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细胞凋亡及周期检测 产品应用手册



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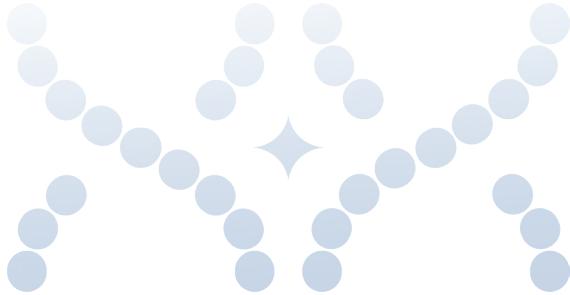
客服 QQ : 4006721600

全国统一客服电话 : 400-6721-600

公司地址 : 浙江省杭州市萧山区闻堰街道天马路 1688 号 2 棟 301 室

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目 录



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《细胞凋亡及周期检测产品应用手册》

著者：杭州联科生物技术股份有限公司

版次：2024年3月第1版

印次：2024年3月第1次印刷

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概述及应用

OVERVIEW AND APPLICATION

细胞凋亡概述

细胞周期概述

细胞凋亡及周期检测应用

1. 细胞凋亡概述

细胞凋亡 (apoptosis) 指为维持内环境稳定，由基因控制的细胞自主的有序死亡。细胞凋亡与细胞坏死不同，细胞凋亡不是一件被动的过程，而是主动过程，它涉及一系列基因的激活、表达以及调控等的作用，它并不是在病理条件下，自体损伤的一种现象，而是为更好地适应生存环境而主动争取的一种死亡过程。

2. 细胞周期概述

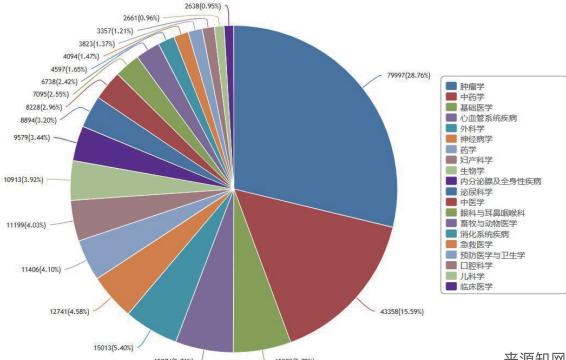
细胞周期 (cell cycle) 是指细胞从一次分裂完成开始到下一次分裂结束所经历的全过程，在这一过程中细胞的遗传物质复制并均匀的分配到两个子细胞中。



01

3. 细胞凋亡及周期检测应用

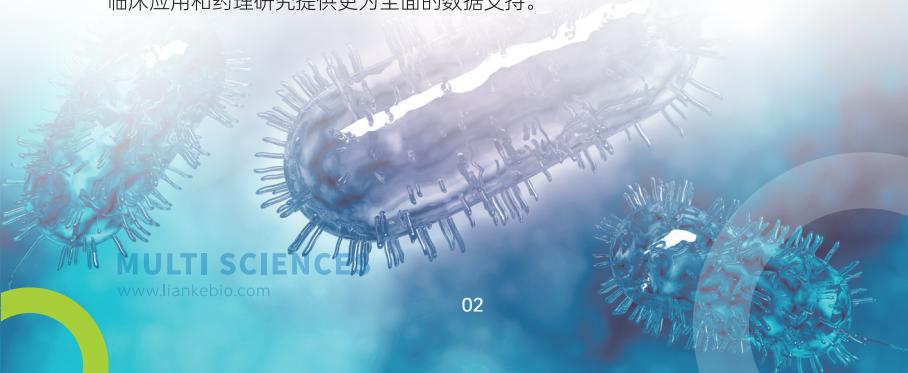
3.1 细胞凋亡应用



来源知网

流式检测细胞凋亡广泛应用于临床的科学研究，特别是疾病发生发展机制与靶向药物治疗上的研究，如肝癌、乳腺癌、肺癌、膀胱癌、卵巢癌等肿瘤疾病的靶向治疗手段中细胞的凋亡研究； 甲状腺异常、系统性红斑狼疮、类风湿性关节炎等自身免疫性疾病发生发展机制研究； 心肌缺血 - 再灌注损伤、心力衰竭、动脉粥样硬化等心血管疾病发展及预后研究； 再生障碍性贫血等血液性疾病的治疗研究； 阿尔兹海默病、帕金森综合征等神经退行性疾病长期监测研究。

同时也广泛应用于中医药领域，它可以帮助科研人员评估中药对细胞凋亡的影响，从而深入了解中药的药效机制和潜在治疗作用。可以定量分析细胞内凋亡标记物的表达情况，揭示中药对肿瘤细胞、炎症相关细胞等的影响，为中药筛选和药效评价提供客观可靠的手段，有望推动中医药领域的研究与发展，为中药的临床应用和药理研究提供更为全面的数据支持。



02

高分文献精选

01

影响因子: 39.3

标 题: Metformin escape in prostate cancer by activating the PTGR1 transcriptional program through a novel super-enhancer

期刊: SIGNAL TRANDUCTION AND TARGETED THERAPY

摘要: 揭示了二甲双胍耐药的细胞机制和 SE-TFs-PTGR1 轴的调控, 找到了二甲双胍在 PCa 治疗中潜在的新靶点。

单位: 华东理工大学广州市第一人民医院

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AT107 Annexin V-APC/PI Apoptosis Kit

Article | Open access | Published: 16 August 2023

Metformin escape in prostate cancer by activating the PTGR1 transcriptional program through a novel super-enhancer

Jianheng Ye, Shanghua Cai, Yuanfa Feng, Jinchuang Li, Zhiqian Cai, Yulin Deng, Ren Liu, Xuejin Zhu, Jianming Lu, Yangjia Zhuo, Yingke Liang, Jianjiang Xie, Yanqiong Zhang, Huichan He, Zhaodong Han, Zhenyu Jia & Weide Zhong

Signal Transduction and Targeted Therapy 8, Article number: 303 (2023) | Cite this article

1325 Accesses | 10 Altmetric | Metrics



02

影响因子: 31.373

标 题: Spleen fibroblastic reticular cell-derived acetylcholine promotes lipid metabolism to drive autoreactive B cell responses

期刊: CELL METABOLISM

发现脾脏的 FRCs 衍生的 Ach, 促进脂质代谢, 能够驱动自身反应性 B 细胞的一系列反应, 是控制 SLE 发展的关键因素, 在 SLE 中, 脂肪酸转位酶 CD36 介导的脂质摄取反应, 可促使 B 细胞中线粒体氧化磷酸化反应的增强。

单位: 广州中山大学第一附属医院

应用产品

AP105 Annexin V-APC/7-ADD Apoptosis Kit

> Cell Metab. 2023 May 23;30(5):837-854.e8. doi: 10.1016/j.cmet.2023.03.010. Epub 2023 Apr 4.

Spleen fibroblastic reticular cell-derived acetylcholine promotes lipid metabolism to drive autoreactive B cell responses

Qin Zeng¹, Shuai Wang², Mengyuan Li¹, Shuang Wang³, Chaoxuan Guo¹, Xinyuan Ruan¹, Ryu Watanabe³, Yimel Lai³, Yuefang Huang⁴, Xiaoyi Yin³, Chuanchao Zhang³, Binfeng Chen¹, Niansheng Yang⁷, Hui Zhang⁸

Affiliations + expand
PMID: 37019104 DOI: 10.1016/j.cmet.2023.03.010

03

影响因子: 31.25

标 题: Influenza-trained mucosal-resident alveolar macrophages confer long-term antitumor immunity in the lungs

期刊: NATURE IMMUNOLOGY

摘要: 揭示流感病毒感染诱导的黏膜组织定居型记忆性肺泡巨噬细胞能在感染后较长时间里发挥抗肺部转移肿瘤的训练免疫保护作用, 研究表明, 诱导组织定居型巨噬细胞的训练免疫或者天然免疫记忆可能是一种潜在的组织特异性抗肿瘤策略。

单位: 浙江大学医学院邵逸夫医院免疫学研究所

应用产品

AP101 Annexin V-FITC/PI Apoptosis Kit

> Nat Immunol. 2023 Mar;24(3):423-438. doi: 10.1038/s41590-023-01428-x. Epub 2023 Feb 20.

Influenza-trained mucosal-resident alveolar macrophages confer long-term antitumor immunity in the lungs

Tao Wang^{1,2}, Jinjing Zhang^{1,2}, Yanling Wang^{1,2}, Ying Li^{1,2}, Lu Wang^{1,2}, Yangle Yu^{1,2}, Yushi Yao^{3,4}

Affiliations + expand
PMID: 36807642 DOI: 10.1038/s41590-023-01428-x



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04

影响因子: 24. 897

标题: Cancer cells corrupt normal epithelial cells through miR-let-7c-rich small extracellular vesicle-mediated downregulation of p53/PTEN

期刊: INTERNATIONAL JOURNAL OF ORAL SCIENCE

摘要: 证明口腔鳞癌来源的 SEV 促进了正常上皮细胞的癌前转化，其中 miR-let-7c/P53/PTEN 通路起着重要作用。

单位: 武汉大学口腔医学院及口腔医院

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AP101/AT101 Annexin V-FITC/PI Apoptosis Kit

> Int J Oral Sci. 2022 Jul 19;14(1):36. doi: 10.1038/s41368-022-00192-2.

