

## Bioluminescence of *Vibrio harveyi*

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**Introduction:**            How does bacterial bioluminescence work?  
Why does the luminescence activity change in the dark?  
How is luciferase involved in luminescence expression?  
Is the bacterial luminescence oxygen-dependent?

**Method:**                We observed luminescence of the *Vibrio harveyi* in the dark room. By shaking the water the light emission got stronger.

**Discussion:**            Bioluminescence in *Vibrio fischeri*: (according to  
<http://info.bio.cmu.edu/courses/03441/TermPapers/97TermPapers/lux/communication.html> )

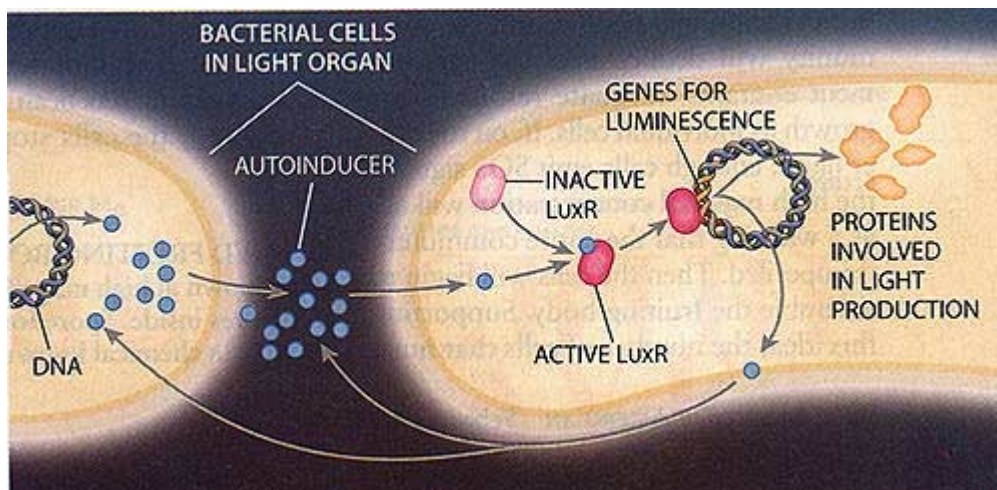
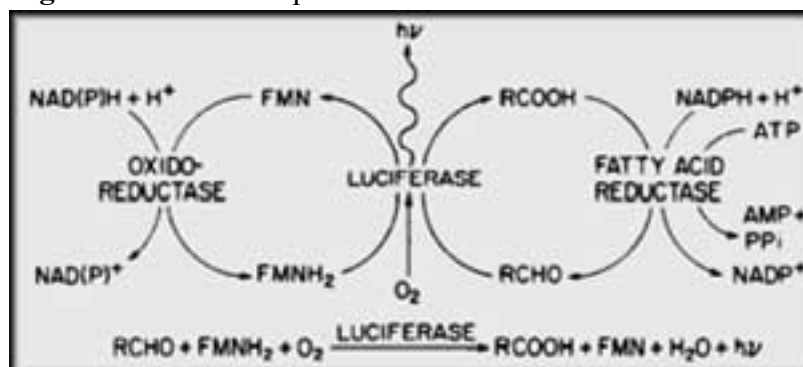


Figure 3: Cell-cell communication between bioluminescent bacteria by autoinduction  
( <http://info.bio.cmu.edu/courses/03441/TermPapers/97TermPapers/lux/communication.html> )

**Luciferase:**    heterodimer with alpha (42kD) and beta (37kD) subunits

**Autoinducer:** Some small molecules like HSL (homoserine lactone) which diffuse from one *V. fischeri* (bacteria ) to the other. The higher the population density, the brighter bioluminescence.

**Light emission** is coupled to aerobic oxidation reactions.



The oxidation of reduced flavin and a long chain aldehyde are catalized by luciferase. The products are fatty acids, water, and radiation ( $h\nu$ , blue green light ; wavelength  $\sim 490$  nm). Involved in this reaction are fatty acid reductase, which recycles the fatty acid back to the aldehyde and an NAD(P)/FMN oxido reductase which re-reduces FMN.

**Questions:**

Why are some of the bacteria able to emit light in the dark?

The bacteria are able to emit light, because of the chemical reaction as seen above.

Why does luminescence fade so quickly?

It fades so quickly because oxygen is consumed very fast in the closed in vitro assay which does not allow oxygen to diffuse into the system.

**Literature:** <http://info.bio.cmu.edu/courses/03441/TermPapers/97TermPapers/lux/communication.html>  
An excellent term paper on „Cell-Cell Communication and the *lux* operon in *Vibrio fischeri*„, by Brian J. Bluth, Sarah E. Frew, Brian McNally, Department of Biological Sciences, Carnegie Mellon University

Experimental protocol [http://www.microeco.unizh.ch/uni/kurs/bio3\\_03/pdf/12biolum02.pdf](http://www.microeco.unizh.ch/uni/kurs/bio3_03/pdf/12biolum02.pdf)