

## 萤火虫萤光素酶报告基因检测试剂盒

产品编号	产品名称	包装
RG005	萤火虫萤光素酶报告基因检测试剂盒	100次
RG006	萤火虫萤光素酶报告基因检测试剂盒	1000次

### 产品简介:

- 碧云天生产的萤火虫萤光素酶报告基因检测试剂盒(Firefly Luciferase Reporter Gene Assay Kit), 是一种以萤光素(luciferin)为底物高信号稳定性检测萤火虫萤光素酶(firefly luciferase)活性的试剂盒。
- 本产品是萤火虫萤光素酶报告基因检测试剂盒II (RG007)的不同包装版本, 两者的检测效果完全一致。本产品, 即RG005/RG006为即用型液体, 其优点是无需配制即可直接使用, 但需要-80°C保存, 如果在-20°C保存时间较长后检测效果会逐渐下降。萤火虫萤光素酶报告基因检测试剂盒II, 即RG007, 为RG005/RG006的冻干粉版本, 优点是在-20°C保存非常稳定, 缺点是使用前需要使用提供的缓冲液充分溶解底物冻干粉后才能使用。
- **本产品的性能基本达到甚至在某些方面优于国外主要同类产品。**本产品的用途与碧云天的同类产品萤火虫萤光素酶报告基因检测试剂盒(增强型) (Enhanced Firefly Luciferase Reporter Gene Assay Kit)及Promega公司的Luciferase Assay System基本相同。本产品(RG005/RG006)的化学发光信号稳定性显著优于萤火虫萤光素酶报告基因检测试剂盒(增强型) (RG009)及国外同类产品(Competitor P) (图1B), 发光强度也可以达到萤火虫萤光素酶报告基因检测试剂盒(增强型) (RG009)及国外同类产品(Competitor P)的40% (图1A)。本产品与RG009及国外同类产品(Competitor P)的检测效果比较参见图1。

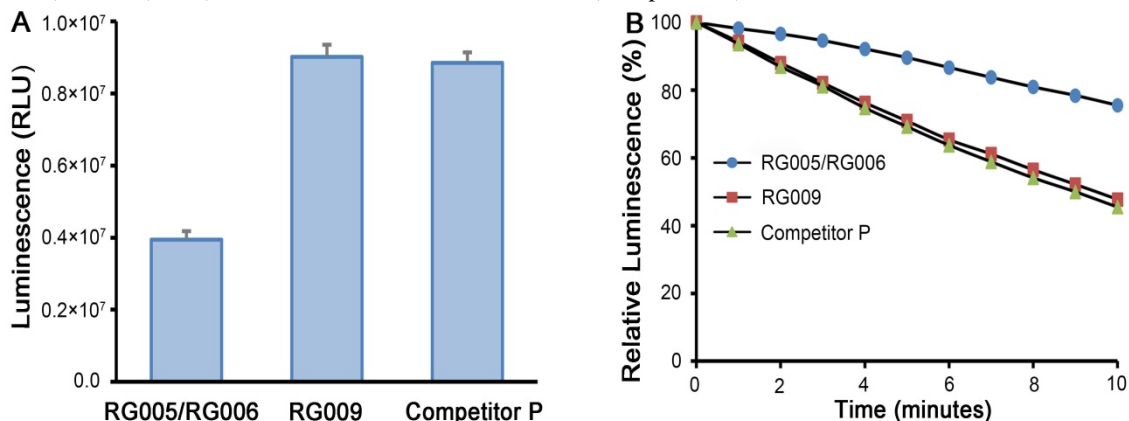


图1. 萤火虫萤光素酶报告基因检测试剂盒(RG005/RG006)的检测效果对比图。图中所示为本产品和碧云天的同类产品萤火虫萤光素酶报告基因检测试剂盒(增强型) (RG009)及国外同类产品(Competitor P)对转染阳性萤火虫萤光素酶报告基因质粒的HeLa细胞裂解样品的检测效果。图A为化学发光强度的检测效果对比图, 图B为化学发光稳定性的检测效果对比图。实际读数会因细胞种类、转染效率、报告基因质粒、检测仪器等的不同而存在差异, 图中数据仅供参考。

- **本产品发光信号稳定。**本产品的发光信号稳定性相对比较好, 1分钟内信号基本保持稳定, 信号变动不超过2%, 3分钟内的信号变动不超过5%, 5分钟内信号波动不超过10%, 信号半衰期约40分钟, 在发光稳定性方面显著优于RG009和国外同类产品Competitor P (图1B), 特别适用于待测样品数量较多的96孔板中进行萤火虫萤光素酶活性的多孔测定。
- **本产品发光强度高。**对于相同的细胞样品, 本产品的发光效果可以达到RG009和国外同类产品的约40%, 虽然低于RG009和国外同类产品(Competitor P), 但是发光强度相对已经非常高, 可以满足各种常规检测。如果样品中萤火虫萤光素酶的表达水平非常低时, 推荐使用发光强度和灵敏度更高的萤火虫萤光素酶报告基因检测试剂盒(增强型) (RG009/RG010)。
- **本产品操作简单, 读数稳定, 检测速度快, 从样品制备到完成检测仅需约20分钟。**本试剂盒中提供的萤火虫萤光素酶检测试剂为即用型试剂, 只需将100微升萤火虫萤光素酶检测试剂与20-100微升裂解制备的细胞样品混合后即可立即进行化学发光检测。并且发光信号比较稳定, 通常5分钟内信号下降不超过10%。
- **本产品稳定性好。**本试剂盒中的萤火虫萤光素酶检测试剂的稳定性非常好, 反复冻融5次对检测效果无明显影响, 反复冻融10次检测效果下降不超过10%。在4°C条件下, 保存3天检测效果下降不超过20%, 保存5天检测效果下降不超过30%, 保存7天仍可保留60%以上的检测效果。在室温保存1天可保留70%以上的检测效果, 室温保存3天可保留60%以上的检测效果, 37°C保存1天可保留50%以上的检测效果。萤火虫萤光素酶检测试剂即使仅保留约50%的检测效果, 仍可以满足各种常规检测的要求。
- 萤火虫萤光素酶是一种分子量约为61kD的蛋白, 在ATP、镁离子和氧气存在的条件下, 可以催化luciferin氧化成

oxyluciferin。在luciferin氧化的过程中，会发出生物萤光(bioluminescence)。生物萤光可以通过化学发光仪(luminometer)或液闪测定仪进行测定[1]。本试剂盒的检测原理参考图2。



