENG Hao[2*], ZHANG Zhen[1*]
(1. Innovation Institute of Chinese Medicine and Pharmacy, Shandong University of Traditional Chinese Medicine, Jinan 250355, China; 2. Linyi People's Hospital, Linyi 276000, China; 3. School of Pharmacy and Food Engineering, Liaocheng University, Liaocheng 252000, China)



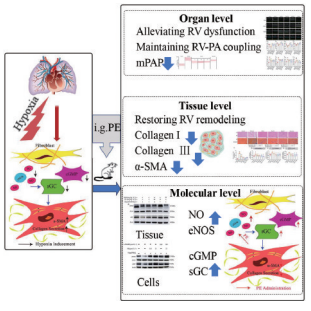
Tripterygium wilfordii carbon dots (T-CDs) induce immunogenic ferroptosis and modulate inflammatory cytokines to promote osteogenesis.

3435
Exploring the mechanism of Lvjiaobuxue Granule in improving postpartum Qi and blood deficiency in rats through milk metabolomics combined with biological target network analysis
CHEN Xiao-yi[1], CHENG Fan[1], YAN Dong-lan[2], HUANG Sheng[2], TIAN Jun-sheng[1*]
(1. Modern Research Center for Traditional Chinese Medicine, Shanxi University, Taiyuan 030006, China; 2. Jiuzhitang Co., Ltd., Changsha 410205, China)



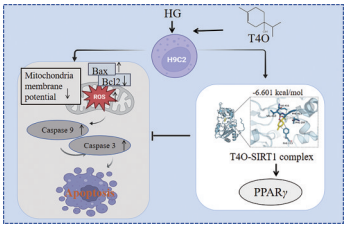
To evaluate the effect of Lvjiaobuxue Granule (LBG) in improving postpartum Qi and blood deficiency in rats, this study detected behavioral indicators, blood routine parameters, immune organ indices, and milk immunoglobulin G. Combined with LC-MS-based milk metabolomics to screen differential metabolites, biological target network analysis was used to predict the relationships among key components-targets-pathways, and molecular docking was employed to verify the interactions. This study demonstrated that LBG improves postpartum Qi-blood deficiency in rats through multi-component synergistic regulation of CYP enzyme-mediated linoleic acid metabolism reprogramming and steroid hormone biosynthesis pathways.

3447
***α*-Phellandrene attenuates the right ventricular structure and function in HPH rats *via* the NO-sGC-cGMP pathway**
WANG Yi-wen[1], PAN Xu[1], BAI Gu-yue[1], BAI Hai-jun[1], LI Zhan-qiang[2], LU Dian-xiang[3], YANG Zhan-ting[1*]
(1. Department of Public Health, Qinghai University Medical College, Xining 810001, China; 2. Key Laboratory of Ministry of Education for High Altitude Medicine, Qinghai Plateau Medicine Laboratory, Research Center for High Altitude Medicine, Qinghai University, Xining 810001, China; 3. Affiliated Hospital of Chengdu University, Chengdu 610081, China)



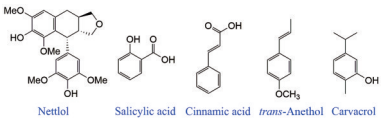
α-Phellandrene (PE) can increase the protein expression level of eNOS, thereby stimulating the secretion of NO, which subsequently upregulates the downstream sGC protein and increase the synthesis of cGMP. The elevated cGMP level decrease collagen deposition and fibrosis levels by reducing the expression of collagen I, collagen III and *α*-SMA proteins, which ultimately improving the structure and function of right ventricle (RV) in hypoxia-induced pulmonary arterial hypertension (HPH) rats.

3457
Terpinen-4-ol ameliorates high glucose-induced cardiomyocyte injury by modulating SIRT1/PPAR*γ* signaling
HE Li[1,2], WANG Yu-ting[2], BI Jun[2], HE Yong-xiang[1], XIAO Hong[1], LENG Dong-guo[1*], ZHANG Yan-yan[2*]
(1. People's Hospital of Qianxi, Qianxi 551500, China; 2. Key Laboratory of Optimal Utilization of Natural Medicine Resources, Guizhou Medical University, Gui'an New Area 561113, China)



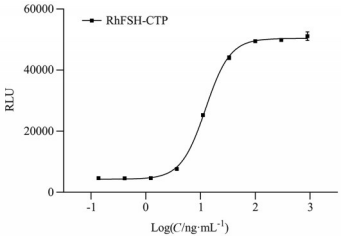
Experimental study on the regulation of mitochondrial function by terpine-4-ol *via* the SIRT1/PPAR*γ* signalling pathway to improve high glucose (HG)-induced damage in H9C2 cells.

