

## Meeting report

# Current Situation of Environmental Pollution in East-Asia and Concern for Human Health — JEMS Symposium in 2013

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Recently, severe air-pollution has been occurring in China as it achieves remarkable economic development, and there are great concerns about the effects of trans-boundary pollutants on human health. Actually, severe air-pollution with fine particulate matters (known as PM<sub>2.5</sub>) intermittently occurred in a broad area of China, including the capital Beijing, in January 2013. Since large concentrations of PM<sub>2.5</sub>, exceeding Japan's environmental quality standard, was also observed in western Japan, it made us pay an increased attention to health effects related to air pollution. In addition, it has been suggested that domestic pollutant sources also highly contribute to PM<sub>2.5</sub> production. On the other hand, Asian dust (yellow dust or yellow sand) is frequently observed in East-Asia, including Japan, during the spring season. Asian dust originates in arid areas in northwestern China and southern Mongolia, such as the Taklamakan and Gobi deserts, from where it is carried eastward by the Westerlies and seasonal winds, and passes over China, Korea, and Japan. Moreover, it is suggested that mutagenic/carcinogenic substances originating from anthropogenic sources may reach other countries by Asian dust.

The Public Symposium of the Japanese Environmental Mutagen Society (JEMS), entitled “Current situation of environmental pollution in East-Asia and concern for human health”, was held on May 25, 2013 (Saturday) at the Shiba Kyoritsu Campus of Keio University in Tokyo. During the symposium, presentations were made by eight expert scientists. To introduce countermeasures against PM<sub>2.5</sub> in Japan, we invited Dr. Toyonori Omori (Ministry of the Environment) as a special lecturer. In a general presentation considering the current situation of environmental pollution in East-Asia and effects on human health from a broad angle, seven expert scientists, including non-JEMS members, were invited. These discussions have been summarized

into this special issue of Genes and the Environment by the symposium organizers Tetsushi Watanabe and Yukari Totsuka. The program of the symposium has been reproduced below:

- Hiroshi Kasai (Chairman, Japanese Environmental Mutagen Society): Opening Speech
- Tetsushi Watanabe (Kyoto Pharmaceutical University): Introduction  
Session 1 (Chair: Keiji Wakabayashi)  
Special Lecture
  - Toyonori Omori (Ministry of the Environment): Current situation and problem of countermeasures against PM<sub>2.5</sub> in Japan  
General presentation
  - Tetsushi Watanabe (Kyoto Pharmaceutical University): Air pollution with particulate matter and mutagens—Relevance of Asian dust storm
  - Daisuke Nakajima (National Institute for Environmental Studies): Air pollution contributed to semi-volatile materials, and their biological activities  
Session 2 (Chair: Yasunobu Aoki)
  - Nobuyasu Yamaguchi (Osaka University Graduate School of Pharmaceutical Sciences): Long-range transportation of bacterial cells by Asian dust phenomenon
  - Kazuichi Hayakawa (Kanazawa University): Atmospheric behaviors of polycyclic aromatic hydrocarbons in East-Asia  
Session 3 (Chair: Yukari Totsuka)
  - Masanari Watanabe (Tottori University): Influence of Asian dust storms on respiratory diseases, such as asthma and allergy
  - Kouya Shiraishi (National Cancer Center Research Institute): Driver gene mutation and polymorphism

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related to lung cancer susceptibility—Molecular epidemiology of Asian lung cancer—

- Kota Katanoda (Center for Cancer Control and Information Services, National Cancer Center): Effects of long-term exposure of airborne particulate matter on human health
- Yukari Totsuka (National Cancer Center): Closing Speech

Dr. Toyonori Omori introduced countermeasures against PM<sub>2.5</sub> in Japan. He pointed out that even though the average of yearly concentration of PM<sub>2.5</sub> shows a decreasing tendency, the achievement rate of environmental limits has still been low, thus further efforts will be needed.

Dr. Tetsushi Watanabe presented that ambient air in Beijing, China was highly contaminated with metals/ions originating from anthropogenic combustion, and demonstrated markedly high mutagenicity compared to those of central and western areas of Japan. Furthermore, based on the results of back trajectory analysis, it was indicated that arrival of mutagens were accompanied by Asian dust from the Asian continent to Japan in winter and spring seasons.

Dr. Daisuke Nakajima gave accounts of mutagenic semi-volatile materials that exist in ambient air, and their mutagenicity tends to be high in the summer season. Since these semi-volatile materials were not collected as airborne particulate matter, he pointed out that evaluation of airborne particulate matter only is not sufficient to assess cancer risks related to air pollution.

Dr. Nobuyasu Yamaguchi reported that, by using fluorescent microscopy analysis, various strains of bacteria, such as *Bacilli*, *Sphingobacteria* and *Actinobacteria* adhere to Asian dust particles, and huge numbers of these bacteria ( $\sim 10^4$  cells/m<sup>3</sup>) are transported to Japan by Asian dust. Some of these bacteria retained growth potential despite the long-range transportation.

Dr. Kazuichi Hayakawa reported on his study focusing on the monitoring results of poly aromatic hydrocarbons (PAHs) and nitro poly aromatic

hydrocarbons (NPAHs). His study indicated that concentrations of PAHs were much higher in China than those in Japan and Korea. He additionally showed that generation sources of PAHs and NPAHs could be determined by the ratio of NPAH/PAH, and the major generation sources were deduced to be different among countries.

Dr. Masanari Watanabe reported that Asian dust was closely related to exacerbation of both childhood and adult asthma. Airborne particles collected on Asian dust storm days induced interleukin-8 in THP-G8 cells. However, this effect was not observed for the original soil sample of Asian dust. Airborne particles on Asian dust storm days may exacerbate asthma by the induction of interleukin-8.

Dr. Kouya Shiraishi reported that, by using GWAS, in addition to TERT and TP63, BPTF and BTNL2 were newly identified as lung adenocarcinoma susceptibility genes. Based on this analysis, racial differences exist in lung cancer development, therefore it is suggested that gene and environment interactions were different between Western and Asian countries, and a unique etiology for lung cancer has been constructed in Japan.

Dr. Kota Katanoda introduced cohort studies regarding effects on human health of airborne particulate matter, and the lung cancer risk was slightly increased ( $\sim 1.2$ ) by PM<sub>2.5</sub> at a concentration of 10  $\mu\text{g}/\text{m}^3$ .

There were about 130 participants at the symposium. The questionnaire survey revealed that about half of the participants were non-members of the Japanese Environmental Mutagen Society. The responses to the questionnaire included many positive comments, for example, “The symposium was very useful since it gave us both administrative and academic information on environmental pollution” and “The symposium was held in a timely fashion.” Through these responses to the questionnaire, we feel that the symposium was favorably accepted by the participants. We take this opportunity to express our thanks to everyone concerned with this symposium.