Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 5, May, 2022

BIOLUMINESCENT ORGANISMS

Uzokova Shakhzoda Sobir kizi
Karshi State University, Faculty of Chemistry and Biology
Bachelor Student

Abstract

According to some studies, bioluminescence systems are virtually unexplored. Of the at least forty different bioluminescence systems believed to exist in nature, only seven are known to have molecular components of the light-emitting reaction, and the complete biochemical pathway leading to light emission is understood for only two of them. Luciferases include a group of enzymes that emit light in the presence of oxygen and a substrate (luciferin). Such a luciferin-luciferase system is found in nature, for example, in bacteria (Vibrio harveyi), dinoflagellates (Gonycaulax), and bile ducts (Photinus pyralis).

Keywords: Bioluminescence, Luciferin, Luciferase, bacteria (Vibrio harveyi), dinoflagellates (Gonycaulax), and the firefly (Photinus pyralis).

Introduction

Bioluminescence imaging with luciferase-luciferin pairs is widely used in biomedical research. Several luciferases have been identified in nature, and many of them have been adapted to observe the cells of whole animals. Unfortunately, optimal luciferases for in vivo imaging use the same substrate and therefore cannot easily distinguish multiple cell types in a single subject. To develop a wider set of detachable probes, it has been developed special luciferins that can be selectively processed by luciferases. Libraries of mutant enzymes were iteratively examined with sterically modified luciferins, and orthogonal enzyme-substrate “hits” were identified. These agents produced light when additional enzyme-substrate partners interacted in both in vitro and cultured cell models (Krysten A. Jones, 2018). Based on their selectivity, these designer pairs enhance the multi-component image and allow direct interrogation of mobile networks that are not currently available with the available tools. Our screening platform is also common, further expanding the range of bioluminescence instruments and accelerating the detection of more unique luciferases and luciferins. Although multifaceted, to date, bioluminescence has been largely limited to the simultaneous observation of a single cell type or biological feature. This is partly due to the lack of luciferase-luciferin pairs that are isolated for in vivo use. Optimal luciferases (from the insect family) use the same substrate, D-luciferin. Thus, they cannot easily distinguish multiple cell types in a single subject. Furthermore, unlike fluorescent protein technologies, a different set of available bioluminescence probes is not yet available. To overcome this gap, analogues of D-luciferin have been developed to emit light of different colors. However, these substrates are still used by the same luciferases, which excludes specific genetic markers of individual cell types. Insect luciferases have also been developed with D-luciferin to emit different colored light. The observed emission spectra have not been sufficiently determined for routine use in complex tissues or animals.

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 5, May, 2022

Luciferases

Luciferases are enzymes that produce light when the substrate is oxidized. The most common luciferase gene comes from fireflies, but luciferases derived from other animals, such as sea pansy Renilla reniformis, copepod Gaussia princeps, and ostracod Cypridina noctiluca, are also used as correspondents. When luciferase combines with a protein of interest, its expression can be measured very accurately using a luminometer. For the fiery luciferase reaction, its substrate is luciferin, as well as adenosine triphosphate (ATP), O2, and Mg2 +. Renilla and Gaussia luciferases use coelenterazine as their substrates; Cypridina uses its own luciferin as a substrate. Luciferases are commonly used to indicate the degree of expression of the proteins to which they are combined.

All beetle luciferases have a common ancestor: they all use ATP, O2, and common luciferin as substrates. The most widely studied of these luciferases was obtained from the beetle Photinus pyralis, a beetle belonging to the super family Cantharoidea. The sensitivity to which the activity of this enzyme could be verified was useful in measuring its minute concentration of ATP. With the cloning of cDNA encoding this luciferase, it has found widespread use as a correspondent gene in molecular biology. It is recently cloned other cDNAs encoding luciferases from the bioluminescence beetle Pyrophorus plagiophtalamus in the Elateroidea superolysis. These newly obtained luciferases are of at least four different species and are distinguished by their ability to produce different bioluminescence colors ranging from green to orange. The unique properties of these luciferases, especially their multi-color production, may make them additionally useful in applications **(J.GouldSureshSubramani, 2004)**.

Bioluminescence, the conversion of chemical energy into light in living organisms, depends on two main components, the enzyme luciferase and the substrate of luciferin. The enzyme luciferase has been extensively studied in beetles and currently contains important enzymatic, sequential, and systemic data. In addition, the enzyme has been used in many important applications, from microbial detection and medical imaging to research on GM gene expression. However, little is known about the biosynthesis of beetle luciferin, and here we review the literature and speculate on its evolutionary origin. Luciferin consists of a benzothiazole moiety attached to a thiazole carboxylic acid moiety, the former being rare in nature and the latter observed in a wide range of biologically derived molecules. However, benzothiazoles are observed in melanogenesis, and we speculate as to whether this may be relevant to understanding the biosynthesis of luciferin in beetles. This review explores the latest new concepts in beetle luciferin processing and we evaluate a number of possible biosynthetic mechanisms **(John C Day 1, 2004)**.

References

1. J.GouldSureshSubramani, S. (2004). Firefly luciferase as a tool in molecular and cell biology. Analytical Biochemistry.
2. John C Day 1, L. C. (2004). Evolution of beetle bioluminescence: the origin of beetle luciferin. Luminescence, 19(1):8-20.
3. Krysten A. Jones, 2. W. (2018). Orthogonal luciferase-luciferin pairs for bioluminescence imaging. J Am Chem Soc, 139(6): 2351–2358.