图 2. 萤火虫萤光素酶的检测原理图。

- 通过萤光素和萤光素酶这一生物发光体系，可以非常灵敏、高效地检测基因的表达。通常把感兴趣基因的转录调控元件或5'启动子区克隆在luciferase的上游，或把3'-UTR区克隆在luciferase的下游等，构建成报告基因(reporter gene)质粒。然后转染细胞，用适当药物等处理细胞后裂解细胞，测定萤光素酶活性。通过萤光素酶活性的高低来判断药物处理等对目的基因的转录调控作用[2]。
- 关于碧云天萤光素酶报告基因检测试剂盒相关产品的比较和选择，请参考碧云天的相关网页：  
<http://www.beyotime.com/support/luciferase-reporter-gene-assay.htm>
- 萤光素、萤光素酶、萤火虫萤光素酶和海肾萤光素酶也经常被称为荧光素、荧光素酶、萤火虫荧光素酶和海肾荧光素酶。
- 萤火虫萤光素酶催化luciferin发光的最强发光波长为560nm (centered around 560nm)。
- 本试剂盒RG005和RG006分别可以测定100个和1000个样品。

### 包装清单：

产品编号	产品名称	包装
RG005-1	报告基因细胞裂解液	60ml
RG005-2	萤火虫萤光素酶检测试剂	10ml
—	说明书	1份

产品编号	产品名称	包装
RG006-1	报告基因细胞裂解液	RG005-1×10
RG006-2	萤火虫萤光素酶检测试剂	RG005-2×10
—	说明书	1份

### 保存条件：

报告基因细胞裂解液4℃保存3个月有效，-20℃保存一年有效，-80℃可以长期保存；萤火虫萤光素酶检测试剂-80℃避光保存，至少一年有效；-20℃避光保存，推荐3-6个月内使用。

### 注意事项：

- 萤火虫萤光素酶检测试剂在-20℃保存其检测效果会逐渐下降，保存半年后其发光效果会降低约50%。因此，本产品如果保存于-20℃，推荐在3-6个月内使用。如果订购后可能放置较长时间后再使用，推荐订购在-20℃保存非常稳定的萤火虫萤光素酶报告基因检测试剂盒II (RG007)。
- 为取得最佳测定效果，在用单管的化学发光仪测定时，样品和测定试剂混合后到测定前的时间应尽量控制在相同时间内，例如30秒内；使用具有化学发光测定功能的多功能荧光酶标仪时，宜先把样品全部加好，然后统一加入萤火虫萤光素酶检测试剂。
- 由于萤光素酶的活性对温度比较敏感，所以反应前样品和检测试剂均需达到室温后再进行测定。可将萤火虫萤光素酶检测试剂在室温或不超过25℃的水浴中融解并混匀后使用。
- 尽管经测试萤火虫萤光素酶检测试剂反复冻融5次对其检测效果无明显影响，为保证萤光素酶检测试剂的稳定性、取得良好的使用效果，第一次解冻后可以采取适当分装后避光保存的方法，以避免反复冻融和长时间暴露于室温。
- 检测时需使用白色或黑色的96孔板。如果使用普通透明的96孔板，相邻孔之间会产生相互干扰。推荐使用碧云天的BeyoGold™全黑96孔细胞培养板(FCP966)或BeyoGold™全白96孔细胞培养板(FCP968)。
- 样品和测定试剂混合后，必须等待1-2秒，再进行测定。测定时间通常为10秒，根据情况也可以测定更长或更短时间，但是同一批样品宜使用相同的测定时间。
- 为避免由于质粒转细胞时效率的差异而带来的误差，可以同时转入海肾萤光素酶(Renilla luciferase)的报告基因质粒作为内参，采用碧云天的双萤光素酶报告基因检测试剂盒(RG027/RG028)进行检测；也可以同时转入β-半乳糖苷酶(β-galactosidase, β-gal)报告基因质粒作为内参，然后采用碧云天生产的β-半乳糖苷酶报告基因检测试剂盒(RG0036)进行检测。采用本试剂盒中的报告基因细胞裂解液裂解获得的样品可以直接用于β-半乳糖苷酶报告基因检测试剂盒(RG0036)的检测。
- 本产品仅限于专业人员的科学研究用，不得用于临床诊断或治疗，不得用于食品或药品，不得存放于普通住宅内。
- 为了您的安全和健康，请穿实验服并戴一次性手套操作。

### 使用说明：

1. 裂解细胞：将报告基因细胞裂解液充分混匀后，按如下方式加入报告基因细胞裂解液，充分裂解细胞。
  - a. 对于贴壁细胞：吸尽细胞培养液后，参考下表加入适量的报告基因细胞裂解液；对于悬浮细胞：离心去上清后，参考下表加入适量报告基因细胞裂解液。

器皿类型	96孔板	48孔板	24孔板	12孔板	6孔板

报告基因细胞裂解液(微升/孔)	100	150	200	300	500
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注：如果萤光素酶的表达水平比较低，可以尝试使用更少的裂解液，例如6孔板的每孔用量可以最小为100微升。

b. 充分裂解后，10,000-15,000×g离心3-5分钟，取上清用于测定。

注：细胞裂解后可立即测定萤光素酶，也可以先冻存，待以后再测定。冻存样品需融解，并达到室温后再进行测定。

- 融解萤火虫萤光素酶检测试剂，并达到室温。
- 按仪器操作说明书开启化学发光仪或具有检测化学发光功能的多功能酶标仪，可以将测定间隔设为2秒，测定时间设为10秒，或者根据仪器设备的要求并根据实验需要设置适当的间隔时间和测定时间。
- 每个样品测定时，取样品20-100微升(如果样品量足够，请加入100微升；如果样品量不足可以适当减少用量，但同批样品的使用量宜保持一致)，取等体积的报告基因细胞裂解液作为空白对照。
- 各孔加入100微升萤火虫萤光素酶检测试剂，用枪打匀或用其它适当方式混匀后测定RLU (relative light unit)。本试剂盒的检测效果以及与同类竞争产品的检测效果比较可以参考图1。