Cancer cells corrupt normal epithelial cells through miR-let-7c-rich small extracellular vesicle-mediated downregulation of p53/PTEN

Wellian Liang [#] ¹, Yang Chen [#] ¹, Hanzhe Liu ¹, Hui Zhao ¹, Tingting Luo ², Heuke Tang ³,

Xiaocheng Zhou ³, Erhui Jiang ⁴, Zhe Shao ⁴, Ke Liu ⁴, Zhengjun Shang ³

Affiliations + expand

PMID: 35851058 | PMCID: PMC9293927 | DOI: 10.1038/s41368-022-00192-2

Free PMC article



05

影响因子: 23. 629

标题: Targeting the Otub1/c-Maf axis for the treatment of multiple myeloma

期刊: BLOOD

摘要: 发现 Otub1 为 c-Maf 的一种新的去泛素酶，并提示 Otub1/c-Maf 轴可能是 MM 潜在的治疗靶点。

单位: 广州医科大学基础医学院第二附属医院 - 广东省蛋白质修饰与降解重点实验室

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05

> Blood. 2021 Mar 18;137(11):1478-1490. doi: 10.1182/blood.2020005199.

Targeting the Otub1/c-Maf axis for the treatment of multiple myeloma

Yujia Xu ¹ ², Min Xu ², Jiefei Tong ⁴, Xiaowen Tang ⁵, Jinhao Chen ³, Xuehan Chen ², Zubin Zhang ², Biyin Cao ², A Keith Stewart ⁶, Michael F Moran ⁴, Depei Wu ⁵, Xinliang Mao ¹ ² ⁷

Affiliations + expand

PMID: 32842143 | DOI: 10.1182/blood.2020005199

Free article



06

影响因子: 23. 53

标题: Commensal viruses maintain intestinal intraepithelial lymphocytes via noncanonical RIG-I signaling

期刊: NATURE IMMUNOLOGY

摘要: 该研究率先发现肠道内的共生病毒对维持肠道免疫稳态发挥重要作用，并揭示了其发挥作用的细胞和分子机制。

单位: 中国科学技术大学生命科学与医学部基础医学院

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> Nat Immunol. 2019 Dec;20(12):1681-1691. doi: 10.1038/s41590-019-0513-z. Epub 2019 Oct 21.

Commensal viruses maintain intestinal intraepithelial lymphocytes via noncanonical RIG-I signaling

Lei Liu ¹, Tao Gong ¹, Wanjin Tao ¹, Bolong Lin ¹, Cong Li ¹, Xuesen Zheng ¹, Shu Zhu ², Wei Jiang ³, Rongbin Zhou ⁴ ⁵

Affiliations + expand

PMID: 31636462 | DOI: 10.1038/s41590-019-0513-z

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06

07

影响因子: 20. 693

标题: SARS-CoV-2 ORF3a inhibits cGAS-STING-mediated autophagy flux and antiviral function

期刊: JOURNAL OF MEDICAL VIROLOGY

摘要: 发现 SARS-CoV-2 ORF3a 是一种独特的病毒蛋白, 可以与 STING 相互作用并破坏 STING-LC3 相互作用, 从而阻断 cGAS-STING 诱导的自噬, 但不能阻断 IRF3-I 型 IFN 诱导。

单位: 浙江大学医学院附属第二医院肿瘤研究所

应用产品

AP105/AT105 Annexin V-APC/7-ADD Apoptosis Kit

> J Med Virol. 2023 Jan;95(1):e28175. doi: 10.1002/jmv.28175. Epub 2022 Oct 8.

SARS-CoV-2 ORF3a inhibits cGAS-STING-mediated autophagy flux and antiviral function

Jiaming Su^{1, 2}, Si Shen³, Ying Hu³, Shiqi Chen¹, Leyi Cheng³, Yong Cai³, Wei Wei⁴, Yanpu Wang^{1, 2}, Yajuan Rui^{1, 2}, Xiao-Fang Yu^{1, 2}

Affiliations + expand

PMID: 36163413 | PMCID: PMC9538343 | DOI: 10.1002/jmv.28175

Free PMC article



08

影响因子: 19. 924

标题: Surface-Engineered Extracellular Vesicles with CDH17 Nanobodies to Efficiently Deliver Imaging Probes and Chemo-Photothermal Drugs for Gastric Cancer Theragnostic

期刊: ADVANCED FUNCTIONAL MATERIALS

摘要: 装载 ICG 或 RRx-001 的 CDH17 纳米体功能化 EV 通过将荧光染料诱导的 PTT 与化疗相结合, 在成像和治疗 GC 方面具有巨大的前景。

单位: 深圳市呼吸病临床研究中心

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07

ADVANCED FUNCTIONAL MATERIALS

Research Article

Surface-Engineered Extracellular Vesicles with CDH17 Nanobodies to Efficiently Deliver Imaging Probes and Chemo-Photothermal Drugs for Gastric Cancer Theragnostic

Peng Xia, Haitao Yuan, Ming Tian, Tianyu Zhong, Rui Hou, Xiaolong Xu, Jingbo Ma, Hufang Wang, Zhiwen Li, Defa Huang, Chengming Qu, Lingyun Dai, Chengchao Xu, Chuabin Yang, Haibo Jiang, Yuanqiao He, Felix Rückert, Zhijie Li, Yufeng Yuan, Jigang Wang

First published: 02 December 2022 | https://doi.org/10.1002/adfm.202209393 | Citations: 1

09

影响因子: 16. 2

标题: Glutamine metabolic microenvironment drives M2 macrophage polarization to mediate trastuzumab resistance in HER2-positive gastric cancer

期刊: CANCER COMMUNICATIONS

摘要: 肿瘤细胞通过 CDC42 分泌 GLS1 微囊泡, 促进谷氨酰胺代谢、M2 巨噬细胞极化和巨噬细胞促血管生成功能, 导致 HER2 阳性胃癌获得性曲妥珠单抗耐药, 抗谷氨酰胺代谢、抗血管生成和促 M1 极化治疗的组合可能为逆转曲妥珠单抗耐药性提供新的见解。

单位: 南方医科大学

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> Cancer Commun (Lond). 2023 Aug;43(8):909-937. doi: 10.1002/cac2.12459. Epub 2023 Jul 11.

Glutamine metabolic microenvironment drives M2 macrophage polarization to mediate trastuzumab resistance in HER2-positive gastric cancer

Xingbin Hu¹, Zhenfeng Ma¹, Beibei Xu¹, Shulong Li², Zhiqi Yao¹, Bishan Liang¹, Jiao Wang¹, Wangjun Liao¹, Li Lin¹, Chunling Wang¹, Siting Zheng¹, Qijing Wu¹, Qiong Huang¹, Le Yu³, Fenghua Wang⁴, Min Shi¹

Affiliations + expand

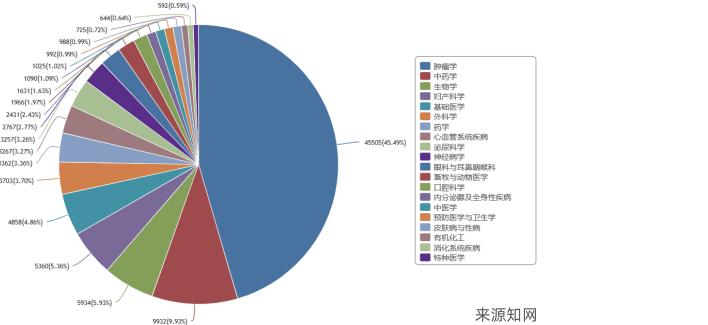
PMID: 37434399 | PMCID: PMC10397568 | DOI: 10.1002/cac2.12459

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08

3.2细胞周期应用



细胞周期检测是一种评估细胞生长和分裂能力的方法，可以用于多种疾病和病症的诊断与监测，常用于细胞功能研究、转基因产品倍体研究、药物靶向治疗研究、疾病信号通路等研究；可以帮助研究癌症细胞的生长和分裂过程，了解肿瘤细胞的恶性程度、侵袭性以及抗药性等特性，为制定治疗方案提供依据；在药物研发过程中，细胞周期检测可以帮助评估新药对细胞周期的影响，寻找潜在的药物作用靶点，提高药物的研发效率和成功率；对于细胞治疗（如干细胞治疗等）来说，细胞周期检测可以评估细胞的生长和分裂能力，确保用于治疗的细胞没有异常，保障治疗的安全性和有效性；细胞周期检测还可以用于优生优育领域，帮助评估胚胎细胞的生长和分裂状况，为试管婴儿等生殖辅助技术提供更为精确的依据。

流式检测细胞周期在中药学中具有广泛的应用，可以帮助研究人员评估中药对细胞增殖和细胞周期的调控作用。可以对细胞进行荧光染色，准确测量不同细胞周期阶段的比例和分布情况，进而揭示中药对细胞增殖的影响机制。这项技术可用于研究中药对肿瘤细胞生长的抑制作用、对细胞周期相关蛋白的调控以及对细胞增殖信号通路的影响等方面。通过流式检测细胞周期，中药学领域可以更深入地了解中药的药理作用，为中药的研发和应用提供更加准确和全面的数据支持。

高分文献精选

01

影响因子：38.104

标题: Imatinib blocks tyrosine phosphorylation of Smad4 and restores TGF- β growth-suppressive signaling in BCR-ABL1-positive leukemia

期刊: SIGNAL TRANSDUCTION AND TARGETED THERAPY

摘要: 研究发现慢性髓性白血病(CML)的致癌 BCR-ABL1 和细胞 ABL1 酪氨酸激酶磷酸化并使 Smad4 失活以阻断抗增殖 TGF- β 信号通路。

单位: 浙江大学生命科学研究所, 生物系统稳态与保护教育部重点实验室和浙江省癌症分子细胞生物学重点实验室

应用产品

CCS01 Cell Cycle Staining Buffer 细胞周期染色液

Article | [Open access](#) | Published: 24 March 2023

Imatinib blocks tyrosine phosphorylation of Smad4 and restores TGF- β growth-suppressive signaling in BCR-ABL1-positive leukemia

