Aqueous and organic extracts of PM2.5 collected in different seasons and cities of Japan differently affect respiratory and immune system

Pratiti Home CHOWDHURY\textsuperscript{1}, Hitoshi OKANO\textsuperscript{1}, Akiko HONDA\textsuperscript{1}, Hitomi KUDOU\textsuperscript{1}, Gaku KITAMURA\textsuperscript{1}, Sho ITO\textsuperscript{1}, Hideki SASAKI\textsuperscript{2}, Kayo UEDA\textsuperscript{1}, Hirohisa TAKANO\textsuperscript{1}

\textsuperscript{1}Environmental Health Division, Department of Environmental Engineering, Kyoto University, Japan, 
\textsuperscript{2}Japan Environmental Sanitation Center, Kanagawa, Japan

Epidemiologic studies have reported PM\textsubscript{2.5} extracts show detrimental effects on respiratory health. The components and/or factors of PM\textsubscript{2.5} that contribute to respiratory health have not been identified. It is necessary to determine whether different types of components of seasonally variable ambient PM\textsubscript{2.5} extracts affect respiratory and immune system. Our study elucidates the effects of aqueous and organic extracts of PM\textsubscript{2.5} collected from four different seasons during November 2014-December 2015 in Kawasaki and Fukuoka cities of Japan. Human airway epithelial cells, murine splenocytes and bone marrow derived cells (BMDC) were exposed to extracts of PM\textsubscript{2.5}. The cell viability and release of IL-6, IL-8 and sICAM-1 in airway epithelial cells, proliferation, TCR and CD19 expression in splenocytes and DEC205 and CD86 expression on BMDC were measured. The aqueous extracts especially of fall from Kawasaki had more cytotoxic effect than organic extracts in airway epithelial cells, however, caused almost no pro-inflammatory response. Aqueous extracts of fall, summer and spring from Fukuoka significantly increased cell proliferation of splenocytes. Organic extracts of spring and summer from Kawasaki significantly elevated TCR expression, while CD19 expression slightly decreased. Furthermore, extracts from fall, especially aqueous extracts from Fukuoka, increased expression of DEC205 and CD86. These results suggest that PM\textsubscript{2.5} extracts can be responsible for cytotoxicity in airway epithelial cells and activation of immune cells via T-cells and BMDC. These effects can differ by components, collection areas and seasons.

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