A study on chemical composition of living acantharian (Radiolaria) shell

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Radiolaria is one of marine zooplanktons having skeletons/shell of opal (SiO_2+nH_2O) and/or celestite ($SrSO_4$), ranging from Cambrian to Recent. Living Radiolaria is divided into 5 Orders, Collodaria, Nassellaria, Spumellaria, Acantharia, and Taxopodia. The first three orders, have siliceous skeletons and then become to be microfossils in pelagic sediments. While Acantharia has a skeleton consisting of celestite, and thereby this order group cannot become fossils. In this study, we have conducted radiolarian culturing in laboratory at Ehime University for direct observation of their skeletal growth system. The living radiolarian specimens were obtained from surface waters of warm Kuroshio Current near off Kashiwajima Island, Kochi Prefecture, Shikoku Island, Japan. The detection of additional growth on skeletons was used a fluorescent compound following the method by Ogane et al. (2009, 2010). Through this direct-observation study, a possibility that acantharian shells contain siliceous compound was suggested. We therefore focus on to present the data of living Acantharia obtained in the poster.
Living acantharian cells were collected from surface waters (ca. <5-m depth) on 12the July, 30thh November,2015 and 11th January, 2016 by using a plankton net (85 micron meters mesh). We picked up individual cells from sample materials at Kashiwajima, and then performed on culturing experiments for radiolarian cells at a laboratory of Ehime University. The samples were incubated under an artificial day-night cycle (12hours day/12hours night) with white and blue LED lights at 27dgree Celsius.
After 24hours when we left radiolarian cells within incubators, we added a solution including fluorescent compound called HCK-123 into culturing dishes (final concentration ca. 0.5-1 micron mole). After 24-30 hours culturing, we mounted slides for observation with a confocal laser scanning microscope (Carl Zeiss LSM510) at Department of Biology, Faculty of Science of Ehime University. Some fluorescent compounds such as PDMPO and HCK-123 have been used one of the tracers for biological silicification (ex. Shimizu et al., 2001; Desclés et al., 2007; Ogane et al. 2010), which can stained newly formed siliceous skeletons of microplanktons because these agents are incorporated in siliceous depositions during biogenic mineralization. Therefore we can detect Silicon distributions in additional parts in siliceous shells. We also conducted FE-SEM and WDS analyses to check Si-distribution in the acantharian shells.
[Results]
Four specimens of Acantharia, identified, *Acanthometra muelleri*, *Amphilonche complanata, Acanthostaurus conacanthus* and *Acanthometron pellucidum*, among culturing radiolarian specimens clearly emitted fluorescence using by a fluorescent compound HCK-123 labeling. Each specimen shows fluorescence emission at the following parts of living cells: surface of spines and central soft parts for *A. muelleri*, proximal parts of spines and centrals for *A. complanata*, proximal surface parts of spines for *A. conacanthus*, and broken spines including its tip parts for *A. pellucidum.* WDS analysis was also performed on *A. complanata* shell for distribution mapping of Sr, S, O and Si contents. Sr, S and O, which are considered as major compositions of acantharian shells ($SrSO_4$), occurred from whole skeletal part. Si signals were also detected from a tip and surface of spines. Considering these results from our culturing experimental works and WDS analyses on living Acantharia above-mentioned, it is revealed that living acantharian cells contain Silica, in

particular on an active growth part of skeletons. This fact suggests that SiO_2 is one of the important components on skeletal forming of Acantharia.

Keywords: Radiolaria, Acantharia, skeletal composition