Lijiang Wang, Shuchen Gu, Fenfang Chen, Yi Yu, Jin Cao, Xinran Li, Chun Gao, Yanzhen Chen, Shuchong Yuan, Xia Liu, Jin Qin, Bin Zhao, Pinglong Xu, Tingbo Liang, Hongyan Tong, Xia Lin & Xin-Hua Feng

Signal Transduction and Targeted Therapy 8, Article number: 120 (2023) | [Cite this article](#)

1526 Accesses | 2 Citations | 2 Altmetric | [Metrics](#)



02

影响因子：27.401

标题: CDK6-PI3K signaling axis is an efficient target for attenuating ABCB1/P-gp mediated multi-drug resistance (MDR) in cancer cells

期刊: MOLECULAR CANCER

摘要: 揭示了 CDK6 和 PI3K 在 CDK6 缺陷的癌细胞群体中的交叉下调，表明 CDK6-PI3K 轴可能成为抑制 ABCB1 介导的多药耐药的新靶点。同时，CDK6 基因敲除可抑制癌细胞增殖和恶性程度。这些新发现将有助于开发针对 CDK6 或 PIK3CA/PIK3CB 基因或基因产物的新药，通过这些药物可以优化治疗效果。

单位: 中国科学院福建物质结构研究所, 结构化学国家重点实验室

应用产品

CCS012 Cell Cycle Staining Kit 细胞周期检测试剂盒

> Mol Cancer. 2022 Apr 22;21(1):103. doi: 10.1186/s12943-022-01524-w.

CDK6-PI3K signaling axis is an efficient target for attenuating ABCB1/P-gp mediated multi-drug resistance (MDR) in cancer cells

Lei Zhang^{1 2 3}, Yidong Li⁴, Chaohua Hu⁵, Yangmin Chen⁴, Zhuo Chen^{6 7}, Zhe-Sheng Chen⁴, Jian-Ye Zhang⁸, Shuo Fang⁹

Affiliations + expand

PMID: 35459184 PMCID: PMC9027122 DOI: 10.1186/s12943-022-01524-w

Free PMC article



03

影响因子: 19.16

标 题: Topoisomerase IIA in adult NSCs regulates SVZ neurogenesis by transcriptional activation of Usp37

期刊: NUCLEIC ACIDS RESEARCH

摘要: Usp37 的过表达足以挽救由 Top2a 敲低引起的成人 NSC 自我更新能力受损, 说明 TOP2a/Usp37 介导的成人神经发生新分子机制, 这将显着扩展我们对拓扑异构酶在成人大脑中功能的理解。

单位: 海军军医大学神经科学研究所, 分子神经生物学教育部重点实验室

应用产品

CCS012 Cell Cycle Staining Kit 细胞周期检测试剂盒

> Nucleic Acids Res. 2022 Sep 9;50(16):9319-9338. doi: 10.1093/nar/gkac731.

Topoisomerase IIA in adult NSCs regulates SVZ neurogenesis by transcriptional activation of Usp37

Shangyo Qin¹, Yimin Yuan¹, Xiao Huang¹, Zijian Tan¹, Xin Hu¹, Hong Liu¹, Yingyan Pu¹, Yu-Qiang Ding², Zhida Su¹, Cheng He¹

Affiliations + expand

PMID: 36029179 PMCID: PMC9458435 DOI: 10.1093/nar/gkac731

Free PMC article



04

影响因子: 17.694

标 题: DNA polymerase POLD1 promotes proliferation and metastasis of bladder cancer by stabilizing MYC

期刊: NATURE COMMUNICATIONS

摘要: 该研究确定了 POLD1 通过稳定 MYC 促进膀胱癌发生发展的机制, 并且 POLD1 具有成为膀胱癌生物标志物的潜力。

单位: 武汉大学中南医院泌尿外科

应用产品

CCS012 Cell Cycle Staining Kit 细胞周期检测试剂盒

> Nat Commun. 2023 Apr 27;14(1):2421. doi: 10.1038/s41467-023-38160-x.

DNA polymerase POLD1 promotes proliferation and metastasis of bladder cancer by stabilizing MYC

Yejinpeng Wang^{# 1}, Lingao Ju^{# 2 3 4}, Gang Wang^{1 2 3}, Kaiyu Qian^{1 2 3}, Wan Jin⁵, Mingxing Li⁶, Jingtian Yu¹, Yiliang Shi¹, Yongzhi Wang¹, Yi Zhang^{6 7}, Yu Xiao^{8 9 10 11}, Xinghuan Wang^{12 13 14 15}

Affiliations + expand

PMID: 37105989 PMCID: PMC10140023 DOI: 10.1038/s41467-023-38160-x

Free PMC article



05

影响因子: 16.744

标 题: Injectable Hydrogel as a Unique Platform for Antitumor Therapy Targeting Immunosuppressive Tumor Microenvironment

期刊: CHEMICAL ENGINEERING JOURNAL

摘要: 肿瘤微环境对癌症免疫治疗的疗效起着至关重要的作用。可注射水凝胶已成为强大的药物递送平台, 具有良好的生物相容性和生物降解性、最小的侵袭性、方便的合成、多功能性、高载药量、可控的药物释放和低毒性。

单位: 华中科技大学同济医学院协和医院眼科

应用产品

CCS012 Cell Cycle Staining Kit 细胞周期检测试剂盒

Review > Front Immunol. 2022 Jan 17:12:832942. doi: 10.3389/fimmu.2021.832942.
eCollection 2021.

Injectable Hydrogel as a Unique Platform for Antitumor Therapy Targeting Immunosuppressive Tumor Microenvironment

Yushuai Liu ¹, Yuanyuan Geng ², Beilei Yue ², Pui-Chi Lo ³, Jing Huang ², Honglin Jin ²

Affiliations + expand

PMID: 35111169 | PMCID: PMC8801935 | DOI: 10.3389/fimmu.2021.832942

Free PMC article

06

影响因子: 15.9

标 题: The CTBP2-PCIF1 complex regulates m6Am modification of mRNA in head and neck squamous cell carcinoma

期刊: JOURNAL OF CLINICAL INVESTIGATION

摘要: CTBP2 通过与细胞核中的 PCIF1 结合形成 PCIF1-CTBP2 复合物, 发挥 m6Am 修饰作用。此外, 还发现 TET2 (Tet 甲基胞嘧啶双加氧酶 2) 是 HNSCC 中 PCIF1-CTBP2 复合物的功能性下游靶点, PCIF1-CTBP2 介导的 TET2 上的 m6Am 修饰负向调控 TET2 转录物的翻译。

单位: 广州中山大学耳鼻喉科医院

应用产品

AP101 Annexin V-FITC/PI Apoptosis Assay Kit CCS012 Cell Cycle Staining Kit 细胞周期检测试剂盒

> J Clin Invest. 2023 Oct 16;133(20):e170173. doi: 10.1172/JCI170173.

The CTBP2-PCIF1 complex regulates m6Am modification of mRNA in head and neck squamous cell carcinoma

Kang Li ¹, Jie Chen ², Caihua Zhang ³, Maosheng Cheng ¹, Shuang Chen ¹, Wei Song ³, Chunlong Yang ³, Rongsong Ling ⁴, Zhi Chen ⁵, Xiaochen Wang ¹, Gan Xiong ¹, Jieyi Ma ¹, Yan Zhu ¹, Quan Yuan ³, Qi Liu ⁵, Liang Peng ⁶, Qianming Chen ⁷, Demeng Chen ¹

Affiliations + expand

PMID: 37643007 | PMCID: PMC10575729 | DOI: 10.1172/JCI170173

Free PMC article

13

07

影响因子: 15.828

标 题: Reconstitution of male germline cell specification from mouse embryonic stem cells using defined factors in vitro

期刊: CELL DEATH AND DIFFERENTIATION

摘要: 发现真核翻译起始因子 2 亚基 3 和结构基因 Y 连锁 (Eif2s3y) 对精子发生至关重要。Eif2s3y 过表达的 ESCs 在体外表现出增强的精子发生, 如 SSCLC 诱导过程中 SSC 特异性标志物的表达水平升高, 不育雄性小鼠繁殖能力恢复改善, 单倍体细胞诱导效率提高。

单位: 西北农林科技大学陕西省干细胞工程与技术中心兽医学院

应用产品

CCS012 Cell Cycle Staining Kit 细胞周期检测试剂盒

> Cell Death Differ. 2019 Oct;26(10):2115-2124. doi: 10.1038/s41418-019-0280-2. Epub 2019 Jan 25.