## 常见问题：

### 1. Luminometer和荧光分光光度计有何不同？

荧光分光光度计检测的样品本身不能发光，样品需要由特定波长的激发光激发，然后才能产生荧光并被荧光分光光度计检测。Luminometer检测的样品本身可以发光，不需要激发光进行激发。也就是说luminometer是检测化学发光(萤光)的仪器。有些型号的荧光分光光度计也具有luminometer的功能，即也可以检测化学发光。您所使用的荧光分光光度计能否用于化学发光的测定请仔细阅读该仪器的说明书。

### 2. 可以进行ATP化学发光检测的仪器是否就可以用于本试剂盒的检测？

是。ATP化学发光的检测原理和本试剂盒的原理相同，可以用相同的仪器测定。

## 参考文献：

- J R de Wet, K V Wood, M DeLuca, D R Helinski, and S Subramani. Mol Cell Biol. 1987. 7:725-37.
- E Schenborn, D Groskreutz. Mol Biotechnol. 1999. 13:29-44.

## 相关产品：

产品编号	产品名称	包装
RG005/RG006	萤火虫萤光素酶报告基因检测试剂盒	100/1000次
RG007S/M	萤火虫萤光素酶报告基因检测试剂盒II	100/1000次
RG009S/M	萤火虫萤光素酶报告基因检测试剂盒(增强型)	100/1000次
RG010S/M	萤火虫萤光素酶报告基因检测试剂盒II(增强型)	100/1000次
RG016/RG017	海肾萤光素酶报告基因检测试剂盒	100/1000次
RG027/RG028	双萤光素酶报告基因检测试剂盒	100/1000次
RG029S/M	双萤光素酶报告基因检测试剂盒II	100/1000次
RG051S/M	Bright-Lumi™萤火虫萤光素酶报告基因检测试剂盒	100/1000次
RG052S/M	Bright-Lumi™ II萤火虫萤光素酶报告基因检测试剂盒	100/1000次
RG055S/M	One-Lumi™萤火虫萤光素酶报告基因检测试剂盒	100/1000次
RG056S/M	One-Lumi™ II萤火虫萤光素酶报告基因检测试剂盒	100/1000次
RG058S/M	Steady-Lumi™萤火虫萤光素酶报告基因检测试剂盒	100/1000次
RG059S/M	Steady-Lumi™ II萤火虫萤光素酶报告基因检测试剂盒	100/1000次
RG062S/M	Renilla-Lumi™海肾萤光素酶报告基因检测试剂盒	100/1000次
RG066S/M	Renilla-Lumi™ Plus海肾萤光素酶报告基因检测试剂盒	100/1000次
RG088S/M	Dual-Lumi™双萤光素酶报告基因检测试剂盒	100/1000次
RG089S/M	Dual-Lumi™ II双萤光素酶报告基因检测试剂盒	100/1000次
RG126S/M	萤火虫萤光素酶报告基因细胞裂解液	10/100ml
RG127S/M	萤火虫萤光素酶报告基因细胞裂解液(增强型)	10/100ml
RG129S/M	海肾萤光素酶报告基因细胞裂解液	10/100ml
RG132S/M	双萤光素酶报告基因细胞裂解液	10/100ml

## 使用本产品的文献：

- Zhou F, Zhang L, Gong K, Lu G, Sheng B, Wang A, Zhao N, Zhang X, Gong Y. LEF-1 activates the transcription of E2F1. BIOCHEM BIOPH RES CO. 2008 Jan 4;365(1):149-53.
- Chen H, Sun JG, Cao XW, Ma XG, Xu JP, Luo FK, Chen ZT. Preliminary validation of ERBB2 expression regulated by miR-548d-3p and miR-559. BIOCHEM BIOPH RES CO. 2009 Aug 7;385(4):596-600.
- Zhang J, Chen Y, Xin XL, Li QN, Li M, Lin LP, Geng MY, Ding J. Oligomannuric sulfate blocks tumor growth by inhibiting NF- $\kappa$ B activation. Acta Pharmacol Sin. 2010 Mar;31(3):375-81.
- Tian YP, Jiang W, Gao N, Zhang JL, Chen W, Fan DY, Zhou DS, An J. Inhibitory effects of glutathione on dengue virus production. Biochemical and Biophysical Research Communications. 2010 Jul 2;397(3):420-4.
- Zhang J, Xin X, Chen Q, Xie Z, Gui M, Chen Y, Lin L, Feng J, Li Q, Ding J, Geng M. Oligomannuric sulfate sensitizes cancer cells to doxorubicin by inhibiting atypical activation of NF- $\kappa$ B via targeting of

