
RNA-Seq analysis of the fat body and the lanterns of bioluminescent and non-bioluminescent Elateroidea (Coleoptera)

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Abstract

The bioluminescence in Elateroidea species, is usually generated by a well-defined organ, the lantern. However, in fireflies, the fat body and eggs also produce weak bioluminescence (Viviani et al., 2008). Although the fat bodies of *Aspisoma lineatum* (Lampyridae) and *Pyrearinus fragilis* (Elateridae) display bioluminescence, those from *Phrixothrix hirtus* (Phengodidae) and *Chauliognathus flavipes* (Cantharidae) do not. Here we compared the molecular differentiation of the fat body and lanterns in bioluminescent and non-bioluminescent species of Elateroidea superfamily through RNA-Seq analyses. Whereas both lantern and fat body of the luminescent *A. lineatum* and *P. fragilis*, as well as the fat body of non-luminescent cantharid *C. opacus* display gene products involved in bioluminescence and its control (superoxide dismutase, catalase, luciferase/luciferase-like enzymes, luciferin regenerating enzyme, etc.) *P. hirtus* fat body lacks several of these gene products. Although these gene products are more abundant in the lanterns their presence in the fat body confirm the bioluminescent potential of this tissue in fireflies and click beetles. However, in Phengodidae, the absence of bioluminescence and related gene products in the fat body, as well as morphological studies of lanterns and photocytes (Bassot, 1974), indicate that the lanterns may have originated from a distinct tissue, possibly related to the ectoderm. Altogether, the results suggest that different tissues may have a latent bioluminescent potential, which could depend on the expression level of genes products involved in the bioluminescence and its control. The presence of two luciferase/luciferase-like enzymes with high abundance, one of them was more abundant in the lantern and the other in the fat body/eggs in *A. lineatum* and *P. fragilis*, indicates the possibility of two distinct isoenzymes involved in the origin of bioluminescence in the lantern and fat body of Elateridae and Lampyridae species.

Keywords: Transcriptome, Elateroidea, fat body, lantern.

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