Reconstitution of male germline cell specification from mouse embryonic stem cells using defined factors in vitro

Na Li ¹, Wentao Ma ¹, Qiaoyan Shen ¹, Mengfei Zhang ¹, Zhaoyu Du ¹, Chongyang Wu ¹, Bowen Niu ¹, Wenqiang Liu ¹, Jinlian Hua ²

Affiliations + expand

PMID: 30683919 | PMCID: PMC6748084 | DOI: 10.1038/s41418-019-0280-2

Free PMC article



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14

检测原理

DETECTION PRINCIPLE

细胞凋亡检测原理

细胞周期检测原理

1. 细胞凋亡检测原理

Annexin V(或 Annexin A5)为胞内蛋白膜联蛋白家族成员，以钙依赖的方式与磷脂酰丝氨酸(PS)结合。PS 存在于正常细胞浆膜的内层,但在凋亡早期,膜不对称性丧失, PS 易位至细胞表面。荧光标记的 Annexin V 可与之特异性结合,表明该细胞为凋亡细胞。碘化丙啶(PI)是一种核酸染料,它不能透过正常细胞或早期凋亡细胞的完整的细胞膜,但可以透过凋亡晚期和坏死细胞的细胞膜而使细胞核染红。因此,将 Annexin V 与 PI 联合使用时,PI 则被排除在活细胞(Annexin V-/PI-) 和早期凋亡细胞(Annexin V+/PI-) 之外,而晚期凋亡细胞和坏死细胞同时被荧光标记的 Annexin V 和 PI 结合染色呈现双阳性(Annexin V+/PI+)。

联科凋亡检测明星产品

目录号	产品名称	规格
AP101	Annexin V-FITC/PI Apoptosis Kit(适用于除C6以外的流式细胞仪)	30T/60T/100T
AP101C	Annexin V-FITC/PI Apoptosis Kit (C6专用)	30T/60T/100T
AP104	Annexin V-PE/7-AAD Apoptosis Kit	30T/60T/100T
AP105	Annexin V-APC/7-AAD Apoptosis Kit	30T/60T/100T
AP107	Annexin V-APC/PI Apoptosis Kit	30T/60T/100T
AT101	Annexin V-FITC/PI Apoptosis Kit (细胞凋亡试剂盒-适用贴壁细胞 除C6流式细胞仪以外的流式细胞仪)	30T/60T/100T

目录号	产品名称	规格
AT101C	Annexin V-FITC/PI Apoptosis Kit (贴壁细胞) (C6专用)	30T/60T/100T
AT104	Annexin V-PE/7-AAD Apoptosis Kit (贴壁细胞)	30T/60T/100T
AT105	AnnexinV APC/7-AAD Apoptosis Kit (贴壁细胞)	30T/60T/100T
AT107	AnnexinV APC/PI Apoptosis Kit (贴壁细胞)	30T/60T/100T

2. 细胞周期检测原理

从一次细胞分裂结束到下一次分裂结束为一个细胞周期,通常由 G0/G1 期、S 期、G2 期和 M 期组成。在细胞周期的不同时期,细胞核内的 DNA 含量存在差异。使用 PI 染料对 DNA 进行染色,DNA 含量多, 荧光强度高, DNA 含量少, 荧光强度低。因此根据 DNA 荧光强度的不同, 即可判断细胞处于哪个时期。

联科周期检测明星产品

目录号	产品名称	规格
CCS01	Cell Cycle Staining Buffer 细胞周期染色液	50T
CCS012	Cell Cycle Staining Kit 细胞周期检测试剂盒	50T



实验检测步骤

EXPERIMENTAL DETECTION STEPS

Annexin V
检测凋亡实验步骤



细胞周期
检测实验步骤



1. Annexin V 检测凋亡实验步骤

1.1 细胞消化 (不同类型的细胞, 方案需要优化)

Accutase 是一种天然的酶, 兼具蛋白水解酶和胶原酶的活性。但它比胰酶和胶原酶更有效, 使用浓度更低, 使之毒性更小、更温和。因此对细胞的损伤更小, 可减少因消化处理带来的假阳性。即便长时间消化, 也可保持 90% 以上的细胞活力。适合于各种贴壁细胞、胚胎和神经元干细胞等较敏感的细胞的消化。

1.1.1 将 Accutase 酶于 4°C 或室温解冻, 切勿放置于 37°C 解冻

1.1.2 小心吸去细胞培养基 (如培养上清中存在凋亡细胞, 则应收集)

1.1.3 (可选) 无菌 PBS 洗涤

1.1.4 加入适量解冻的 Accutase(不需要等温度至 37°C), 覆盖住细胞。根据细胞汇合度和密度情况, 通常在 T25 细胞瓶中加入 2.5-5 mL Accutase(联科生物 AT 系列凋亡检测试剂盒包含 Accutase, 专为贴壁细胞研发)

1.1.5 室温放置 5-10 分钟, 至多可长达 1 小时, 无需终止

1.1.6 当细胞开始圆缩, 用手掌轻拍培养瓶, 使细胞脱落

1.1.7 温和的吹散细胞, 收集细胞

1.2 仪器参数调节

1.2.1 收集 1×10^6 个细胞, 用预冷 PBS 离心洗涤两次, 弃上清

1.2.2 加入 500 μL Apoptosis Positive Control Solution (联科生物独家配备凋亡阳性质控液) 重悬, 置冰上孵育 30 分钟

1.2.3 用预冷 PBS 离心洗涤, 弃上清

1.2.4 用双蒸水稀释 5 \times Binding Buffer 为 1 \times 工作液, 加入适量预冷 1 \times Binding Buffer 重悬, 并加入数量相同且未经处理的活细胞与之混合。加入预冷 1 \times Binding Buffer 补充至 1.5 mL, 等分成三管, 其中一管为空白对照管、两管为单染管

1.2.5 单染管分别加入 5 μL Annexin V-FITC 或 10 μL PI, 室温避光孵育 5 分钟

1.2.6 在流式细胞仪上, 用空白管调节 FSC、SSC 和荧光通道的电压, 并在此电压条件下, 用单染管调节荧光通道的补偿

1.3 样本检测

1.3.1 按实验方案诱导凋亡

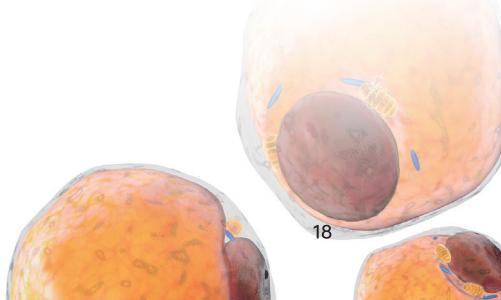
1.3.2 用预冷 PBS 离心洗涤, 收集 10^5 个细胞 (包括培养上清中的细胞)。取 500 μL 1 \times Binding Buffer 重悬细胞

1.3.3 每管加入 5 μL Annexin V-FITC 和 10 μL PI

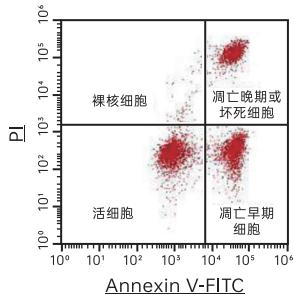
1.3.4 轻柔涡旋混匀后, 室温避光孵育 5 分钟

1.3.5 根据实验方法, 进行流式分析

1.3.6 流式分析在流式细胞仪上, 通过 FITC 检测通道检测 Annexin V-FITC (Ex = 488 nm ; Em = 530 nm) 和通过 PI 检测通道 (Ex= 535 nm ; Em = 615 nm) 检测 PI

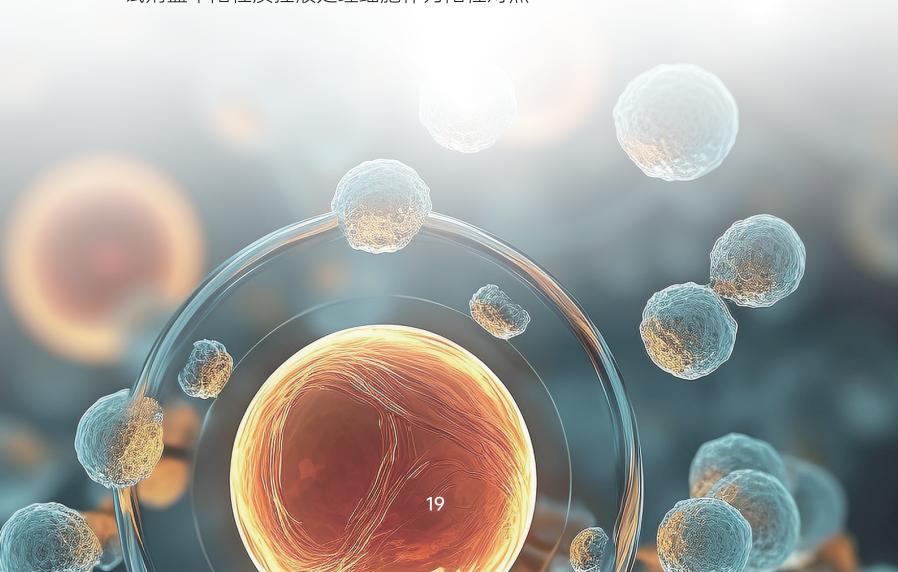


1.4 实验结果展示



1.5 实验注意事项

- 1.5.1 PI 有潜在的致癌性,操作时请特别注意并采取必要的防护措施
- 1.5.2 检测贴壁细胞时,若不好控制消化时间,建议用 Accutase 酶进行细胞消化,对细胞损伤小且不会改变细胞膜上 PS 的分布
- 1.5.3 Annexin V, FITC 和 PI 均对光敏感,所有染色过程和培养过程均需避光
- 1.5.4 实验设计时,要考虑到补偿,设单染管调节补偿
- 1.5.5 若是首次做细胞凋亡实验,建议做阳性对照组,可使用联科生物凋亡试剂盒中阳性质控液处理细胞作为阳性对照



2. 细胞周期检测实验步骤

2.1 一步法活细胞检测

2.1.1 样品制备,收集 $2 \times 10^5 - 1 \times 10^6$ 个活细胞,离心弃上清,用 PBS 洗涤一次,离心弃上清

2.1.2 复染,加入 1 mL DNA staining solution (Cat#CCS01), 涡旋振荡 5 - 10 秒混匀。室温避光孵育 30 分钟,进行流式检测。如需在荧光显微镜下观察,则离心细胞,弃上清,加入新鲜缓冲液重悬。滴加 1 滴细胞悬液至载玻片,盖上盖玻片后使用合适的滤光片进行观察

2.2 活细胞 / 固定细胞检测

2.2.1 可当天检测的活细胞样本

2.2.1.1 收集 $2 \times 10^5 - 1 \times 10^6$ 个细胞,离心弃上清。用 PBS 洗涤一次,离心弃上清

2.2.1.2 加入 1 mL DNA Staining solution 和 10 μL Permeabilization solution (Cat#CCS012), 涡旋振荡 5-10 秒混匀。室温避光孵育 30 分钟

