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Long Distant Transport of Halotolerant Bacterial Community by Asian Dust (KOSA) Bioaerosol

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Summary

Asian desert dust (KOSA) which originates in desert regions of northern China such as the Takla Makan Deserts can carry microbial organisms (KOSA bioaerosol) and possibly impact ecosystem and human health in the downwind environments of Japan. In atmosphere, the halobacterial population is expected to dominate, because halobacteria have tolerance to several stress factors, such as UV irradiance and low oxygen, as well as high concentration of salinity. The physiological characteristic of halobacteria in the atmosphere has to be investigated for searching the functions of novel halobacteria. However, a few studies have focused on the atmospheric bacterial population.

In this study, bioaerosol samples were collected at 10 and 800 m above the ground within the KOSA source area, Dunhuang City, China, and at 10 and 600 m above the ground within the KOSA arrival area, Suzu City at a tip of the Noto Peninsula, which is located in East Sea coastal area. During sampling period of Suzu City, the particle numbers at 600 m were higher than at below 20 m, suggesting the presence of KOSA particles in atmosphere. The microorganisms in bioaerosol samples collected from Dunhuang City and Suzu City grew in media containing up to 15 % NaCl, suggesting that bacteria tolerant to high salinities remain viable in the atmosphere.

The denaturing gradient gel electrophoresis (DGGE) analysis using 16S rDNA sequences revealed that halobacterial communities in the bioaerosol samples of Dunhuang City and Suzu City were composed of similar bacterial species belonging to the genus *Bacillus*. The some species of the genus *Bacillus* are thought to maintain alive in the cosmopolitan atmosphere. Moreover, at the both sampling cities, some sequences of 16S rRNA genes were identical between the samples at ground area and upper areas. Presumably, active mixing processes of the boundary layer transport viable halotolerant bacteria into the free atmosphere, where the long-range atmospheric transport of desert dust is frequently observed and down to the ground surface, where the KOSA particles were transported from China. Since the bacterial population of the genus *Bacillus*, which were detected from the NaCl amended cultures of bioaerosol samples in Dunhuang City and Suzu City, could be isolated using the TS agar plates, the detail physiological characteristics of bacteria including the novel NaCl tolerance system will be elucidated in the future studies.