- Mre11. *Int J Cancer* . 2012 Jan 15;130(2):467-77.
6. Hou S, Shu Q, Jiang Z, Chen Y, Li F, Chen F, Kijlstra A, Yang P. Replication study confirms the association between UBAC2 and Behçet's disease in two independent Chinese sets of patients and controls. *Arthritis Res Ther* . 2012 Mar 29;14(2):R70.
  7. Zhang J, Chen J, Yang J, Xu CW, Pu P, Ding JW, Jiang H. Resveratrol attenuates oxidative stress induced by balloon injury in the rat carotid artery through actions on the ERK1/2 and NF-kappa B pathway. *CELL PHYSIOL BIOCHEM* . 2013;31(2-3):230-41.
  8. Liu D, Duan X, Dong D, Bai C, Li X, Sun G, Li B. Activation of the nrf2 pathway by inorganic arsenic in human hepatocytes and the role of transcriptional repressor Bach1. *Oxid Med Cell Longev* . 2013;2013:984546.
  9. Ding Q, Zhong H, Qi Y, Cheng Y, Li W, Yan S, Wang X. Anti-arthritis effects of crocin in interleukin-1 $\beta$ -treated articular chondrocytes and cartilage in a rabbit osteoarthritic model. *Inflamm Res* . 2013 Jan;62(1):17-25.
  10. Song S, Zhou F, Chen WR, Xing D. PDT-induced HSP70 externalization up-regulates NO production via TLR2 signal pathway in macrophages. *FEBS Lett* . 2013 Jan 16;587(2):128-35.
  11. Yang CG, Liu SS, Sun B, Wang XL, Wang N, Chen SL. Iron-metabolic function and potential antibacterial role of hepcidin and its correlated genes (Ferroportin 1 and Transferrin Receptor) in turbot (*Scophthalmus maximus*). *FISH SHELLFISH IMMUN* . 2013 Mar;34(3):744-55.
  12. Deng X, Rui W, Zhang F, Ding W. PM2.5 induces Nrf2-mediated defense mechanisms against oxidative stress by activating PI3K/AKT signaling pathway in human lung alveolar epithelial A549 cells. *Cell Biol Toxicol* . 2013 Jun;29(3):143-57.
  13. Li H, Liu F, Guo H, Zhu Z, Jiao Y. Role of interferon-inducible protein 202 (p202) in the regulation of adipogenesis in mouse adipose-derived stem cells. *Mol Cell Endocrinol* . 2014 Feb 15;382(2):814-24.
  14. Wu WY, Yan H, Wang XB, Gui YZ, Gao F, Tang XL, Qin YL, Su M, Chen T, Wang YP. Sodium tanshinone IIA silicate inhibits high glucose-induced vascular smooth muscle cell proliferation and migration through activation of AMP-activated protein kinase. *PLoS One* . 2014 Apr 16;9(4):e94957.
  15. Li K, Feng L, Shen J, Zhang Q, Liu Z, Lee ST, Liu J. Patterned substrates of nano-graphene oxide mediating highly localized and efficient gene delivery. *ACS APPL MATER INTER* . 2014 Apr 23;6(8):5900-7.
  16. Ruan GX, Chen YZ, Yao XL, Du A, Tang GP, Shen YQ, Tabata Y, Gao JQ. Macrophage mannose receptor-specific gene delivery vehicle for macrophage engineering. *Acta Biomater* . 2014 May;10(5):1847-55.
  17. Huang KF, Huang XP, Xiao GQ, Yang HY, Lin JS, Diao Y. Kallistatin, a novel anti-angiogenesis agent, inhibits angiogenesis via inhibition of the NF- $\kappa$ B signaling pathway. *Biomed Pharmacother* . 2014 May;68(4):455-61.
  18. Han L, Tang C, Yin C. Oral delivery of shRNA and siRNA via multifunctional polymeric nanoparticles for synergistic cancer therapy. *Biomaterials* . 2014 May;35(15):4589-600.
  19. Zeng W, Chang H, Ma M, Li Y. CCL20/CCR6 promotes the invasion and migration of thyroid cancer cells via NF-kappa B signaling-induced MMP-3 production. *Exp Mol Pathol* . 2014 Aug;97(1):184-90.
  20. Li C, Pan Z, Xu T, Zhang C, Wu Q, Niu Y. Puerarin induces the upregulation of glutathione levels and nuclear translocation of Nrf2 through PI3K/Akt/GSK-3 $\beta$  signaling events in PC12 cells exposed to lead. *Neurotoxicol Teratol* . 2014 Sep 4;46C:1-9.
  21. Qin W, Pan Y, Zheng X, Li D, Bu J, Xu C, Tang J, Cui R, Lin P, Yu X. MicroRNA-124 regulates TGF- $\alpha$ -induced epithelial-mesenchymal transition in human prostate cancer cells. *Int J Oncol* . 2014 Sep;45(3):1225-31.
  22. Gao X, He Y, Gao LM, Feng J, Xie Y, Liu X, Liu L. Ser9-phosphorylated GSK3 $\beta$  induced by 14-3-3 $\zeta$  actively antagonizes cell apoptosis in a NF- $\kappa$ B dependent manner. *Biochem Cell Biol* . 2014 Oct;92(5):349-56.
  23. Ruan GX, Zhang TY, Li LM, Zhang XG, Shen YQ, Tabata Y, Gao JQ. Hepatic-targeted gene delivery using cationic mannan vehicle. *MOL PHARMACOL* . 2014 Oct 6;11(10):3322-9.
  24. Gao F, Wang W. MicroRNA-96 promotes the proliferation of colorectal cancer cells and targets tumor protein p53 inducible nuclear protein 1, forkhead box protein O1 (FOXO1) and FOXO3a. *Mol Med Rep* . 2015 Feb;11(2):1200-6.