2.2.1.3 选择最低上样速度,在流式细胞仪上进行检测。如需在荧光显微镜下观察,则离心细胞,弃上清,加入新鲜缓冲液重悬。滴加 1 滴细胞悬液至载玻片,盖上盖玻片后使用合适的滤光片进行观察

2.2.2 当天无法检测的活细胞样本

2.2.2.1 按照下述方法固定,或其他合适的方法固定

a. 收集 $2 \times 10^5 - 1 \times 10^6$ 个细胞,离心弃上清。轻弹管壁,使沉淀重悬在残余的液体中,加入 1 mL 室温下的 PBS

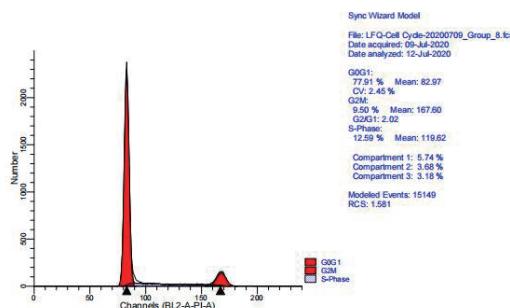
b. 将细胞缓慢加入至 3 mL 无水乙醇 (-20°C 预冷) 中,边加边高速搅拌。-20°C 固定过夜,可保存数月

2.2.2.2 检测当天,将固定细胞离心,弃去乙醇,轻弹管壁使沉淀松散,加入 2-5 mL 室温下的 PBS,放置 15 分钟使细胞再次水化。离心,弃上清

2.2.2.3 加入 1 mL DNA staining solution, 涡旋振荡 5-10 秒混匀, 室温避光孵育 30 分钟

2.2.2.4 选择最低上样速度，在流式细胞仪上进行检测。如需在荧光显微镜下观察，则离心细胞，弃上清，加入新鲜缓冲液重悬。滴加1滴细胞悬液至载玻片，盖上盖玻片后使用合适的滤光片进行观察

2.3 实验结果展示



2.4 实验注意事项

2.4.1 制备单细胞悬液：操作应轻柔，减少碎片

2.4.2 最低速度上机检测：降低 CV，避免仪器把相邻细胞当做一个细胞

2.4.3 排除粘连体：避免细胞黏黏检测的 DNA 含量为非 2 倍体，导致实验结果不准确

2.4.4 PI 的坐标选线性：线性更能体现 DNA 含量的倍数关系

2.4.5 实验放最后做：由于 PI 具有黏性，通常周期实验放在最后做，否则需要深度清洗后，再进行其他实验

2.4.6 固定细胞后，虽然可以保持较长时间再上机，为了确保不出其它因素，建议尽早上机，长时间上机的话会导致上机时细胞黏连较多，影响实验结果

实验常见问题及解决方案

COMMON PROBLEMS AND SOLUTIONS IN EXPERIMENTS

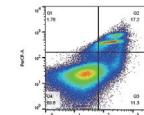
细胞凋亡检测常见问题及解决方案

细胞周期检测常见问题及解决方案

1. 细胞凋亡常见问题及解决方案

问题一

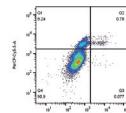
处理组晚期凋亡细胞分两群，早期凋亡不明显



可能原因	解决方案
①药物处理细胞的浓度过大	①降低药物浓度
②溶解药物的有机溶剂用量过大	②有机溶剂的量最好控制在5%以下
③细胞处理条件极端（沸水）	③培养、实验过程都需要温柔对待细胞

问题二

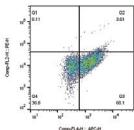
正常细胞出现较多裸核细胞



可能原因	解决方案
①细胞状态不佳	①选择状态良好的细胞开展实验
②实验操作手法太过粗暴	②处理细胞时尽量柔和，减少细胞机械性损伤

问题三

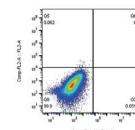
核染（PI/7-AAD），几乎无阳性信号



可能原因	解决方案
①核染料忘记添加	①重新实验，注意添加核染料
②试剂保存不当而失效，如保存温度不当	②重新购买试剂，注意试剂的保存条件
③阈值设置过大，凋亡信号没有收集到	③调整仪器设置，降低阈值
④贴壁细胞培养液上清中的细胞没有收集	④重新实验，注意收集上清中的细胞

问题六

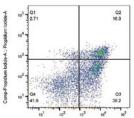
早凋和晚凋均未染上色



可能原因	解决方案
①试剂失效或者是储存不当	①更换合格的试剂盒
②操作不当，染色之后用缓冲液洗掉荧光	②按照说明书操作
③细胞本身未发生凋亡	③增加阳性对照或用联科试剂盒凋亡阳性质控液处理，探索更合适的实验条件

问题四

分群不明显



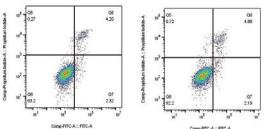
可能原因	解决方案
①细胞带自发荧光	①更换其他标记的试剂盒
②细胞状态较差，所有细胞都有一定的PS外翻	②培养、实验过程都需要温柔对待细胞

2. 细胞周期常见问题及解决方案

常见问题	解决方案
如何排除黏连体？	①在流式上样前用滤器过滤掉粘连细胞 ②流式分析时尽量用低速 ③在流式分析时A/W或A-H去除粘连细胞
什么样的流式周期数据可以使用？	①检测的有效细胞数量不低于10000个 ②CV值低于8% ③RCS最好在1~3，3~5也是可以的，但高于5就不被认可
固定后细胞数太少怎么办？	可以适当延长离心时间或稍稍加大离心力
为什么没有S期？	一般是因为固定不完全 ①使用-20°C冷冻过夜的冰乙醇 ②乙醇与细胞混合需逐滴加入并实时混匀 ③固定12-24小时效果更佳 ④可能有些病理细胞由于基因突变等其他情况，细胞周期可能受到改变，导致S期的存在受到影
凋亡和周期的PI是否可以混用？	不可以混用或可咨询产品厂家

问题五

实验组凋亡率和正常组没有差别



可能原因	解决方案
①药物作用时间不够	①重新设置细胞给药梯度
②药物作用浓度不够	②增加药物浓度
③未收集上清中的细胞，凋亡细胞都在上清中	③收集上清细胞

联科生物 凋亡检测试剂盒应用及文献引用

APPLICATION AND LITERATURE CITATION OF LIANKE BIOLOGICAL APOPTOSIS DETECTION KIT

细胞凋亡检测试产品文献引用

细胞周期检测试产品文献引用

1. 细胞凋亡产品引用文献

货号	产品名称	论文标题	期刊	影响因子
AT107	Annexin V-APC/PI Apoptosis Kit	Metformin escape in prostate cancer by activating the PTGR1 transcriptional program through a novel super-enhancer	SIGNAL TRANSDUCTION AND TARGETED THERAPY	39.3
API05	Annexin V-APC/7-AAD Apoptosis kit	GPR54-mediated sensing of lysophosphatidylserine released by apoptotic neutrophils activates type 3 innate lymphoid cells to mediate tissue repair	IMMUNITY	31.745
API05	Annexin V-APC/7-AAD Apoptosis kit	Spleen fibroblastic reticular cell-derived acetylcholine promotes lipid metabolism to drive autoreactive B cell responses	CELL METABOLISM	31.373
API01	Annexin V-FITC/PI Apoptosis Kit	Influenza-trained mucosal-resident alveolar macrophages confer long-term antitumor immunity in the lungs	NATURE IMMUNOLOGY	31.25
API01/AT101	Annexin V-FITC/PI Apoptosis Kit	Cancer cells corrupt normal epithelial cells through miR-let-7c-rich small extracellular vesicle-mediated downregulation of p53/PTEN	INTERNATIONAL JOURNAL OF ORAL SCIENCE	24.897
API01	Annexin V-FITC/PI Apoptosis Kit	Targeting the Otub1/c-Maf axis for the treatment of multiple myeloma	BLOOD	23.629
API01/AT101	Annexin V-FITC/PI Apoptosis kit	Commensal viruses maintain intestinal intraepithelial lymphocytes via noncanonical RIG-I signaling	NATURE IMMUNOLOGY	23.53

货号	产品名称	论文标题	期刊	影响因子
AT105/API105	Annexin V-APC/7AAD Apoptosis kit	SARS-CoV-2 ORF3a inhibits cGAS-STING-mediated autophagy flux and antiviral function	JOURNAL OF MEDICAL VIROLOGY	20.693
AT101	Annexin V-FITC/PI Apoptosis Kit	Surface-Engineered Extracellular Vesicles with CDH17 Nanobodies to Efficiently Deliver Imaging Probes and Chemo-Photothermal Drugs for Gastric Cancer Theragnostic	ADVANCED FUNCTIONAL MATERIALS	19.924
API01/AT101	Annexin V-FITC/PI Apoptosis kit	Gut dysbacteriosis attenuates resistance to Mycobacterium bovis infection by decreasing Cyclooxygenase 2 to inhibit endoplasmic reticulum stress	EMERGING MICROBES & INFECTIONS	19.568
AT105/API105	Annexin V-APC/7-AAD Apoptosis kit	Mild photothermal therapy boosts nanomedicine antitumor efficacy by disrupting DNA damage repair pathways and modulating tumor mechanics	NANO TODAY	18.962
AT101/AT101C	Annexin V-FITC/PI Apoptosis kit	Alternative Strategy to Optimize Cerium Oxide for Enhanced X-ray-Induced Photodynamic Therapy	ACS NANO	18.027
API01/AT101	Annexin V-FITC/PI Apoptosis kit	Breaking the Iron Homeostasis: A "Trojan Horse" Self-Assembled Nanodrug Sensitizes Homologous Recombination Proficient Ovarian Cancer Cells to PARP Inhibition	ACS NANO	18.027
AP101	Annexin V-FITC/PI Apoptosis kit	HER2 recruits AKT1 to disrupt STING signalling and suppress antiviral defence and antitumour immunity	NATURE CELL BIOLOGY	17.728
API05/API105	Annexin V-APC/7-AAD Apoptosis kit	Mannose ameliorates experimental colitis by protecting intestinal barrier integrity	NATURE COMMUNICATIONS	17.694
AT105	Annexin V and 7-AAD Apoptosis Kit	THADA inhibition in mice protects against type 2 diabetes mellitus by improving pancreatic β -cell function and preserving β -cell mass	NATURE COMMUNICATIONS	17.694
AT105	Annexin V and 7-AAD Apoptosis Kit	Mutant KRAS Drives Immune Evasion by Sensitizing Cytotoxic T-Cells to Activation-Induced Cell Death in Colorectal Cancer	ADVANCED SCIENCE	17.521

