Bioluminescence of *Vibrio harveyi*

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Introduction

Luminescent bacteria are associated with fish, squid, shrimp and other animals, as **parasites** or as **saprophytes**. All these host organisms use the luminiscence as attraction of prey, intra-species communication, or to escape from predators.
Vibrio harveyi is a luminous bacterial strain, isolated from brackish water shrimp off the coast of Java, Indonesia.
Luciferase, an enzyme, is catalyzing the light production. Luciferase is a heterodimer with alpha (42 kD) and beta (37 kD) subunits. The *in vitro* light emitting reaction is coupled to **aerobic** oxidations. The oxidation of reduced flavin and a long chain aldehyde are catalyzed by luciferase. The products are **fatty acids**, water, and radiation (*hv*, blue green light ; wavelength ~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.
The expression of the genes for luciferase occurs in late log phase and it is induced by a small sensory molecule called **autoinducer**. The higher the population density, the brighter the bioluminescence.

Method

In the dark room, we looked at a long glas tube (with an air bubble), the tube was filled with overnight culture of *Vibrio harveyi.*

Results

We could observe the luminescence, while we turned the tube upside down several times. By shaking the water the light emission got stronger. With the shaking we allowed the oxygen, present in the bubble, to diffuse into the medium.

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 luminscence 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.