  25. Cao G, Gong S, Zhang F, Fu W. Xiao Yao San against Corticosterone-Induced Stress Injury via Upregulating Glucocorticoid Receptor Reaction Element Transcriptional Activity. *EVID-BASED COMPL ALT* . 2016;2016:5850739.
  26. Chen Z, Yang L, Cui Y, Zhou Y, Yin X, Guo J, Zhang G, Wang T, He QY. Cytoskeleton-centric protein transportation by exosomes transforms tumor-favorable macrophages. *ONCOTARGET* . 2016 Oct 11;7(41):67387-67402.
  27. Ding L, Yang M, Zhao T, Lv G. Roles of p300 and cyclic adenosine monophosphate response element binding protein in high glucose-induced hypoxia-inducible factor 1 $\alpha$  inactivation under hypoxic conditions. *J DIABETES INVEST* . 2016 Nov 3. doi: 10.1111/jdi.12592. [Epub ahead of print] .
  28. Liu J, Li Y, Luo M, Yuan Z, Liu J. MicroRNA-214 inhibits the osteogenic differentiation of human osteoblasts through the direct regulation of baculoviral IAP repeat-containing 7. *Exp Cell Res* . 2017 Jan 18. pii: S0014-4827(17)30016-2.
  29. Liu J, Li Y, Luo M, Yuan Z, Liu J. MicroRNA-214 inhibits the osteogenic differentiation of human osteoblasts through the direct regulation of baculoviral IAP repeat-containing 7. *Exp Cell Res* . 2017 Feb 15;351(2):157-162.
  30. Ding L, Yang M, Zhao T, Lv G. Roles of p300 and cyclic adenosine monophosphate response element binding protein in high glucose-induced hypoxia-inducible factor 1 $\alpha$  inactivation under hypoxic conditions. *J DIABETES INVEST* . 2017 May;8(3):277-285.
  31. Xu W, Wu B, Fu L, Chen J, Wang Z, Huang F, Chen J, Zhang M, Zhang Z, Lin J, Lan R, Chen R, Chen W, Chen L, Hong J, Zhang W, Ding Y, Okunieff P, Lin J, Zhang L. Comparison of three different methods for the detection of circulating tumor cells in mice with lung metastasis. *Oncol Rep* . 2017 Jun;37(6):3219-3226.
  32. Zhao H, Jiang J, Li K, Liu G. *Populus simonii*  $\times$  *Populus nigra* WRKY70 is involved in salt stress and leaf blight disease responses. *Tree Physiol* . 2017 Jun 1;37(6):827-844.
  33. Ding Y, Fan J, Deng L, Peng Y, Zhang J, Huang B. Bioluminescence imaging of a tumor-selective, thymidine kinase-defective vaccinia virus Guang9 strain after intratumoral or intraperitoneal administration in mice. *ONCOTARGET* . 2017 Sep 8;8(51):88708-88718.
  34. Hou Q, Huang Y, Luo Y, Wang B, Liu Y, Deng R, Zhang S, Liu F, Chen D. MiR-351 negatively regulates osteoblast differentiation of MSCs induced by (+)-cholesten-3-one through targeting VDR. *Am J Transl Res* . 2017 Nov 15;9(11):4963-4973.
  35. Wang D1,2,3, Liu C1,2,3, Wang Y1,2,3, Wang W1,2,3, Wang K1,2,3, Wu X1,2,3, Li Z1,2,3, Zhao C1,2,3, Li L1,2,3, Peng L1,2,3. Impact of miR-26b on cardiomyocyte differentiation in P19 cells through regulating canonical/non-canonical Wnt signalling. *CELL PROLIFERAT* . 2017 Dec;50(6). doi: 10.1111/cpr.12371.
  36. Zhou L, Yang L, Li YJ, Mei R, Yu HL, Gong Y, Du MY, Wang F. MicroRNA-128 Protects Dopamine Neurons from Apoptosis and Upregulates the Expression of Excitatory Amino Acid Transporter 4 in Parkinson's Disease by Binding to AXIN1. *CELL PHYSIOL BIOCHEM* . 2018;51(5):2275-2289.
  37. Wu KH, Xiao QR, Yang Y, Xu JL, Zhang F, Liu CM, Zhang ZM, Lu YQ, Huang NP. MicroRNA-34a modulates the Notch signaling pathway in mice with congenital heart disease and its role in heart development. *J Mol Cell Cardiol* . 2018 Jan;114:300-308.
  38. Chu XQ, Wang J, Chen GX, Zhang GQ, Zhang DY, Cai YY. Overexpression of microRNA-495 improves the intestinal mucosal barrier function by targeting STAT3 via inhibition of the JAK/STAT3 signaling pathway in a mouse model of ulcerative colitis. *Pathol Res Pract* . 2018 Jan;214(1):151-162.
  39. Hou R, Han Y, Fei Q, Gao Y, Qi R, Cai R, Qi Y. Dietary Flavone Tectochrysin Exerts Anti-Inflammatory Action by Directly Inhibiting MEK1/2 in LPS-Primed Macrophages. *Mol Nutr Food Res* . 2018 Jan;62(2).
  40. Guo Y, Tao M, Jiang M. MicroRNA-454-3p inhibits cervical cancer cell invasion and migration by targeting c-Met. *Exp Ther Med* . 2018 Mar;15(3):2301-2306.
  41. Lu HJ, Jin PY, Tang Y, Fan SH, Zhang ZF, Wang F, Wu DM, Lu J, Zheng YL. MicroRNA-136 inhibits proliferation and promotes apoptosis and radiosensitivity of cervical carcinoma through the NF- $\kappa$ B pathway by targeting E2F1. *Life Sci* . 2018 Apr 15;199:167-178.
  42. Liu XL, Wang G, Song W, Yang WX, Hua J, Lyu L. MicroRNA-137 promotes endothelial progenitor cell proliferation and angiogenesis in cerebral ischemic stroke mice by targeting NR4A2 through the Notch pathway. *J Cell Physiol* . 2018 Jul;233(7):5255-5266.