货号	产品名称	论文标题	期刊	影响因子
AP101	Annexin V-FITC/PI Apoptosis kit	Near-Death Cells Cause Chemotherapy-Induced Metastasis via ATF4-Mediated NF- κ B Signaling Activation	ADVANCED SCIENCE	17.521
AT107	Annexin V-APC/PI Apoptosis kit	Cartilage-targeting mRNA-lipid nanoparticles rescue perifocal apoptotic chondrocytes for integrative cartilage repair	CHEMICAL ENGINEERING JOURNAL	16.744
AP101	Annexin V-FITC/PI Apoptosis Kit	Nanomaterial-Facilitated Cyclin-Dependent Kinase 7 Inhibition Suppresses Gallbladder Cancer Progression via Targeting Transcriptional Addiction	ACS NANO	15.881
AP101C/AT101C	Annexin V-FITC/PI Apoptosis kit	On-Demand Generation of Peroxynitrite from an Integrated Two-Dimensional System for Enhanced Tumor Therapy	ACS NANO	15.881
AP101	Annexin V - FITC/PI Apoptosis Kit	Targeting Super-Enhancers via Nanoparticle-Facilitated BRD4 and CDK7 Inhibitors Synergistically Suppresses Pancreatic Ductal Adenocarcinoma	ADVANCED SCIENCE	15.84
AP104/AT104	Annexin V-PE/7-AAD Apoptosis kit	Interventional Photothermal Therapy Enhanced Brachytherapy: A New Strategy to Fight Deep Pancreatic Cancer	ADVANCED SCIENCE	15.804
AP105/AT105	Annexin V-APC/7-AAD Apoptosis kit	Blocking Triggering Receptor Expressed on Myeloid Cells-1-Positive Tumor-Associated Macrophages Induced by Hypoxia Reverses Immunosuppression and Anti-Programmed Cell Death Ligand 1 Resistance in Liver Cancer	HEPATOLOGY	14.971
AP101	Annexin V - FITC/PI Apoptosis Kit	C/EBP β enhances platinum resistance of ovarian cancer cells by reprogramming H3K79 methylation	NATURE COMMUNICATIONS	14.919
AP101/AT101/A P107/AT107	Annexin V - FITC/PI Apoptosis Kit	The genomic landscape of cholangiocarcinoma reveals the disruption of post-transcriptional modifiers	NATURE COMMUNICATIONS	14.919
AP104/AT104/A P105/AT105	Annexin V-PE/7-AAD Apoptosis kit	Bioadaptation of implants to In vitro and In vivo oxidative stress pathological conditions via nanotopography-induced FoxO1 signaling pathways to enhance Osteoimmunological regeneration	BIOACTIVE MATERIALS	14.593

货号	产品名称	论文标题	期刊	影响因子
AP101/AP101C/AT101C/AT101	Annexin V-FITC/PI Apoptosis kit	Oxygen-evolving photosynthetic cyanobacteria for 2D bismuthene radiosensitizer-enhanced cancer radiotherapy	BIOACTIVE MATERIALS	14.593
AP101	Annexin V-FITC/PI Apoptosis kit	Nanoenabled Disruption of Multiple Barriers in Antigen Cross-Presentation of Dendritic Cells via Calcium Interference for Enhanced Chemo-Immunotherapy	ACS NANO	14.588
AP101/AT101	Annexin V-FITC/PI Apoptosis kit	HSPA13 facilitates NF- κ B-mediated transcription and attenuates cell death responses in TNF α signaling	SCIENCE ADVANCES	14.143
AP101-100-AVF	Annexin V-FITC/PI Apoptosis kit	Inhibiting Metastasis and Preventing Tumor Relapse by Triggering Host Immunity with Tumor-Targeted Photodynamic Therapy Using Photosensitizer-Loaded Functional Nanographenes	ACS NANO	13.942
AP105	Annexin V-APC/7-AAD Apoptosis kit	miR-448 targets IDO1 and regulates CD8 + T cell response in human colon cancer	JOURNAL FOR IMMUNOTHERAPY OF CANCER	13.751
AP101/AT101	Annexin V-FITC/PI Apoptosis kit	Nanoparticle enhanced combination therapy for stem-like progenitors defined by single-cell transcriptomics in chemotherapy-resistant osteosarcoma	SIGNAL TRANSDUCTION AND TARGETED THERAPY	13.493
AP105	Annexin V-APC/7-AAD Apoptosis kit	CDK4/6 inhibition enhances oncolytic virus efficacy by potentiating tumor-selective cell killing and T cell activation in refractory glioblastoma	CANCER RESEARCH	13.312
AP101/AT101	Annexin V-FITC/PI Apoptosis kit	Tumor Customized 2D Supramolecular Nanodisks for Ultralong Tumor Retention and Precise Photothermal Therapy of Highly Heterogeneous Cancers	SMALL	13.281
AP105/AT105	Annexin V APC/7-AAD apoptosis kit	Hollow polydopamine spheres with removable manganese oxide nanoparticle caps for tumor microenvironment-responsive drug delivery	CHEMICAL ENGINEERING JOURNAL	13.273
AP101/AT101	Annexin V-FITC/PI Apoptosis kit	Polyhedral oligomeric silsesquioxane (POSS)-based hybrid nanocomposite for synergistic chemo-photothermal therapy against pancreatic cancer	CHEMICAL ENGINEERING JOURNAL	13.273

货号	产品名称	论文标题	期刊	影响因子
AP104	Annexin V-PE/7-AAD Apoptosis kit	Chronic psychological stress promotes breast cancer pre-metastatic niche formation by mobilizing splenic MDSCs via TAM/CXCL1 signalling	JOURNAL OF EXPERIMENTAL & CLINICAL CANCER RESEARCH	12.658
AP101	Annexin V-FITC/PI Apoptosis kit	HERC2 promotes inflammation-driven cancer stemness and immune evasion in hepatocellular carcinoma by activating STAT3 pathway	JOURNAL OF EXPERIMENTAL & CLINICAL CANCER RESEARCH	12.658
AP101/AT101	Annexin V-FITC/PI Apoptosis kit	Bcl-2 inhibitors reduce steroid-insensitive airway inflammation	JOURNAL OF ALLERGY AND CLINICAL IMMUNOLOGY	12.485
AP101/AT101	Annexin V/PI Apoptosis Kit	Reactive oxygen species-activatable self-amplifying Watson-Crick base pairing-inspired supramolecular nanoprodrug for tumor-specific therapy	BIOMATERIALS	12.479
AP101/AT101	Annexin V-PI Apoptosis kit	Role of cellular uptake in the reversal of multidrug resistance by PEG-b-PLA polymeric micelles	BIOMATERIALS	12.479
AP101/AT101	Annexin V-FITC/PI Apoptosis kit	Tamoxifen-resistant breast cancer cells are resistant to DNA-damaging chemotherapy because of upregulated BARD1 and BRCA1	NATURE COMMUNICATIONS	12.353
AP101/AT101	Annexin V-FITC/PI Apoptosis kit	TRIM21 and PHLDA3 negatively regulate the crosstalk between the PI3K/AKT pathway and PPP metabolism	NATURE COMMUNICATIONS	12.121
AP101	Annexin V-FITC/PI Apoptosis kit	Elaophyllin, a novel autophagy inhibitor, exerts antitumor activity as a single agent in ovarian cancer cells	AUTOPHAGY	11.753
AP101/AP101C/AT101/AT101C	Annexin V-FITC/PI Apoptosis kit	"Pincer Movement": Reversing cisplatin resistance based on simultaneous glutathione depletion and glutathione S-transferases inhibition by redox-responsive degradable organosilica hybrid	ACTA PHARMACEUTICA SINICA B	11.614
AP101/AT101	Annexin V-FITC/PI Apoptosis Kit	m ^{<sup>6</sup> A-induced lncDBT promotes the malignant progression of bladder cancer through FABP5-mediated lipid metabolism.}	THERANOSTICS	11.6

