



16-17 November, 2023

The Key Role of Luciferase in Fungal Bioluminescence

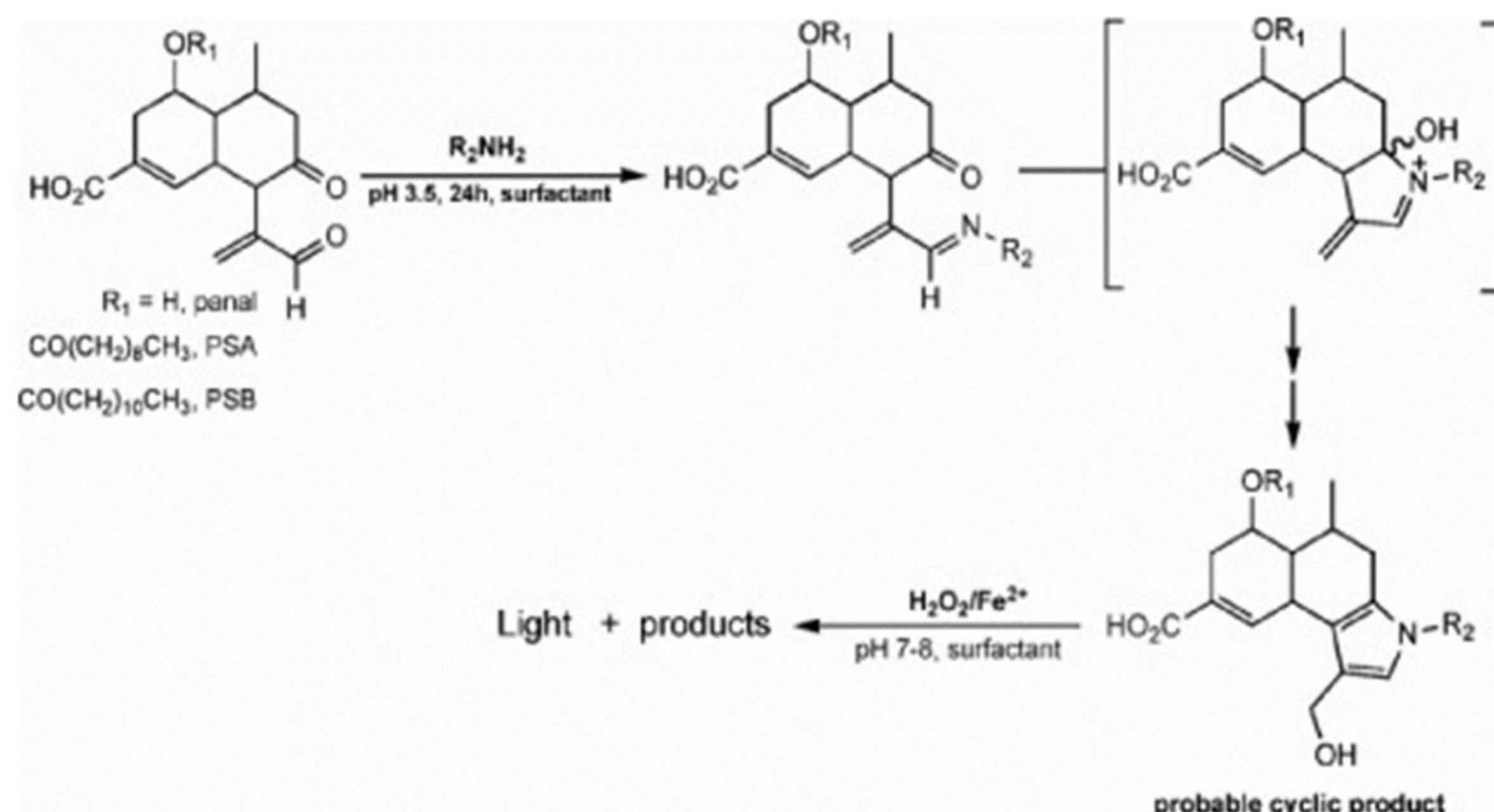
Razvan Valentin Strungaru, Mirela Ahmadi

University of Life Sciences "King Mihai I" from Timisoara, Faculty of Bioengineering of Animal
Resources, Calea Aradului, nr.119, Timisoara - 300645
Corresponding author: mirelaahmadi@usvt.ro

Abstract: Bioluminescence is possible due to a very special enzyme: luciferase – a photoprotein with the role of an oxidative enzyme that uses luciferin as a substrate. Lately, luciferases are more and more used in biotechnology, for gene reporters, and for bioluminescence in imaging investigations (like microscopy). In bioluminescence (BL) the luciferin is the key compound in the reaction between forming oxyluciferin, producing light. There are many bioluminescent organisms, like bioluminescent marine species, bacteria, and fungi. In this paper, we review some general information about bioluminescence, and also about bioluminescent fungi found in temperate and tropical geographical areas.

