Measuring and Visualizing the Concentration of Aerosol Particles Using Flame Photometry

Mizutani, Sasara (School: Tokyo Metropolitan Koishikawa Secondary School)

SARS-CoV-2 infection is caused by the aerosol dispersion of droplets or droplet nuclei. Therefore, there is a growing need to investigate aerosol particle behaviors to prevent the spread of SARS-CoV-2 infection. To date, the visualization of aerosol particles and simultaneous measurement of their concentration was impossible. It was reported that metal salts diffuse as fine particles and detectable via a flame test. Based on this phenomenon, I developed a novel method to measure the concentration of aerosol particles and visualize them, using flame photometry. Aerosol produced from a 1.00 mol/L NaCl solution was used as a tracer for exhaled droplets or droplet nuclei. Aerosol particles were quantified by measuring the intensity of the Na flame color reaction. For this technique, an easier-to-use, less expensive, and more accurate flame photometer was developed at a cost of approximately 50 USD. In addition, the flame color reaction was observable. Thus, I succeeded in developing a method that can measure and visualize aerosols simultaneously. The aerosol index (estimated amount of aerosol) developed in this study resembled the mass concentration more than the number concentration of the particles. This method is safe and simple, so it can be used for various purposes, such as for the efficacy evaluation of ventilation methods, or the accuracy improvement of proposed computational fluid dynamic simulations. This method can also be expected to help prevent the spread of aerosol-mediated infection.

Awards Won: