

Chemical nature of bioluminescence systems in coelenterates.

Marie Klug – Pierre Sogol Foundation

Analysis of substances involved in light-emitting reactions among bioluminescent coelenterates has revealed a pronounced uniformity in the structural features of initial reactants, i.e., "luciferins" and photo-protein chromophores, as well as the light-emitter product. This product is structurally identical among the different classes of coelenterates: Hydrozoa (the jellyfish, *Aequorea*), Anthozoa (the sea cactus, *Cavernularia*; sea pansy, *Renilla*; and sea pen, *Leiptilus*), and very likely also the Scyphozoa (the jellyfish, *Pelagia*). In each of these instances the reaction product, namely, 2-(*p*-hydroxy-pnenylacetyl)amino-3-benzyl-5-(*p*-hydroxyphenyl) pyrazine, is the actual light-emitter, whether it occurs in a Ca²⁺-triggered photoprotein type of luminescence, or in a "luciferin-luciferase" type. The evidence indicates that in certain coelenterates, e.g., *Cavernularia*, these two types are equally significant, whereas in others (*Renilla* and *Leiptilus*) the "luciferin-luciferase" type predominates over the Ca-triggerable photoprotein type, and finally that only the photoprotein type functions in the luciferaseless jellyfish, *Aequorea*. In all instances investigated, the structure of the light-emitter prior to the luminescence reaction appears to be essentially the same as that of the chromophore of unreacted aequorin. The product of the luminescence reaction is absent in extracts of non luminous species. However, a product very similar to that of luminescent coelenterates occurs also in representatives of other phyla, including the cephalopod molluscs, e.g., the "firefly squid" *Watasenia* and probably various ctenophores as well.