货号	产品名称	论文标题	期刊	影响因子
AP101C/AT101C	Annexin V-FITC/ PI Apoptosis Kit	SNP rs4971059 predisposes to breast carcinogenesis and chemoresistance via TRIM46-mediated HDAC1 degradation	EMBO JOURNAL	11.598
AP104/AT104	Annexin V-PE/7-AAD Apoptosis kit	Localized Delivery of shRNA against PHD2 Protects the Heart from Acute Myocardial Infarction through Ultrasound-Targeted Cationic Microbubble Destruction	THERANOSTICS	11.556
AP107	Annexin V-APC/ PI Apoptosis kit	The kynureine derivative 3-HAA sensitizes hepatocellular carcinoma to sorafenib by upregulating phosphatases	THERANOSTICS	11.556
AP105/AT105	Annexin V-APC/7-AAD Apoptosis kit	Tumor-specific activatable biopolymer nanoparticles stabilized by hydroxyethyl starch prodrug for self-amplified cooperative cancer therapy	THERANOSTICS	11.556
AP105/AT105	Annexin V-APC/7-AAD Apoptosis kit	Doxorubicin and erastin co-loaded hydroxyethyl starch-polycaprolactone nanoparticles for synergistic cancer therapy	JOURNAL OF CONTROLLED RELEASE	11.467
AP101/AP101C/AT101C/AT101	Annexin V-FITC/PI Apoptosis Kit	Liver fibrosis therapy based on biomimetic nanoparticles which deplete activated hepatic stellate cells	JOURNAL OF CONTROLLED RELEASE	11.467
AP101/AP101C/AT101C/AT101	Annexin V-FITC/PI Apoptosis Kit	Safe engineering of cancer-associated fibroblasts enhances checkpoint blockade immunotherapy	JOURNAL OF CONTROLLED RELEASE	11.467
AP105/AT105	Annexin V-APC/7-AAD Apoptosis kit	Exosome-derived circTRPS1 promotes malignant phenotype and CD8+ T cell exhaustion in bladder cancer microenvironments	MOLECULAR THERAPY	11.454
AP101	Annexin V-FITC/PI Apoptosis Kit	A HIF1α-GPD1 feedforward loop inhibits the progression of renal clear cell carcinoma via mitochondrial function and lipid metabolism	JOURNAL OF EXPERIMENTAL & CLINICAL CANCER RESEARCH	11.161
AP101/AT101	Annexin V-FITC/PI Apoptosis Kit	C-Myc-activated long non-coding RNA LINC01050 promotes gastric cancer growth and metastasis by sponging miR-7161-3p to regulate SPZ1 expression	JOURNAL OF EXPERIMENTAL & CLINICAL CANCER RESEARCH	11.161

货号	产品名称	论文标题	期刊	影响因子
AP101	Annixin V-FITC/PI Apoptosis kit	Efficacy and mechanism of the combination of PARP and CDK4/6 inhibitors in the treatment of triple-negative breast cancer	JOURNAL OF EXPERIMENTAL & CLINICAL CANCER RESEARCH	11.161
AP105/AT105	Annixin V-APC/7-AAD Apoptosis kit	Downregulation of AC0928941 promotes oxaliplatin resistance in colorectal cancer via the USP3/AR/RASGRP3 axis	BMC MEDICINE	11.15
API01/API01C/AT101C/AT101	Annixin V-FITC/PI Apoptosis kit	Engineered Sandwich-Structured Composite Wound Dressings with Unidirectional Drainage and Anti-Adhesion Supporting Accelerated Wound Healing	ADVANCED HEALTHCARE MATERIALS	11.092
AP101/AT101	Annixin V-FITC/PI Apoptosis kit	Targeting the LSD1-G9a-ER Stress Pathway as a Novel Therapeutic Strategy for Esophageal Squamous Cell Carcinoma.	RESEARCH	11.036
AT101/AT101C	Annixin V-FITC/PI Apoptosis kit	FCN3 inhibits the progression of hepatocellular carcinoma by suppressing SBDS-mediated blockade of the p53 pathway	INTERNATIONAL JOURNAL OF BIOLOGICAL SCIENCES	10.75
AT101/AT101C	Annixin V-FITC/PI Apoptosis Kit	Polyphyllin B Suppresses Gastric Tumor Growth by Modulating Iron Metabolism and Inducing Ferroptosis	INTERNATIONAL JOURNAL OF BIOLOGICAL SCIENCES	10.75
AT105/AP105	Annixin V-APC/7-AAD Apoptosis Kit	The developmental regulator HAND1 inhibits gastric carcinogenesis through enhancing ER stress apoptosis <>via</i> targeting CHOP and BAK which is augmented by cisplatin	INTERNATIONAL JOURNAL OF BIOLOGICAL SCIENCES	10.75
AP101/AT101	Annixin V-FITC/PI Apoptosis Kit	Thioredoxin 1 supports colorectal cancer cell survival and promotes migration and invasion under glucose deprivation through interaction with G6PD.	INTERNATIONAL JOURNAL OF BIOLOGICAL SCIENCES	10.75
AP101C	Annixin V-FITC/PI Apoptosis Kit	Targeting a positive regulatory loop in the tumor-macrophage interaction impairs the progression of clear cell renal cell carcinoma	CELL DEATH AND DIFFERENTIATION	10.717
AP101/AT101/A P101C/AT101C	Annixin V-FITC/PI apoptosis kit	Bone-targeted oxidative stress nanoamplifier for synergistic chemo/chemodynamic therapy of bone metastases through increasing generation and reducing elimination of ROS	CHEMICAL ENGINEERING JOURNAL	10.652

货号	产品名称	论文标题	期刊	影响因子
AP105/AT105	Annixin V-APC/7-AAD Apoptosis Kit	DNA addition polymerization with logic operation for controllable self-assembly of three-dimensional nanovehicles and combinatorial cancer therapy	CHEMICAL ENGINEERING JOURNAL	10.652
AP101/AT101	Annixin V-FITC/PI Apoptosis Kit	Reversing Immune Evasion using a DNA Nano-orchestrator for Pancreatic Cancer Immunotherapy	ACTA BIOMATERIALIA	10.633
AP101/AT101	Annixin V-FITC/PI Apoptosis Kit	Multi-omics analysis to reveal disorders of cell metabolism and integrin signaling pathways induced by PM2.5	JOURNAL OF HAZARDOUS MATERIALS	10.588
AP101/AT101	Annixin V-FITC/PI apoptosis kit	Mn doped Prussian blue nanoparticles for T1/T2 MR imaging, PA imaging and Fenton reaction enhanced mild temperature photothermal therapy of tumor	JOURNAL OF NANOBIOTECHNOLOGY	10.435
AP101	Annixin V-FITC/PI Apoptosis Kit	Prodrug polymeric micelles integrating cancer-associated fibroblasts deactivation and synergistic chemotherapy for gastric cancer	JOURNAL OF NANOBIOTECHNOLOGY	10.435
AP101/AT101	Annixin V-FITC/PI Apoptosis Kit	Aberrant translation regulated by METTL1/WDR4-mediated tRNA N7-methylguanosine modification drives head and neck squamous cell carcinoma progression	CANCER COMMUNICATIONS	10.392
AP105/AT105	Annixin V-APC/7-AAD Apoptosis Kit	IL-2Ra up-regulation is mediated by latent membrane protein 1 and promotes lymphomagenesis and chemotherapy resistance in natural killer/T-cell lymphoma	CANCER COMMUNICATIONS	10.392
AP101/AT101	Annixin V-FITC/PI Apoptosis Kit	Phenformin alone or combined with gefitinib inhibits bladder cancer via AMPK and EGFR pathways	CANCER COMMUNICATIONS	10.392
AP107	Annixin V-APC/PI Apoptosis kit	Structural and functional characterization of multiple myeloma associated cytoplasmic poly(A) polymerase FAM46C	CANCER COMMUNICATIONS	10.392
AP101/AT101/A P101C/AT101C	Annixin V-FITC/PI Apoptosis Kit	Janus-Inspired Core-Shell Structure Hydrogel Programmatically Releases Melatonin for Reconstruction of Postoperative Bone Tumor	ACS APPLIED MATERIALS & INTERFACES	10.383

2. 细胞周期产品引用文献

货号	产品名称	论文标题	期刊	影响因子
CCS01	Cell Cycle Staining Buffer	Imatinib blocks tyrosine phosphorylation of Smad4 and restores TGF-β growth-suppressive signaling in BCR-ABL1-positive leukemia	SIGNAL TRANDUCTION AND TARGETED THERAPY	38.104
CCS012	Cell Cycle Staining Kit	CDK6-Pi3K signaling axis is an efficient target for attenuating ABCB1/P-gp mediated multi-drug resistance (MDR) in cancer cells	MOLECULAR CANCER	27.401
CCS012	Cell Cycle Staining Kit	Topoisomerase IIA in adult NSCs regulates SVZ neurogenesis by transcriptional activation of Usp37	NUCLEIC ACIDS RESEARCH	19.16
CCS012	cell cycle staining kit	DNA polymerase POLD1 promotes proliferation and metastasis of bladder cancer by stabilizing MYC	NATURE COMMUNICATIONS	17.694
CCS012	Cell cycle staining Kit	Injectable Tumor Microenvironment-Modulated Hydrogels with Enhanced Chemosensitivity and Osteogenesis for Tumor-Associated Bone Defects Closed-Loop Management	CHEMICAL ENGINEERING JOURNAL	16.744
CCS012	Cell Cycle Staining Kit	Reconstitution of male germline cell specification from mouse embryonic stem cells using defined factors in vitro	CELL DEATH AND DIFFERENTIATION	15.828
CCS01/CCS012	Cell Cycle Staining Kit	N6-methyladenosine modification of CENPF mRNA facilitates gastric cancer metastasis via regulating FAK nuclear export	CANCER COMMUNICATIONS	15.283
CCS012	Cell Cycle Staining Kit	Integrative analysis of bulk and single-cell gene expression profiles to identify tumor-associated macrophage-derived CCL18 as a therapeutic target of esophageal squamous cell carcinoma	JOURNAL OF EXPERIMENTAL & CLINICAL CANCER RESEARCH	12.658

