

# White Paper

Applications of JCRB Stable Luciferase Expressing Cell Lines for  
Bio-imaging and Drug Discovery Using FUJIFILM Wako's  
Luminescent Probes



# Overview

A luminescent probe is a substance that emits light in a chemical reaction due to change in the energy state of substrate from excited to ground state. This process is triggered by specific chemical reactions, making luminescent probes highly selective with low background noise, thereby enhancing signal detection. Since a luminescent probe covers a wide dynamic range, it is often used to investigate the dynamics of ATP and calcium ions. It is also used as a reporter gene to visualize specific cells or investigate gene expression. FUJIFILM Wako provides various kinds of stable luciferase expressing JCRB cell lines.

## JCRB Cell Lines

JCRB (Japanese Collection of Research Bioresources) is one of the most comprehensive cell banks in the world for pure and applied science, spanning many fields of research across the globe.

We have teamed up with the National Institute of Biomedical Innovation to bring you access to over 1,600 cell lines, including lung and glioma cell lines. In Europe, we are the exclusive distributor of JCRB's comprehensive catalog of cell lines.



## Luciferase Stably Expressing Cell Lines

JCRB No.	Cell-line name	Profile
JCRB1379	MKN45-Luc	MKN45; Human Gastric Cancer
JCRB1383	HT-29-Luc	HT-29; Human Colon Cancer
JCRB1387	DU-145-Luc	DU-145; Human Prostate Cancer
JCRB1407	NCI-H460-Luc	NCI-H460; Human Non-small cell lung cancer
JCRB1448	BxPC-3-Luc#2	BxPC-3; Human pancreatic adenocarcinoma cell line
JCRB1559	MDA-MB-231-Luc	MDA-MB-231; Human Breast Cancer

# Applications of JCRB cell lines

## 1. Toxicology and Drug Screening

JCRB0134 (MCF-7) cell lines are used as valuable models for toxicology and drug discovery. They retain their genome over time and can be used to perform drug screening and facilitate patient specific drug development.

## 2. Benefit of Variety of Ethnic Background in Patient Targeted Cancer Therapies

JCRB offers a highly representative panel of cell lines in terms of ethnic and gender diversity, which could improve the success rate in identifying effective cancer therapeutics in cell culture models and thereby reduce drug failures in diverse human populations.

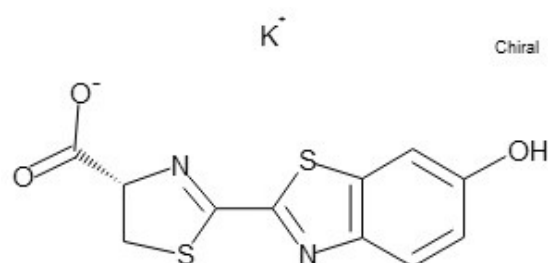
JCRB provides a wide variety of cell line products. To see more information or full lineup of cell line products: [https://labchem-wako.fujifilm.com/europe/cell\\_bank/index.html](https://labchem-wako.fujifilm.com/europe/cell_bank/index.html)

## JCRB Cell Lines Related Luminescent Probes

FUJIFILM Wako provides AkaLumine-HCl and Coelenterazine that perform better than the substrates used in conventional luminescent probes in addition to D-Luciferin.

### 1. D-Luciferin (Potassium salt)

D-luciferin is a luminescent substrate derived from fireflies. Luciferin is converted to the luciferin-AMP intermediate by luciferase in the presence of ATP and magnesium, which is further oxidated to the excited state oxyluciferin. When oxyluciferin changes from the excited state to the stable situation, it releases energy as green-yellow luminescence ( $\lambda_{\max}=565\text{nm}$ ), producing  $\text{CO}_2$  and AMP.<sup>1</sup> This product is potassium salt and is freely soluble.



Structure of D-Luciferin (Potassium salt)

## 2. AkaLumine-HCl (TokeOni)

AkaLumine-HCl is a luminescent substrate of luciferase used for *in vivo* bioluminescence imaging. This substrate emits light in the near-infrared spectrum, specifically within the range of 670-680 nm. This wavelength is notably advantageous because it is less absorbed by water and hemoglobin, compared to traditional luciferin. Consequently, this characteristic of AkaLumine-HCl allows for more effective penetration and visualization of deeper biological structures within the body, enhancing the utility of bioluminescence imaging in medical research and diagnostics.