43. Zhu Z, Xu L, Cai T, Yuan G, Sun N, Lu C, Qian R. Clock represses preadipocytes adipogenesis via GILZ. *J Cell Physiol.* 2018 Aug;233(8):6028-6040.
44. Guo J, Jin D, Wu Y, Yang L, Du J, Gong K, Chen W, Dai J, Miao S, Xi S. The miR-495-UBE2C-ABCG2/ERCC1 axis reverses cisplatin resistance by downregulating drug resistance genes in cisplatin-resistant non-small cell lung cancer cells. *EBioMedicine.* 2018 Sep;35:204-221.
45. Ren N, Wang M. microRNA-212-induced protection of the heart against myocardial infarction occurs via the interplay between AQP9 and PI3K/Akt signaling pathway. *Exp Cell Res.* 2018 Sep 15;370(2):531-541.
46. Hui X, Zhang S, Wang Y. miR-454-3p suppresses cell migration and invasion by targeting CPEB1 in human glioblastoma. *Mol Med Rep.* 2018 Oct;18(4):3965-3972.
47. Du X, Liu D, Huang J, Zhang C, Proksch P, Lin W. Polyketide derivatives from the sponge associated fungus *Aspergillus europaeus* with antioxidant and NO inhibitory activities. *Fitoterapia.* 2018 Oct;130:190-197.
48. Zhu XB, Lin WJ, Lv C, Wang L, Huang ZX, Yang SW, Chen X. MicroRNA-539 promotes osteoblast proliferation and differentiation and osteoclast apoptosis through the AXNA-dependent Wnt signaling pathway in osteoporotic rats. *J Cell Biochem.* 2018 Nov;119(10):8346-8358.
49. Jin D, Guo J, Wang D, Wu Y, Wang X, Gao Y, Shao C, Xu X, Tan S. The antineoplastic drug metformin downregulates YAP by interfering with IRF-1 binding to the YAP promoter in NSCLC. *EBioMedicine.* 2018 Nov;37:188-204.
50. Wu P, Luo X, Wu H, Yu F, Wang K, Sun M, Oupicky D. Cholesterol Modification Enhances Antimetastatic Activity and siRNA Delivery Efficacy of Poly(ethylenimine)-Based CXCR4 Antagonists. *Macromol Biosci.* 2018 Nov;18(11):e1800234.
51. Li Y, Huang D, Zheng L, Cao H, Fan Z. Effect of microRNA-141 on the development of diabetic nephropathy through regulating AKT/AMPK signaling pathway by targeting insulin receptor substrate 2. *J Cell Biochem.* 2018 Nov 14.
52. Lin JC, Liu ZG, Yu B, Zhang XR. MicroRNA-874 targeting SUFU involves in osteoblast proliferation and differentiation in osteoporosis rats through the Hedgehog signaling pathway. *BIOCHEM BIOPH RES CO.* 2018 Nov 17;506(1):194-203.
53. Li Q, Yin W, Li W, Zhang Z, Zhang X, Zhang XE, Cui Z. Encapsulating Quantum Dots within HIV-1 Virions through Site-Specific Decoration of the Matrix Protein Enables Single Virus Tracking in Live Primary Macrophages. *Nano Lett.* 2018 Nov 8.
54. Li SY, Wang H, Mai HF, Li GF, Chen SJ, Li GS, Liang BC. Down-regulated long non-coding RNA RNAZFHX4-AS1 suppresses invasion and migration of breast cancer cells via FAT4-dependent Hippo signaling pathway. *Cancer Gene Ther.* 2018 Dec 14.
55. Tang CZ, Yang JT, Liu QH, Wang YR, Wang WS. Up-regulated miR-192-5p expression rescues cognitive impairment and restores neural function in mice with depression via the Fln2-mediated TGF- $\beta$ 1 signaling pathway. *FASEB J.* 2019 Jan;33(1):606-618.
56. Chao Yang, Zeqiang Yan, Fen Hu, Wei Wei, Zhihua Sun, Wei Xu. Silencing of microRNA-517a induces oxidative stress injury in melanoma cells via inactivation of the JNK signaling pathway by upregulating CDKN1C. *Cancer Cell Int.* 2020 Jan 29;20:32.;doi: 10.1186/s12935-019-1064-y.
57. Li Jiang, Yanguo Qiao, Zhenghui Wang, Xiuzhu Ma, Haichao Wang, Jian Li. Inhibition of microRNA-103 attenuates inflammation and endoplasmic reticulum stress in atherosclerosis through disrupting the PTEN-mediated MAPK signaling. *J Cell Physiol.* 2020 Jan;235(1):380-393.;doi: 10.1002/jcp.28979.
58. Xiao-Lu Guan, Bao-Cun Zhang, Li Sun. Japanese flounder pol-miR-3p-2 suppresses *Edwardsiella tarda* infection by regulation of autophagy via p53. *Dev Comp Immunol.* 2020 Feb;103:103531.;doi: 10.1016/j.dci.2019.103531.
59. Jiwei Li, Li Wei, Zhijun Han, Zhong Chen, Quan Zhang. Long non-coding RNA X-inactive specific transcript silencing ameliorates primary graft dysfunction following lung transplantation through microRNA-21-dependent mechanism. *EBioMedicine.* 2020 Feb;52:102600.;doi: 10.1016/j.ebiom.2019.102600.
60. Li Chen, De-Zhong Sun, Yu-Gui Fu, Pei-Zhen Yang, Huai-Qing Lv, Yongli Gao, Xiao-Yan Zhang. Upregulation of microRNA-141 suppresses epithelial-mesenchymal transition and lymph node metastasis in laryngeal cancer through HOXC6-dependent TGF- $\beta$  signaling pathway. *Cell Signal.* 2020 Feb;66:109444.;doi: 10.1016/j.cellsig.2019.109444.
