

Bioluminescence (BLI) & Chemiluminescence Imaging using Irradiators

Bioluminescence and chemiluminescence are captivating phenomena involving the emission of light through biological processes and chemical reactions, respectively (Figure 1). Bioluminescence is the production and emission of light by living organisms, occurring through biochemical reactions involving luciferins (light-emitting molecules) and luciferases (enzymes that catalyze the reaction). Chemiluminescence refers to light emission resulting from a chemical reaction, occurring in both biological and non-biological contexts. Unlike bioluminescence, it is not exclusive to living organisms.

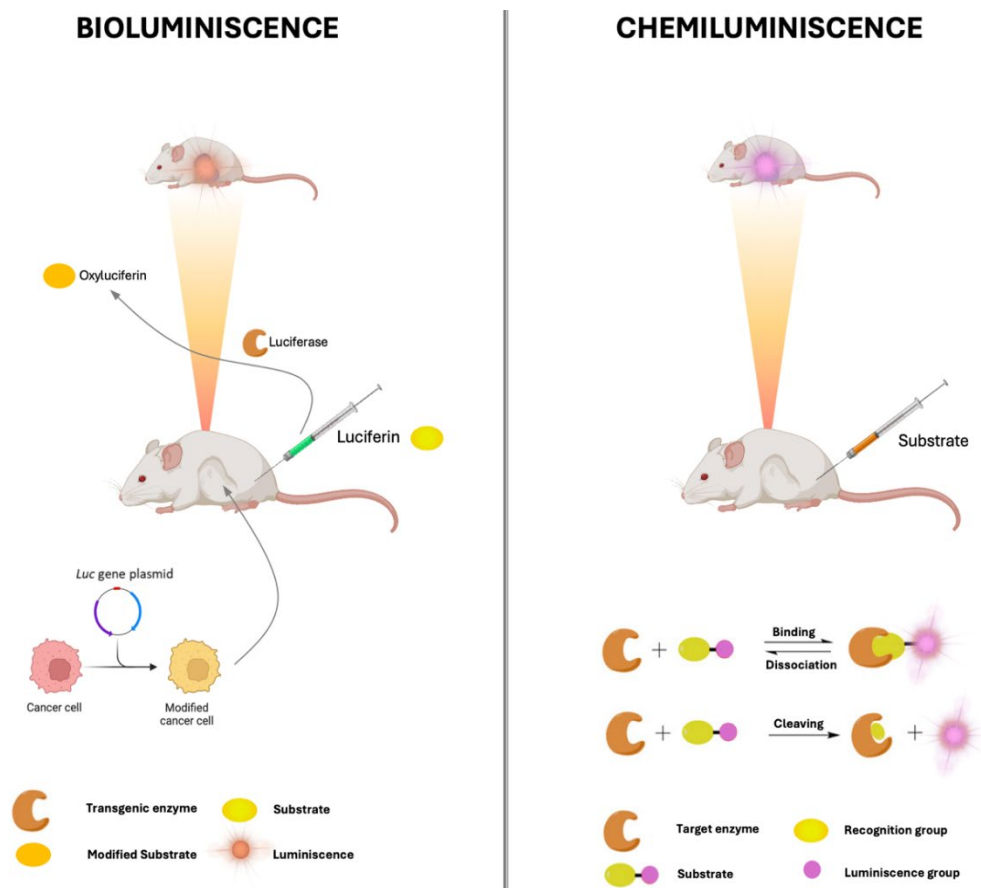


Figure 1. Overview of bioluminescence processes (left) and chemiluminescence processes (right). Image created with BioRender.com.

The Precision X-Ray, Inc. SmART+ and X-Rad family are state-of-the-art preclinical irradiators, which can be enhanced with advanced imaging capabilities through the OptiMAX module, offering Optimized Detection, an Enhanced Imaging Workflow, and Advanced Software. The integration supports a wide range of applications, including Preclinical Imaging of Tumor Response to Radiation, Evaluating the Efficacy of Novel Drug Treatments, and Tumor Microenvironment and Therapeutic Responses¹⁻³.

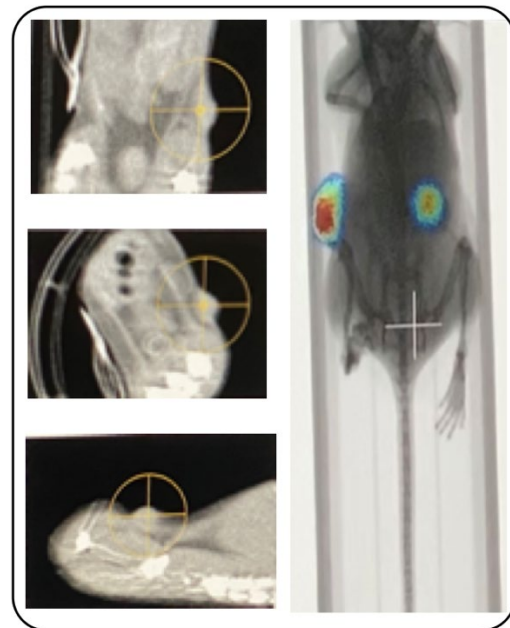


Figure 2. **Examples of imaging-targeting in Precision X-Ray Smart+ system using CT and BLI.** The overlay of cellular activity measured by BLI on the CT scan is shown to optimize irradiation at the most active site of the subcutaneous (sc) tumors.

Conclusion

The integration of Bio/Chemiluminescence Imaging (BLI) with the Precision Smart+ and XRAD systems, enhanced by OptiMAX, marks a significant improvement in the imaging capabilities of these systems. This integration facilitates targeted radiation delivery and allows for effective monitoring of processes and their efficiency. Additionally, these imaging capabilities can be employed independently of radiation for research purposes. This combination enhances sensitivity, resolution, and workflow efficiency, facilitating a broad spectrum of applications in preclinical research.

References

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