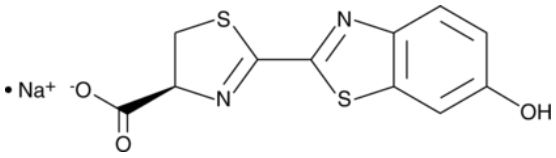
Product Data Sheet

Product Name: D-Luciferin (sodium salt)

Cat. No.: GC43497

Chemical Properties

Cas No.	103404-75-7		
Canonical SMILES	O=C([O-])[C@H]1CSC(C(S2)=NC3=C2C=C(O)C=C3)=N1.[Na+]		
分子式	$C_{11}H_7N_2O_3S_2$•Na	分子量	302.3
溶解度	DMSO : 100 mg/mL (330.80 mM) Water : 33.33 mg/mL (110.25 mM)	储存条件	Store at -20°C, protect from light
General tips	For obtaining a higher solubility , please warm the tube at 37 ℃ and shake it in the ultrasonic bath for a while.Stock solution can be stored below -20℃ for several months.		
Shipping Condition	Evaluation sample solution : ship with blue ice All other available size: ship with RT , or blue ice upon request.		
Structure			

Protocol

Cell experiment [1]:

Cell lines	B16-F10 and MCF-7 clonal cells
Preparation Method	Cells that stably express luciferase were seeded in 12-well plates (2 × 10^3/well). Cells were treated with D-luciferin substrate diluted in media or media alone.
Reaction Conditions	30 min incubation at 37°C in the dark, washed with PBS once and replaced the normal growth medium.
Applications	D-luciferin could be used to investigate whether biophotonic activity or the luciferase gene itself have negative influence on cell growth in vitro. Luciferase bioluminescence was not sufficient to generate photodynamic toxicity in vitro. It has little difference of cell viability between clones expressing different levels of luciferase or between cells periodically treated with D-luciferin.

Animal experiment [2]:

Animal models	BALB/C nude (females), aged 6–8 weeks
Preparation Method	HEK 293T cells were prepared at a concentration of 2 × 10^6 cells/ml in PBS; Injecting 1 × 10^5 HEK 293T cells into both flanks of mice immediately, images were acquired after injection of D-luciferin.
Dosage form	150 mg/kg

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Applications	The BLI measurements were performed when the peak of emission occurred, after injection of the luciferins into animals. Luc2/ D-luciferin, CBG99/ D-luciferin, CBR2/ D-luciferin, and Akaluc/ D-luciferin produced peaks at 610 nm, 540 nm, 620 nm, and 640 nm, respectively. When CycLuc1 was used as a substrate, the emission peak of Luc2 and Akaluc were green shifted towards 600 nm. Analysed the total emission of each luciferase in vivo with D-Luciferin or the luciferin analogues, Luc2, CBG99, and CBR2 paired with D-luciferin produced the highest signals which were 20-fold higher than that of Akaluc/ D-luciferin (p value < 0.001).

References:
[1]. Tiffen JC,et al. Luciferase expression and bioluminescence does not affect tumor cell growth in vitro or in vivo. Mol Cancer. 2010 Nov 22;9:299. doi: 10.1186/1476-4598-9-299.
[2]. Zambito G. Evaluating Brightness and Spectral Properties of Click Beetle and Firefly Luciferases Using Luciferin Analogues: Identification of Preferred Pairings of Luciferase and Substrate for In Vivo Bioluminescence Imaging. Mol Imaging Biol. 2020 Dec;22(6):1523-1531. doi: 10.1007/s11307-020-01523-7.

Background

D-Luciferin sodium salt is the substrate of luciferases that catalyze the production of light in bioluminescent insects.

D-Luciferin is a common substrate for luciferase and is frequently used in the entire biotechnology field, especially in vivo imaging techniques. The mechanism of action of the imaging is that D-luciferin (substrate) is oxidized to emit light under the action of ATP and luciferase. When D-luciferin is in excess, the number of photons produced is positively correlated with the concentration of luciferase. After transfecting a plasmid carrying a luciferase-encoding gene (Luc) into cells, cells with Luc is engrafted into research animals, and then injected with D-luciferin to detect changes in light intensity through bioluminescence imaging (BLI). The effect of ATP on this reaction system can also be used to indicate energy or vital signs based on changes in bioluminescence intensity. [1][2]

D-luciferin reacts with luciferase, ATP and oxygen with light emission, and the light is detected by a sensitive photographic film.[3] All in vitro D-luciferin measurements were obtained after 1 min at 37 °C using a 30-s acquisition time using a series of filters ranging from 520 to 800 nm. In vitro analysis demonstrated that at a relatively low, but biologically relevant (in vivo) substrate concentration (0.1 mM), three of the four luciferases give maximum signal when combined with D-luciferin. [4]

In vivo analysis showed that the best substrate for Luc2, CBG99, and CBR2 in terms of signal strength was D-luciferin. CBR2 gave the brightest signal with the near-infrared substrate, NH2-NpLH2. When paired with CycLuc1 or Akalumine-HCl, Akaluc was brighter. Besides, new combinations of luciferases with distinct colors having potential for multiplexing with a single substrate in superficial tissue were recommended, such as CBG99/ D-luciferin (540 nm) and CBR2/ D-luciferin (620 nm); CBG99/ D-luciferin (540 nm) and Luc2/ D-luciferin (610 nm).[4]

D-Luciferin (sodium salt)，D-荧光素钠盐是荧光素酶的底物，可催化生物发光昆虫产生光。

D-Luciferin 是荧光素酶的常见底物，经常用于整个生物技术领域，尤其是体内成像技术。成像的作用机制是D-荧光素（底物）在ATP和荧光素酶的作用下被氧化发光。当D-荧光素过量时，产生的光子数与荧光素酶的浓度呈正相关。将携带荧光素酶编码基因 (Luc) 的质粒转染到细胞中后，将带有 Luc 的细胞植入研究动物体内，然后注射 D-荧光素，通过生物发光成像 (BLI) 检测光强变化。ATP 对该反应系统的影响也可用于根据生物发光强度的变化来指示能量或生命体征[1][2]。

D-萤光素与萤光素酶、ATP和氧发生反应并发光，光被感光胶片检测到[3]。所有体外 D-荧光素测量均在 37°C 下 1 分钟后使用 30 秒的采集时间使用一系列 520 至 800 nm 的滤光片获得。体外分析表明，在相对较低但具有生物学相关性（体内）的底物浓度 (0.1 mM) 下，四种荧光素酶中的三种在与 D-荧光素结合时会产生最大信号[4]。

体内分析表明，就信号强度而言，Luc2、CBG99 和 CBR2 的最佳底物是 D-荧光素。CBR2 使用近红外底物 NH2-NpLH2

给出最亮的信号。当与 CycLuc1 或 Akalumine-HCl 配对时，Akaluc 更亮。此外，还推荐了具有不同颜色的荧光素酶的新组合，这些荧光素酶具有在浅表组织中与单一底物进行复用的潜力，例如 CBG99/ D-荧光素 (540 nm) 和 CBR2/ D-荧光素 (620 nm)；CBG99/ D-荧光素 (540 nm) 和 Luc2/ D-荧光素 (610 nm) [4]。

References:

[1] McElroy WD. The Energy Source for Bioluminescence in an Isolated System. Proc Natl Acad Sci U S A. 1947 Nov;33(11):342-5. doi: 10.1073/pnas.33.11.342.
[2] GREEN A, MCELROY WD. Function of adenosine triphosphate in the activation of luciferin. Arch Biochem Biophys. 1956 Oct;64(2):257-71. doi: 10.1016/0003-9861(56)90268-5.
[3] Hauber R. A New, Very Sensitive, Bioluminescence-Enhänced Detection System for Protein Blotting. J. Clin. Chem. Clin. Biochem. 1987,25, pp. 511-514. doi:10.1515/cclm.1987.25.8.511.
[4] Zambito G. Evaluating Brightness and Spectral Properties of Click Beetle and Firefly Luciferases Using Luciferin Analogues: Identification of Preferred Pairings of Luciferase and Substrate for In Vivo Bioluminescence Imaging. Mol Imaging Biol. 2020 Dec;22(6):1523-1531. doi: 10.1007/s11307-020-01523-7.

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