南極とオホーツク海で採取した流氷における重金属濃度と水銀耐性遺伝子の検出

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Determination of Mercury Resistant Genes and Heavy Metal Concentrations in Drift Ice Collected from Antarctic and Okhotsk oceans

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This work presents investigation of metal concentrations and metal resistant genes found in melted ice samples from D'Urville Sea in Antarctica and Japanese coast side of Okhotsk Sea to understand the characteristics of specific genes identified. Only a center part of ice core was melted with a careful process to remove and avoid the contaminants during the transportation, handling, and storage. Directly after the melting process, InstaGene and EXTRAGEN extraction analyses were deployed to identify *merA* and *merB* for the mercury, *tcrB* for the copper, and *cadA* for the cadmium resistant genes. For the total metal analysis, we deployed atomic absorption spectroscopy and total mercury analyzer to measure Cd, Cu, Mn, Na, K, and Hg. All the total metal measurements were conducted after the DNA analyses and the melted ice samples were stored in refrigerated condition until the actual analyses.

Among the tested metal resistant genes, both the Antarctic and Okhotsk drift ice samples indicated presence of mercury resistant gene, *merA*, but no other metal resistant genes were identified. The analyses of total metal concentrations indicated both ice samples contained mercury; however, Okhotsk sea ice drift had 5 to 6 times higher mercury concentration than the Antarctic ice. Recently proposed gas phase mercury sink mechanism (1) associated with amount of atmospheric dust loads in the Antarctic suggests even the deposition of mercury from pre-industrial era might have been contributed to the mercury found in this analysis. Since we have no information regarding the age of the Antarctic ice drift samples, the measured mercury in ice can not be related to any of historical data sets available. For the Okhotsk ice drift, it is recognized that fresh water from the Amur river contributes large part of ice formation, the river water can be a major source of mercury contamination. The Amur river receives water from the Songhua river in China, which has been affected with Minamata disease type organic mercury poisoning in 1970s due to a large mercury discharge from chemical industries, the level of mercury in the river is reported to be still high (2). Although, the concentration of mercury levels found in both ice samples were different, mercury might have been acted as a selective pressure for the emergence of *merA* gene found in two different locations.

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