Real-time Monitoring Of $PM_{2.5}$ In Primary School

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PM2.5 may increase the risk of heart disease, stroke and some cardiovascular diseases. In this study, we monitored PM2.5 in the classrooms of the primary schools in Kaohsiung, Taiwan.

Three primary schools, industry, traffic, and reference school, were selected to assess PM_{10}, $PM_{2.5}$, and PM_1 concentration. The distance between EPA's Monitoring Station and industry, traffic, and reference school, is about 300 m, 0 m, and 537 m, respectively. Real-time monitoring of $PM_{2.5}$ from 08:00 to 16:00 was held simultaneously indoor and outdoor of the classroom to a total of 26 and 35 classrooms during April 13th to Jun 13th, 2009 and September 7th to November 6th, 2009, respectively (DUSTTRAK™ Aerosol Monitor ; Model 8520, TSI USA).

We found that the trends of indoor and outdoor $PM_{2.5}$ were the same, and the concentration of indoor $PM_{2.5}$ is higher than outdoor $PM_{2.5}$ in the classrooms of the schools. The concentrations of indoor and outdoor $PM_{2.5}$ in fall were significantly higher than in spring. For I/O ratio, the indoor concentrations of $PM_{2.5}$ were significantly higher than outdoor $PM_{2.5}$ concentrations in both spring and fall in traffic, and reference school. The relationship between the indoor concentrations of $PM_{2.5}$ in classrooms and the data from monitoring stations was not significant. The typical trend of hour average $PM_{2.5}$ in the classrooms was shown in Figure 1.The hour-average trend of indoor and outdoor concentration was similar and the indoor concentration was higher than outdoor. But the data from the monitoring station was lower than the indoor and outdoor hour-average concentrations in classrooms. It was indicated that the data from the monitoring stations could not represent of the actually exposure of school children.

Table 1. The correlation of data of AQ monitoring stations and indoor $PM_{2.5}$ in primary schools in spring.

	Reference		Traffic		Industry	
	R	*p*-value	R	*p*-value	R	*p*-value
08:00	0.857	0.006	0.687	0.060	0.700	0.036*
09:00	0.976	<.0001	0.577	0.104	0.283	0.460
10:00	0.646	0.083	0.617	0.077	0.167	0.668
11:00	0.706	0.050	0.720	0.029	0.418	0.262
12:00	0.809	0.014	0.786	0.021	0.567	0.112
13:00	0.738	0.036	0.929	0.003	0.733	0.025*
14:00	0.952	0.0003	0.410	0.273	0.762	0.028*
15:00	1	<.0001	0.671	0.048	0.617	0.077

Table 2. The correlation of data of AQ monitoring stations and indoor $PM_{2.5}$ in primary schools in autumn.

	Reference		Traffic		Industry	
	R	*p*-value	R	*p*-value	R	*p*-value
08:00	0.857	0.028	0.811	0.001	0.906	<0.001
09:00	0.472	0.120	0.767	0.003*	0.890	<0.001
10:00	0.437	0.154	0.790	0.002*	0.872	<0.001
11:00	0.296	0.376	0.802	0.001*	0.888	<0.001
12:00	0.801	0.001	0.341	0.303	0.760	<0.001
13:00	0.751	0.004	0.563	0.071*	0.829	<0.001
14:00	0.803	0.009	0.640	0.046*	0.466	0.173
15:00	0.321	0.307	0.842	0.002*	0.482	0.132

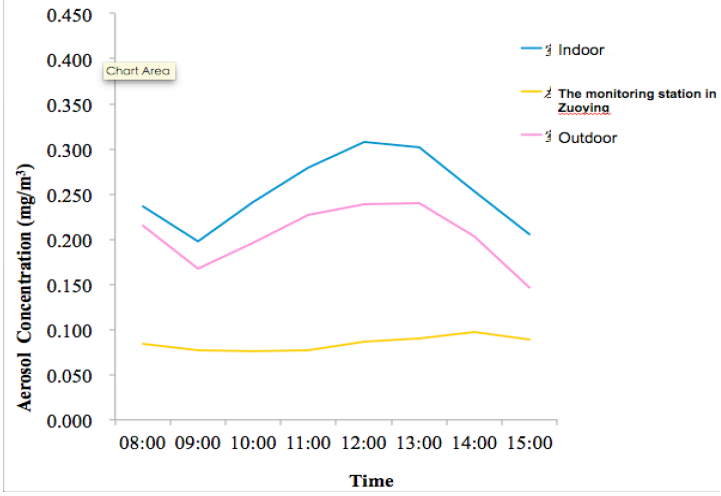

Figure 1. The trend of the average concentration of $PM_{2.5}$ from indoor, outdoor and the monitoring station.