61. Wenfeng Xie, Lei Chen, Li Chen, Qiuye Kou. Silencing of long non-coding RNA MALAT1 suppresses inflammation in septic mice: role of microRNA-23a in the down-regulation of MCEMP1 expression. *Inflamm Res.* 2020 Feb;69(2):179-190.;doi: 10.1007/s00011-019-01306-z.
62. Ruijuan Qi, Ximeng Li, Xiaoyu Zhang, Yunfeng Huang, Qiaoling Fei, Yixin Han, Runlan Cai, Yuan Gao, Yun Qi. Ethanol extract of *Elephantopus scaber* Linn. Attenuates inflammatory response via the inhibition of NF- $\kappa$ B signaling by dampening p65-DNA binding activity in lipopolysaccharide-activated macrophages. *J Ethnopharmacol.* 2020 Mar 25;250:112499.;doi: 10.1016/j.jep.2019.112499.
63. Peng Xia, Rui Gu, Wei Zhang, Yi-Fu Sun. lncRNA CEBPA-AS1 Overexpression Inhibits Proliferation and Migration and Stimulates Apoptosis of OS Cells via Notch Signaling. *MOL THER-NUCL ACIDS.* 2020 Mar 6;19:1470-1481.;doi: 10.1016/j.omtn.2019.10.017.
64. Duo-Ping Wang, Xiao-Zhun Tang, Quan-Kun Liang, Xian-Jie Zeng, Jian-Bo Yang, Jian Xu. microRNA-599 promotes apoptosis and represses proliferation and epithelial-mesenchymal transition of papillary thyroid carcinoma cells via downregulation of Hey2-dependent Notch signaling pathway. *J Cell Physiol.* 2020 Mar;235(3):2492-2505.;doi: 10.1002/jcp.29154.
65. Jing Ma, Zhijian Zhou. Downregulation of miR-302b is associated with poor prognosis and tumor progression of breast cancer. *Breast Cancer.* 2020 Mar;27(2):291-298.;doi: 10.1007/s12282-019-01022-w.
66. Shuang Liu, Xian-Hui Ning, Xiao-Lu Guan, Xue-Peng Li, Li Sun. Characterization of *Streptococcus iniae*-induced microRNA profiles in *Paralichthys olivaceus* and identification of pol-3p-10740\_175 as a regulator of antibacterial immune response. *FISH SHELLFISH IMMUN.* 2020 Mar;98:860-867.;doi: 10.1016/j.fsi.2019.11.045.
67. Jinzhang Cheng, Junjun Chen, Yin Zhao, Jingpu Yang, Kai Xue, Zonggui Wang. MicroRNA-761 suppresses remodeling of nasal mucosa and epithelial-mesenchymal transition in mice with chronic rhinosinusitis through LCN2. *Stem Cell Res Ther.* 2020 Apr 9;11(1):151.;doi: 10.1186/s13287-020-01598-7.
68. Lei Jia, Yuwen Song, Luyan Mu, Qingla Li, Jiabin Tang, Zhao Yang, Wenjuan Meng. Long noncoding RNA TPT1-AS1 downregulates the microRNA-770-5p expression to inhibit glioma cell autophagy and promote proliferation through STMN1 upregulation. *J Cell Physiol.* 2020 Apr;235(4):3679-3689.;doi: 10.1002/jcp.29262.
69. Lilei Peng, Yang Ming, Ling Zhang, Jie Zhou, Wei Xiang, Shan Zeng, Haiping He, Ligang Chen. MicroRNA-30a suppresses self-renewal and tumorigenicity of glioma stem cells by blocking the NTSE-dependent Akt signaling pathway. *FASEB J.* 2020 Apr;34(4):5128-5143.;doi: 10.1096/fj.201802629RR.
70. Jinqiu Li, Xueshibojie Liu, Shanji Nan, Chengbi Xu. Silencing of long non-coding RNA LINC00520 promotes radiosensitivity of head and neck squamous cell carcinoma cells. *FREE RADICAL RES.* 2020 Apr;54(4):254-270.;doi: 10.1080/10715762.2020.1752373.
71. Wei Qian, Fengbo Jin, Yiming Zhao, Yingying Chen, Ling Ge, Lixia Liu, Mingzhen Yang. Downregulation of microRNA-144 inhibits proliferation and promotes the apoptosis of myelodysplastic syndrome cells through the activation of the AKAP12-dependent ERK1/2 signaling pathway. *Cell Signal.* 2020 Apr;68:109493.;doi: 10.1016/j.cellsig.2019.109493.
72. Na Han, Hai-Yan Fang, Jie-Xuan Jiang, Qian Xu. Downregulation of microRNA-873 attenuates insulin resistance and myocardial injury in rats with gestational diabetes mellitus by upregulating IGFBP2. *AM J PHYSIOL-ENDOC M.* 2020 May 1;318(5):E723-E735.;doi: 10.1152/ajpendo.00555.2018.
73. Qing Meng, Bing Qiu. Exosomal MicroRNA-320a Derived From Mesenchymal Stem Cells Regulates Rheumatoid Arthritis Fibroblast-Like Synoviocyte Activation by Suppressing CXCL9 Expression. *Front Physiol.* 2020 May 26;11:441.;doi: 10.3389/fphys.2020.00441.
74. Wen-Rui Li, Xiao-Lu Guan, Shuai Jiang, Li Sun. The novel fish miRNA pol-miR-novel\_171 and its target gene FAM49B play a critical role in apoptosis and bacterial infection. *Dev Comp Immunol.* 2020 May;106:103616.;doi: 10.1016/j.dci.2020.103616.
75. Jie Chen, Mao Liu, Xiao Luo, Lihui Peng, Zixia Zhao, Chengsong He, Yue He. Exosomal miRNA-486-5p derived from rheumatoid arthritis fibroblast-like synoviocytes induces osteoblast differentiation through the Tbl1/BMP/Smad pathway. *BIOMATER SCI-UK.* 2020 Jun 21;8(12):3430-3442.;doi: 10.1039/c9bm01761e.
76. Chunyan Li, Tingfeng Han, Run Li, Liming Fu, Lei Yue. miR-26a-5p mediates TLR signaling pathway by targeting CTGF in LPS-induced alveolar macrophage. *BIOSCIENCE REP.* 2020 Jun 26;40(6):BSR20192598.;doi: 10.1042/BSR20192598.