3467
Study on the contact dermatitis-causing components in *Urtica fissa*
FANG Bo-wen, LI Xiao-bo, CHENG Huan-huan, PENG Ying, CHEN Yan, WANG Meng-yue[*]
(School of Pharmaceutical Science, Shanghai Jiao Tong University, Shanghai 200240, China)



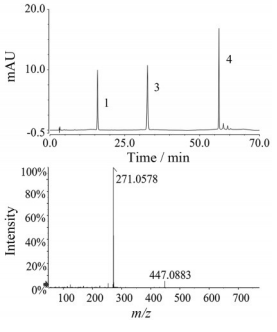
Combining transcriptomics, UPLC-IM-Q-TOF-MS, and skin exposure tests in mice, several inflammation-causing compounds and a new lignan were identified from *Urtica fissa*.

3476
The biological activity of recombinant human follicle-stimulating hormone-CTP fusion protein was determined by reporter gene method
XU Kai-xin[1,2#], WANG Lü-yin[1#], BAI Bi-wei[3], SUN Ming-jian[1], LÜ Ping[1], LI Jing[1*], GAO Xiang-dong[2*], LIANG Cheng-gang[1*]
(1. National Institutes for Food and Drug Control, State Key Laboratory of Drug Regulatory Science, NHC Key Laboratory of Research on Quality and Standardization of Biotech Products, NMPA Key Laboratory for Quality Research and Evaluation of Biological Products, Beijing 102629, China; 2. China Pharmaceutical University, Nanjing 211198, China; 3. Heilongjiang Institute for Drug Control, Harbin 150088, China)



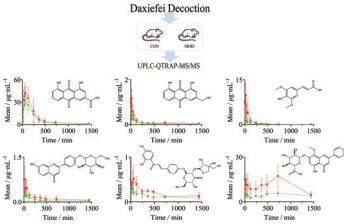
This study aimed to establish a method for detecting the biological activity of recombinant human follicle stimulating hormone-CTP fusion protein (rhFSH-CTP). Using CHO-K1-FSHR-CRE-Luc transgenic cells, a reporter gene method was established after optimizing experimental parameters. This method has strong specificity, good accuracy and precision, and passes the reliability test, which can replace traditional methods for the quality control of rhFSH-CTP.

3483
Qualitative and quantitative assessment of related substances in baicalin eye drops
ZHAO Hong-fang[1], CHEN Yue[1], WU Tao[2], PAN Ke-xin[2], LU Jun[2], LI Qing[1*]
(1. School of Pharmacy, Shenyang Pharmaceutical University, Shenyang 110016, China; 2. Beijing Novelpharm Pharmaceutical Biotechnology Co., Ltd., Beijing 101102, China)



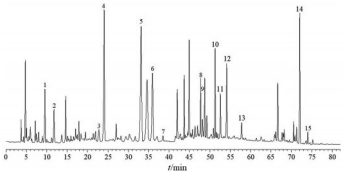
In this study, seven related substances in baicalin eye drops were preliminarily identified by LC-Q/TOF-MS/MS. Additionally, HPLC was used for the quantitative analysis of oroxin A, scutellarin and oroxylin A-7-*O*-glucuronide, providing a basis for ensuring the quality of baicalin eye drops.

3491
Establishment of UPLC-QTRAP-MS/MS analysis method for 6 active ingredients in Dunhuang Medical Formula Daxiefei Decoction and *in vivo* pharmacokinetics study of normal and COPD model rats
LUO Yue-yue[1], HAN Yu[1], HUANG Sheng-ru[1], SU Shu-lan[1*], LIU Pei[1], SHANG Er-xing[1], LIU Yong-qi[2], DUAN Jin-ao[1]
(1. Nanjing University of Chinese Medicine, Jiangsu Key Laboratory for High Technology Research of Traditional Chinese Medicine Formulae, National-Local Joint Engineering Research Center of Resources Industrialization of Chinese Medica and Prescription-oriented Innovative Drugs, Jiangsu Collaborative Innovation Center of Chinese Medicinal Resources Industrialization, State Key Laboratory on Technologies for Chinese Medicine Pharmaceutical Process Control and Intelligent Manufacture, Nanjing 210023, China; 2. Gansu University of Chinese Medicine, Dunhuang Key Laboratory of Medicine and Tranditional Education of the Ministry of Education, Lanzhou 730050, China)