• Luciferin and luciferase – the key elements in biochemistry of BL

- Luciferin is the key compound in a chemical reaction between luciferase with oxidized luciferin forming oxyluciferin, producing light, a process named bioluminescence.

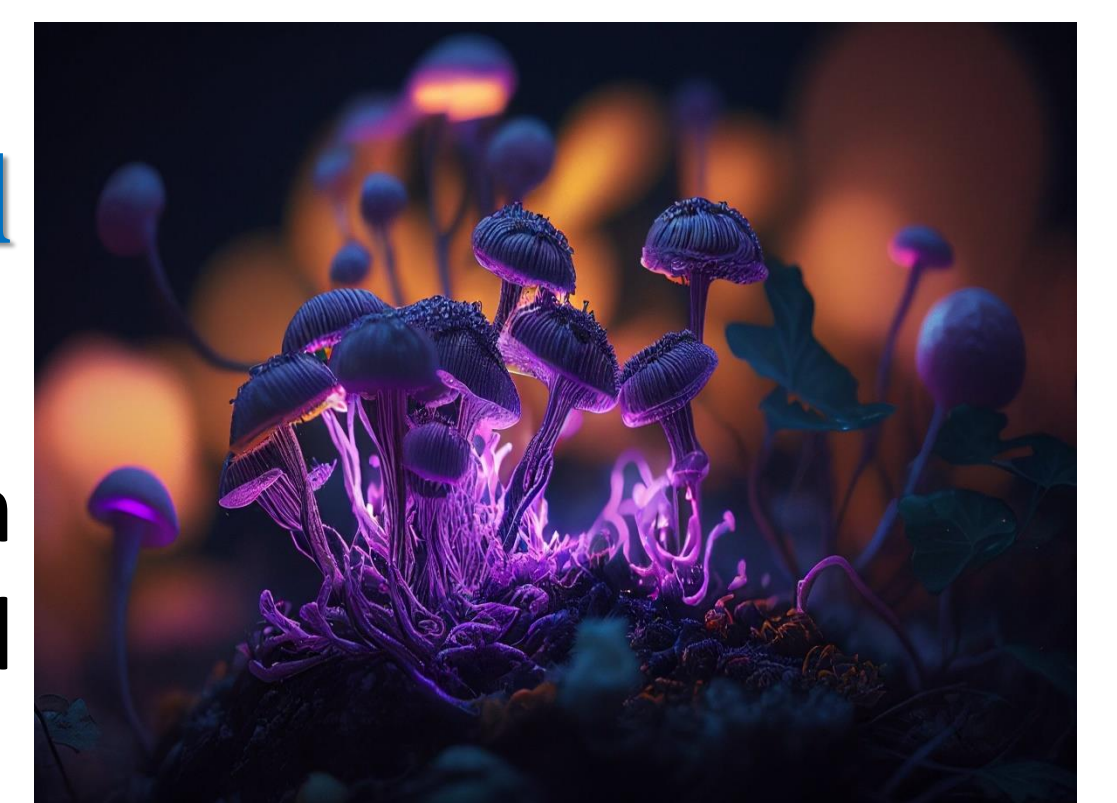


• Bioluminiscent fungi

- more than 112 species of bioluminescent fungi were found
- most of them from *Agaricales* (*Basidiomycota*) order, and one from *Xylariales* order.
- emit a continuous phosphorescent green light at $\lambda = 520-530$ nm wavelength in both mycelia and fruit bodies, or only in mycelia and young rhizomorphs, or only in spores, or only in sclerotia.

• Is there any useful of BL?

- clinical investigations on endogenous biochemical expression patterns of two distinct genes, which allow tracking the differentiation/activation state of individual cells promoters.
- evaluation of the traceability of two separate cell populations (ex. therapeutic cells and diseased cells).



• Conclusions

Recent scientific discoveries on fungal luciferin metabolism offer various opportunities to use biochemical systems that use luciferase/luciferin to expand existing applications:

- biotechnology
- genetics and medicine
- ecology
- energy and electricity

- All bioluminescent fungi are white rot fungi, which can metabolize lignin, especially from wood!
- These fungi are characterized by bioluminescence as an oxygen-dependent biochemical mechanism that provides protection against antioxidation and reactive oxygen species produced during wood development in decay.