Mice with LLC/Firefly luciferase (*luc*) subcutaneous tumor were administered intraperitoneally D-luciferin and AkaLumine-HCl at two substrate concentrations. After 15 minutes, the luminescent images obtained were analyzed quantitatively. As a result, it is found that when AkaLumine-HCl is used as a substrate, the substrate concentration does not easily affect the emission intensity.

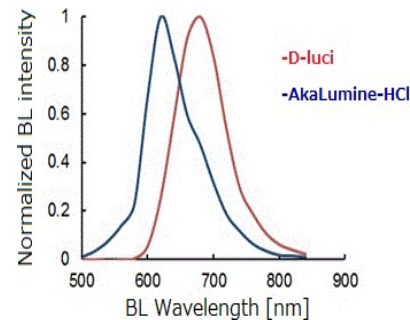


Figure 1 represents luminescence spectra of D-Luciferin and AkaLumine-HCl.

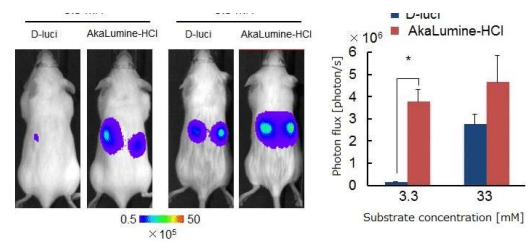


Figure 2 represents *in vivo* imaging data using mouse.

## 3. Coelenterazine h

Coelenterazine is a luminescent substrate for apoaequorin and Renilla luciferase, and coelenterazine h is a synthetic derivative of coelenterazine. The luminous intensity of the complex with aequorin is reported to be about 10 times stronger compared to coelenterazine native.

This product is a luminescent substrate for luciferases and aequorins derived from sea pansy and copepoda, and has also low toxicity and cell membrane permeability.

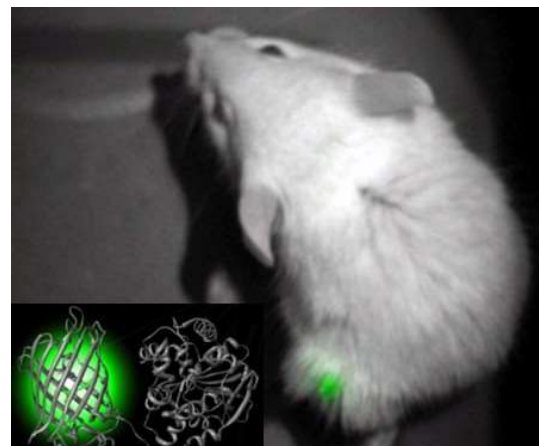


Figure 3 represents the visualization of chemiluminescence imaging of a mouse with Nano-lantern-expressing tumors. This allows real-time imaging of intracellular structures in living cells.

## 2. Product Line up of Luminescent Probes

Product Code	Product Name	Size
126-05111	D-Luciferin (Potassium salt)	10 mg
120-05114		100 mg
126-05116		1 g
012-26701	Aka Lumine n-Hydrochloride	1 mg
018-26703		10 mg
016-26704		50 mg
012-26706		1 g
035-22991	Coelenterazine h	1 mg
031-22993		10 mg
035-22996		100 mg

### Citations

- 1) Griffiths, MW. : *J. Dairy Sci.*, 76(10), 3118–3125(1993).
- 2) Iwano. S, et al.: *Tetrahedron*, 69(19), 3847-3856(2013).
- 3) Kuchimaru. T, et al.: *Nat. Commun.*, 7, 11856(2016).
- 4) Saito. K, et al.: *Nat. Commun.*, 3, 1262(2012).

### Distribution & Enquiries

Listed products are intended for laboratory research use only, and not to be used for drug, food or human use. JCRB Cell Bank is testing the cell lines for viruses pathogenic to humans as extensive as possible. However, there is the problem of detection limit and it is practically impossible to examine "all pathogens" as well as un- identified viruses. Therefore, the cell line should be handled as potentially biohazardous materials. Practically, the handling in accordance to biosafety level 2 is recommended. This does not mean that the cell line produces BSL-2 pathogens but is needed to avoid potential risk./ Please visit our online catalog to search for other products from FUJIFILM Wako; <https://labchem-wako.fujifilm.com> / This leaflet may contain products that can not be exported to your country due to regulations. / Bulk quote requests are welcome. Please contact us.

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