## Bioluminescence

Bioluminescence is the production and emission of light by a living organism. It is a form of chemiluminescence. Bioluminescence occurs widely in marine vertebrates and invertebrates, as well as in some fungi, microorganisms including some bioluminescent bacteria and terrestrial invertebrates such as fireflies. In some animals, the light is produced by symbiotic organisms such as Vibrio bacteria.

see Three-dimensional bioluminescence tomography

Non-invasive bioluminescence imaging is a technique used in biomedical research to visualize and quantify biological processes within living organisms without the need for invasive procedures. This imaging method relies on the detection of light emitted by living cells expressing bioluminescent proteins, often derived from naturally occurring luminescent organisms such as fireflies or certain types of jellyfish.

Here's how non-invasive bioluminescence imaging generally works:

Bioluminescent Reporter: Researchers genetically engineer cells to express a bioluminescent reporter gene, commonly luciferase, which codes for an enzyme that catalyzes a light-emitting reaction. Luciferase is often coupled with a substrate, such as luciferin.

Introduction into Organisms: The modified cells are introduced into the organism of interest, such as a mouse or other small animal, either through direct injection or by creating transgenic animals with the bioluminescent reporter.

Imaging System: The organism is then placed in a specialized imaging system equipped with a sensitive camera capable of detecting low levels of light. This camera is usually able to capture signals emitted by the bioluminescent cells.

Light Emission: When the substrate luciferin is added, the bioluminescent enzyme luciferase catalyzes the conversion of luciferin to oxyluciferin, producing light in the process. The emitted light can be captured and quantified by the imaging system.

Image Analysis: The collected images can be analyzed to visualize the spatial and temporal distribution of bioluminescent signals within the organism. This allows researchers to monitor various biological processes, such as the progression of tumors, gene expression, or the activity of specific cells, in real-time.

In the context of cancer research, non-invasive bioluminescence imaging is commonly used to track the growth and spread of tumors, assess the efficacy of cancer treatments, and study the behavior of cancer cells within living organisms. The technique provides valuable insights into the dynamics of biological processes in a non-invasive manner, reducing the need for sacrificing animals or resorting to more invasive procedures. From: https://neurosurgerywiki.com/wiki/ - **Neurosurgery Wiki** 

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