77. Junling Gong,Haiying Fan,Jing Deng,Qiumei Zhang.LncRNA HAND2-AS1 represses cervical cancer progression by interaction with transcription factor E2F4 at the promoter of C16orf74.J Cell Mol Med. 2020 Jun;24(11):6015-6027.;doi: 10.1111/jcmm.15117.
78. Xiao Gu,Xiaocui Yao,Dengtao Liu.Up-regulation of microRNA-335-5p reduces inflammation via negative regulation of the TPX2-mediated AKT/GSK3 $\beta$  signaling pathway in a chronic rhinosinusitis mouse model.Cell Signal. 2020 Jun;70:109596.;doi: 10.1016/j.cellsig.2020.109596.
79. Wenchao Zhong,Xingyang Li,Janak L Pathak,Liangjiao Chen,Wei Cao,Mingjing Zhu,Qianting Luo,Antong Wu,Yunxin Chen,Lingbo Yi,Manyuan Ma,Qingbin Zhang.Dicalcium silicate microparticles modulate the differential expression of circRNAs and mRNAs in BMSCs and promote osteogenesis via circ\_1983-miR-6931-Gas7 interaction.BIOMATER SCI-UK. 2020 Jul 7;8(13):3664-3677.;doi: 10.1039/d0bm00459f.
80. Xiaohu Fang,Yong Dong,Ruilin Yang,Lunshou Wei.LINC00619 restricts gastric cancer progression by preventing microRNA-224-5p-mediated inhibition of OPCML.Arch Biochem Biophys. 2020 Aug 15;689:108390.;doi: 10.1016/j.abb.2020.108390.
81. Wenbiao Liao,Yi Zhang.MicroRNA-381 facilitates autophagy and apoptosis in prostate cancer cells via inhibiting the RELN-mediated PI3K/AKT/mTOR signaling pathway.Life Sci. 2020 Aug 1;254:117672.;doi: 10.1016/j.lfs.2020.117672.
82. Yuedi Ding,Jun Fan,Lili Deng,Ying Peng,Bin Zhou,Biao Huang.Evaluation of Tumor Specificity and Immunity of Thymidine Kinase-Deleted Vaccinia Virus Guang9 Strain.ONCOTARGETS THER. 2020 Aug 5;13:7683-7697.;doi: 10.2147/OTT.S260288.
83. Zhuo Liang,Yue Luo,Yonggang Lv.Mesenchymal stem cell-derived microvesicles mediate BMP2 gene delivery and enhance bone regeneration.J Mater Chem B. 2020 Aug 5;8(30):6378-6389.;doi: 10.1039/d0tb00422g.
84. Guo-Feng Zhang,Jia-Cheng Wu,Hong-Yong Wang,Wei-Dong Jiang,Ling Qiu.Overexpression of microRNA-205-5p exerts suppressive effects on stem cell drug resistance in gallbladder cancer by down-regulating PRKCE.BIOSCIENCE REP. 2020 Sep 30;40(9):BSR20194509.;doi: 10.1042/BSR20194509.
85. Hui Zhao,Feng Ding,Guanghong Zheng.LncRNA TMPO-AS1 promotes LCN2 transcriptional activity and exerts oncogenic functions in ovarian cancer.FASEB J. 2020 Sep;34(9):11382-11394.;doi: 10.1096/fj.201902683R.
86. Zhiyan Ruan,Hongling Deng,Minhua Liang,Zhe Xu,Manxiang Lai,Hong Ren,Xiangliang Deng,Xinguo Su.Downregulation of long non-coding RNA MAFG-AS1 represses tumorigenesis of colorectal cancer cells through the microRNA-149-3p-dependent inhibition of HOXB8.Cancer Cell Int. 2020 Oct 19;20:511.;doi: 10.1186/s12935-020-01485-4.
87. Qihan Song,Fengli Zhao,Jingfan Yao,Hailin Dai,Lei Hu,Shun Yu.Protective effect of microRNA-134-3p on multiple sclerosis through inhibiting PRSS57 and promotion of CD34 + cell proliferation in rats.J Cell Biochem. 2020 Nov;121(11):4347-4363.;doi: 10.1002/jcb.29643.
88. Linbao Wen,Jingwei Sun,Xionggao Chen,Ruili Du.miR-135b-dependent downregulation of S100B promotes neural stem cell differentiation in a hypoxia/ischemia-induced cerebral palsy rat model.AM J PHYSIOL-CELL PH. 2020 Dec 1;319(6):C955-C966.;doi: 10.1152/ajpcell.00481.2019.
89. Murong Bao,Gaoxia Liu,Jia Song,Yidan Gao.Long non-coding RNA MALAT1 promotes odontogenic differentiation of human dental pulp stem cells by impairing microRNA-140-5p-dependent downregulation of GIT2.Cell Tissue Res. 2020 Dec;382(3):487-498.;doi: 10.1007/s00441-020-03246-1.
90. Xiong Guo,Ling Liu,Qi Zhang,Weiming Yang,Yang Zhang.E2F7 Transcriptionally Inhibits MicroRNA-199b Expression to Promote USP47, Thereby Enhancing Colon Cancer Tumor Stem Cell Activity and Promoting the Occurrence of Colon Cancer.Front Oncol. 2021 Jan 7;10:565449.;doi: 10.3389/fonc.2020.565449.
91. Yi Hou,Hai Li,Wei Huo.MicroRNA-495 alleviates ulcerative interstitial cystitis via inactivating the JAK-STAT signaling pathway by inhibiting JAK3.Int Urogynecol J. 2021 Jan 8.;doi: 10.1007/s00192-020-04593-x.
92. Xinyu Zeng,Huiqun Liao,Fusen Wang.MicroRNA-384 inhibits nasopharyngeal carcinoma growth and metastasis via binding to Smad5 and suppressing the Wnt/ $\beta$ -catenin axis.Cytotechnology. 2021 Apr;73(2):203-215.;doi: 10.1007/s10616-021-00458-3.
93. Meng-Xia Zhu,Lin-Hui Huang,Yi-Ke Zhu,Xing-Jun Cai.LncRNA NEAT1 promotes airway smooth muscle cell inflammation by activating the JAK3/STAT5 pathway through targeting of miR-139.Exp Lung Res. Apr-May 2021;47(4):161-172.;doi: 10.1080/01902148.2021.1876792.
94. Zhihua Guo,Huangyang Ye,Xiaobin Zheng,Weiqliang Yin,Jianxing He.Extracellular vesicle-encapsulated microRNA-425-derived from drug-resistant cells promotes non-small-cell lung cancer progression through DAPK1-mediated PI3K/AKT pathway.J Cell Physiol. 2021 May;236(5):3808-3820.;doi: 10.1002/jcp.30126.

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