货号	产品名称	论文标题	期刊	影响因子
CCS012	Cell Cycle Staining Kit	N6-methyladenosine-modified USP13 induces pro-survival autophagy and imatinib resistance via regulating the stabilization of autophagy-related protein 5 in gastrointestinal stromal tumors	CELL DEATH AND DIFFERENTIATION	12.067
CCS012	Cell Cycle Staining Kit	Design of stapled peptide-based PROTACs for MDM2/MDMX atypical degradation and tumor suppression.	THERANOSTICS	11.6
CCS012	Cell Cycle Staining Kit	m⁶A reader hnRNPA2B1 drives multiple myeloma osteolytic bone disease.	THERANOSTICS	11.6
CCS012	Cell Cycle Staining Kit	LncRNA PCAT1 activates SOX2 and suppresses radioimmune responses via regulating cGAS/STING signalling in non-small cell lung cancer	CLINICAL AND TRANSLATIONAL MEDICINE	11.492
CCS012	Cell Cycle Staining Kit	A nanotherapeutic strategy that engages cytotoxic and immunosuppressive activities for the treatment of cancer recurrence following organ transplantation	EBIOMEDICINE	11.205
CCS012	Cell Cycle Staining Kit	Up-regulation of IGF2BP2 by multiple mechanisms in pancreatic cancer promotes cancer proliferation by activating the Pi3K/Akt signalling pathway	JOURNAL OF EXPERIMENTAL & CLINICAL CANCER RESEARCH	11.161
CCS01	Cell Cycle Staining Buffer	MIR-509-3 augments the synthetic lethality of PARPi by regulating HR repair in PDX model of HGSC	JOURNAL OF HEMATOLOGY & ONCOLOGY	11.059
CCS012	Cell Cycle Assay Kit	Isovalerylspiramycin I suppresses non-small cell lung carcinoma growth through ROS-mediated inhibition of PI3K/AKT signalling pathway	INTERNATIONAL JOURNAL OF BIOLOGICAL SCIENCES	10.75

货号	产品名称	论文标题	期刊	影响因子
70-CCS012	Cell Cycle Staining Kit	Neurotrophin3 promotes hepatocellular carcinoma apoptosis through the JNK and P38 MAPK pathways	INTERNATIONAL JOURNAL OF BIOLOGICAL SCIENCES	10.75
70-CCS012	Cell Cycle Staining Kit	Timosaponin AII promotes non-small-cell lung cancer ferroptosis through targeting and facilitating HSP90 mediated GPX4 ubiquitination and degradation	INTERNATIONAL JOURNAL OF BIOLOGICAL SCIENCES	10.75
CCS01/CCS012	Cell Cycle Staining Kit	TRIM26 promotes non-small cell lung cancer survival by inducing PBX1 degradation	INTERNATIONAL JOURNAL OF BIOLOGICAL SCIENCES	10.75
CCS01	Cell Cycle Staining Buffer	WTAP facilitates progression of hepatocellular carcinoma via m6A-Hur-dependent epigenetic silencing of ETS1	MOLECULAR CANCER	10.679
CCS012	Cell Cycle Staining Kit	Antibacterial and angiogenic wound dressings for chronic persistent skin injury	CHEMICAL ENGINEERING JOURNAL	10.652
CCS012	Cell Cycle Staining Kit	Regulating the immunosuppressive tumor microenvironment to enhance breast cancer immunotherapy using pH-responsive hybrid membrane-coated nanoparticles	JOURNAL OF NANOBIOTECHNOLOGY	10.435
CCS01/CCS012	Cell Cycle Staining Kit	Smart and Generalizable Cytarabine Derivative-Triggered Nanoparticles for Synergistic Therapy of Relapsed/Refractory Acute Myeloid Leukemia	ACS APPLIED MATERIALS & INTERFACES	10.383
CCS012	Cell Cycle Staining Kit	Identification of Frataxin as a regulator of ferroptosis	REDOX BIOLOGY	9.986
CCS012	Cell Cycle Staining Kit	Circ-TRIO promotes TNBC progression by regulating the miR-432-5p/CCDC58 axis	CELL DEATH & DISEASE	9.685
CCS012	Cell Cycle Staining Kit	HOXA5 inhibits the proliferation of extrahepatic cholangiocarcinoma cells by enhancing MXD1 expression and activating the p53 pathway	CELL DEATH & DISEASE	9.685

货号	产品名称	论文标题	期刊	影响因子
CCS01	Cell Cycle Staining Buffer	NRP1 promotes prostate cancer progression via modulating EGFR-dependent AKT pathway activation	CELL DEATH & DISEASE	9.685
CCS012	Cell Cycle Staining Kit	TP53-inducible putative long noncoding RNAs encode functional polypeptides that suppress cell proliferation	GENOME RESEARCH	9.438
CCS012	Cell Cycle Staining Kit	Fusobacterium nucleatum promotes esophageal squamous cell carcinoma progression and chemoresistance by enhancing the secretion of chemotherapy-induced senescence-associated secretory phenotype via activation of DNA damage response pathway	GUT MICROBES	9.434
CCS012	Cell Cycle Staining Kit	Therapeutic potential of Clostridium butyricum anticancer effects in colorectal cancer	GUT MICROBES	9.434
CCS012	Cell Cycle Staining Kit	Efficient tumor synergistic chemoimmunotherapy by self-augmented ROS-responsive immunomodulatory polymeric nanodrug	JOURNAL OF NANOBIOTECHNOLOGY	9.429
CCS012	Cell Cycle Staining Kit	Endothelial cell-derived exosomes boost and maintain repair-related phenotypes of Schwann cells via miR199-5p to promote nerve regeneration	JOURNAL OF NANOBIOTECHNOLOGY	9.429
CCS012	Cell Cycle Staining Kit	Mannan-Binding Lectin via Interaction With Cell Surface Calreticulin Promotes Senescence of Activated Hepatic Stellate Cells to Limit Liver Fibrosis Progression	CELLULAR AND MOLECULAR GASTROENTEROLOGY AND HEPATOLOGY	9.225
CCS012	Cell Cycle Staining Kit	Cancer-Associated MORC2-Mutant M276I Regulates an hnRNPM-Mediated CD44 Splicing Switch to Promote Invasion and Metastasis in Triple-Negative Breast Cancer	CANCER RESEARCH	9.13
CCS012	Cell Cycle Staining Kit	Targeted trapping of endogenous endothelial progenitor cells for myocardial ischemic injury repair through neutrophil-mediated SPIO nanoparticle-conjugated CD34 antibody delivery and imaging	ACTA BIOMATERIALIA	8.947

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杨老师

南方医科大学附属南方医院

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浙江大学医学院

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吕老师

浙江中医药大学

实验室一直使用联科生物的试剂，质量有保证，值得信赖。



丁老师

中国医学科学院肿瘤医院

联科生物流式凋亡周期产品拥有出色的性能和稳定性，为我们提供了高质量、可靠的实验结果。



张老师

北京大学



联科生物的流式检测凋亡周期产品在高质量的成果和卓越的性能上展现出了令人惊叹的优势。

顾老师 浙江大学医学院附属邵逸夫医院

联科生物的凋亡周期产品实验室一直在用，货期快，实验结果可靠以及稳定，是国产凋亡周期试剂首选。



企业及产品介绍

ENTERPRISE & PRODUCT LINE INTRODUCTION

产品介绍

除流式产品以外，联科生物自主生产或代理产品如下：

ELISA试剂盒



酶联免疫吸附测定 (Enzyme-Linked Immunosorbent Assay, ELISA) 是指将可溶性的抗原或抗体结合到聚苯乙烯等固相载体上，利用抗原抗体结合特异性进行免疫反应的定性和定量检测方法。常用的 ELISA 检测方法包括双抗体夹心法，间接法和竞争法等，可以用来检测细胞因子、生长因子、蛋白酶、可溶性受体、凋亡效应因子以及多种其他小分子物质的含量。

IVD试剂

联科生物已有116个流式检测试剂产品获得类医疗器械备案凭证，已建成 GMP 生产车间，拥有11项国家技术发明专利，生产体系通过ISO9001国际质量体系认证，多个III类和I类体外诊断试剂盒在注册申报中，将不断围绕流式细胞术应用和免疫学诊断研发申报更多产品。联科生物可以提供流式抗体检测试剂CDMO和LDT、细胞因子检测试剂CDMO、ELISA检测试剂CDMO等技术服务。



重组蛋白



联科生物是 PeproTech 的全国代理商。PeproTech 是重组蛋白 / 细胞因子的优质生产商，1988 年成立，目前在美国拥有先进的制造工厂，生产高品质的产品为生命科学研究创造基石，从而助力科学发现和人类健康。PeproTech 拥有超过 2000 种产品，主要包括科研级别 (R&D) 细胞因子、无动物成分 AF (Animal Free) 细胞因子和 GMP 级别细胞因子，单克隆抗体、多克隆抗体等。PeproTech 产品线齐全，每年近万篇权威引用文献数据支撑，为科学家和研究者提供稳定、高质量的产品。

企业介绍



联科生物成立于 2002 年，是一家专业从事细胞生物学与免疫学相关的检测试剂研发、生产、销售、服务的国家高新技术企业。联科生物拥有 ELISA 试剂盒、流式试剂、IVD 产品、重组蛋白和重组抗体开发平台，已成为中国科研试剂行业领先的民族品牌。公司是业内第一家挂牌全国中小企业股份转让系统（新三板）的企业（股票代码：831936），产品拥有 9 项国家发明专利，生产体系通过 ISO9001 国际质量体系认证，研发体系通过 ISO13485 国际质量体系认证。截止 2023 年底，引用联科生物产品的 SCI 科研论文数量共计 8820 篇，其中包括 *Science*, *Nature*, *Cell* 等顶刊文献，最高影响因子 IF=68.164。