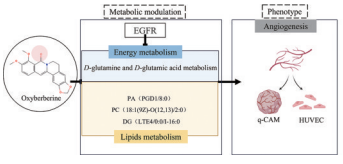
This study established a sensitive and accurate UPLC-QTRAP-MS/MS method for simultaneous determination of six active components in chronic obstructive pulmonary disease (COPD) model rat plasma after oral administration of Daxiefei Decoction, and investigated its pharmacokinetic characteristics.

3499
Study on the quality consistency of Xiao'er Kechuanling oral liquid evaluated by HPLC-QAMS
WANG Yuan[1], YANG Yuan-shuo[2], SHI Yu-jun[2], LI Si-zhi[1*]
(1. Department of Pharmacy, 983 Hospital of the PLA Joint Logistic Support Force, Tianjin 300142, China; 2. School of Pharmacy, Tianjin Medical University, Tianjin 300070, China)



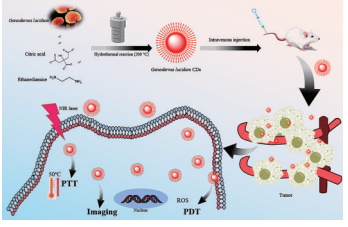
In this paper, 15 components in Xiao'er Kechuanling oral liquid were detected by high performance liquid chromatography-quantitative analysis of multi-components by single marker (HPLC-QAMS). Compared with the traditional methods, the results were consistent.

3507
Evaluation of angiogenic activity and metabolic regulation mechanism of protoberberine alkaloids
CHEN Ke-dian[1,2], CUI He-rong[1*], LEI Hai-min[1*]
(1. School of Chinese Materia Medica, Beijing University of Chinese Medicine, Beijing 102488, China; 2. Institute of Chinese Materia Medica, China Academy of Chinese Medical Sciences, Beijing 100700, China)



Oxyberberine in Coptidis Rhizoma alters the metabolic profile by modulating amino acid synthesis and metabolic pathways, while also inhibiting angiogenesis through suppression of lipid metabolism, aberrant signaling, and oxidative stress.

3518
Preparation of Chinese medicine *Ganoderma lucidum* carbon dots and their application photodynamic/photothermal therapy for pancreatic cancer *in vitro*
YU Huan[1,2#], LUO Kun-shun[1#], ZHU Yue[1,2], CHEN Teng[1,2], CHEN Zhi-yong[1,2], FENG Ting-ting[1,2*], WANG Zu-hua[1,2*]
(1. College of Pharmaceutical Sciences, Guizhou University of Traditional Chinese Medicine, Guiyang 550025, China; 2. Guizhou Key Laboratory of Modern Traditional Chinese Medicine Creation, Guiyang 550025, China)



In this study, *Ganoderma lucidum*-derived carbon quantum dots were synthesized *via* a one-step hydrothermal method. The as-prepared *Ganoderma lucidum* CDs exhibited excellent fluorescence imaging capabilities and demonstrated certain tumor-targeting properties. Under near-infrared laser irradiation, the *Ganoderma lucidum* CDs could efficiently kill pancreatic cancer cells through combined photothermal therapy and photodynamic therapy effects.

3527
Cloning and functional characterization of coclaurine *O*-methyltransferase (*ScOMT26*) gene in *Stephania cepharantha*
TANG Ting-wei[1], CAI Ling[1], LIU Bai-mei[2], PENG Hong-ying[2], WANG Can[3,4*]
(1. College of Medical Technology, Chengdu University of Traditional Chinese Medicine, Chengdu 611137, China; 2. School of Pharmacy, Chengdu University of Traditional Chinese Medicine, Chengdu 611137, China; 3. Innovative Institute of Chinese Medicine and Pharmacy, Chengdu University of Traditional Chinese Medicine, Chengdu 611137, China; 4. Institute of Herbgenomics, Chengdu University of Traditional Chinese Medicine, Chengdu 611137, China)

In this study, the *O*-methyltransferase gene *ScOMT26* was cloned and identified from *Stephania cepharantha*, and it was found to catalyze the methylation of the C4′-hydroxyl group of coclaurine to produce 4′-methylcoclaurine, revealing its function in benzylisoquinoline alkaloid biosynthesis.

