

---

# Global scale diversity of a novel luciferase candidate gene from the genus *Odontosyllis*.

Yasuo Mitani<sup>\*1</sup>, Yasuno Rie<sup>2</sup>, H Todd<sup>3</sup>, and Ohmiya Yoshihiro<sup>4</sup>

<sup>1</sup>Bioproduction Research Institute, National Institute of Advanced Industrial Science and Technology (AIST) – Japan

<sup>2</sup>Biomedical Research Institute, AIST, Tsukuba, Japan – Japan

<sup>3</sup>University of California, Santa Barbara – United States

<sup>4</sup>Biomedical Research Institute, AIST, Tsukuba; DAILAB, Biomedical Institute, AIST, Tsukuba – Japan

## Abstract

Luminous animals are widespread and scattered over diverse branches of the tree of life. The luminous mechanisms including luciferin and luciferase have been characterized for many species, particularly for terrestrial animals including fireflies, click beetles, and railroad worms. Recently, a novel luciferin was identified from an annelid, the Siberian earth worm. However, no luciferase or photoprotein have been characterized from the phylum Annelida. This is probably because challenges to animal collection make it difficult to obtain enough animals to perform conventional purification that require a large amount of starting materials. Here, we isolated a protein from the luminous mucus of an *Odontosyllis* fireworm living in Toyama Bay that exhibited luminescence activity in the presence of an ethanol extract of the same animal. We also found a gene encoding this protein, using less than 10 individual fireworms. First, we isolated the protein from a gel, and it was subjected to highly sensitive mass spectrometry to obtain peptide fragment sequences. In parallel with this analysis, we established a cDNA database by using RNA-Seq analysis. Then, the predicted peptide sequence was subjected to blastP analysis against the cDNA database. From the MS analysis, two peptide sequences were obtained, resulting in a single ORF encoding 329 amino acids. This protein was produced as a recombinant protein using a mammalian expression system and was confirmed to show same spectral pattern as that obtained using the original animal. These data strongly suggested that this is the first characterized luciferase gene from the phylum Annelida. Furthermore, we obtained a fireworm in the Caribbean Sea and identified a homologous sequence to the Japanese species. In this meeting, we will discuss the global scale diversity of fireworm luminescence system(s).

**Keywords:** *Odontosyllis*, luciferase, fireworm

---

\*Speaker