Soft x-ray imaging of intracellular structure of *Leptolyngbya tenuis* (*Phormidium tenue*) generating musty smell in Lake Biwa

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In the 1970s, a problem of musty smell in drinking water has occurred due to sudden propagation of certain plant plankton in Lake Biwa. *Leptolyngbya tenuis* (*Phormidium tenue*) was identified as a causative alga. In *L. tenuis* in Lake Biwa, it is known that there are several species not generating musty smell. It is difficult to distinguish whether they are the strains which generate musty smell or not under light microscopic examination. Self fluorescence microscopy is an exceptional method to discriminate such strains from others. However, it is reported that this method cannot identify all the strains[1].

Soft X-ray microscope is a powerful tool to investigate whole cells up to 10 μm thickness with much higher resolution than light microscope. In our previous study, laboratory-cultured *L. tenuis* was observed clearly under the soft x-ray microscope. Several granules were also clearly seen in the cells [2, 3]. The purpose of this study is to distinguish whether the images are the strains generating musty smell or not under soft x-ray microscopic examination.

The laboratory-cultured *L. tenuis* was observed by soft x-ray microscope (BL-12). Cell suspension without chemical fixation and staining was dropped onto a polyimide thin film (thickness < 300 nm) and air-dried. The cells were imaged under atmospheric pressure. Two wavelengths, 2.0 nm and 2.4 nm (below and above the wavelength oxygen K-edge threshold, 2.28 nm), were used for the x-ray imaging.

Figure 1 shows x-ray microscopic images of *L. tenuis*. Each cell is clearly observed.

Granules are also clearly recognized. All granules were not observed by 2.4 nm observations. Cellular size of the strains generating musty smell was larger than that of non-smelling strains. Using x-ray micrographs, average size of cells were estimated. The average size of the strains generating musty smell was 1.35 μm and the non-smelling strain was 1.08 μm. Although each cell had the same number of intracellular granules, the size distribution of intracellular granules was quite different.

These results show that soft x-ray microscopy is effective for discriminating the strains which generates musty smells from others.

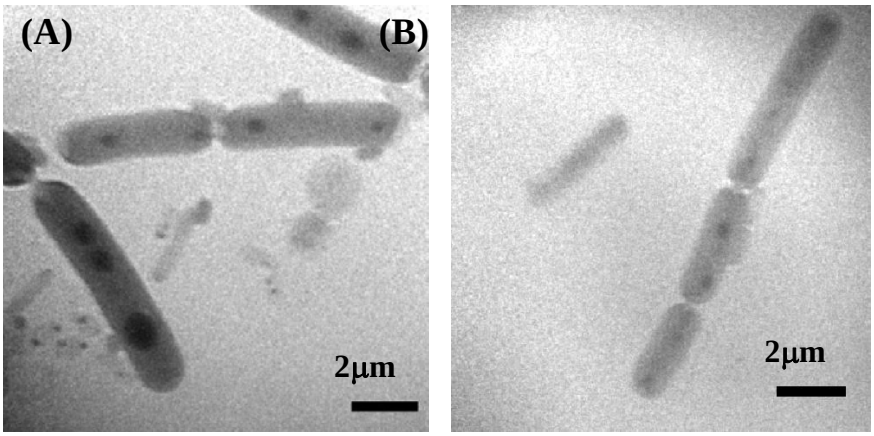

Figure 1 X-ray microscopic images of *L. tenuis* (A)generating musty smell and (B) not generating musty smell. Observation wavelength is 2.0 nm. Each exposure time was 5 min.

References

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