

# Exposure Assessment of Ozone in Elementary Schools in Kaohsiung, Taiwan

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In the previous studies, children's health effect was related to ozone. Kaohsiung daily average ozone concentration is much higher than the average of Taiwan. The objective of this study is to evaluate the ozone concentration in classrooms in elementary schools in Kaohsiung, Taiwan.

From April to June (spring) and September to November (autumn) in 2009, 62 classrooms were selected from three elementary schools in Kaohsiung to monitor indoor and outdoor ozone by Ozone Monitor Model 202 (2B Technologies, Inc) in real-time for continuous eight hours.

Poor correlation between the concentration inside classroom and air monitoring station was shown in both Spring and Autumn (Table 1 and Table 2). In spring, the indoor and outdoor ozone concentration were from 6.06 to 93.52 ppb and 11.78 to 53.33 ppb, respectively, with failure rate of 58% and 0%, respectively, when comparing to the recommendation of Taiwan Environment Protection Administration (30ppb). In fall, the indoor and outdoor ozone concentration was from 7.6 to 86.1 ppb and 7.14 to 94.57 ppb, respectively, with failure rate was 77% and 46%, respectively.

The concentration of ozone rose in the morning and the maximum value appeared between 11:00 to 12:00. In autumn, the outdoor ozone concentrations were slightly higher than indoor in three schools. Indoor/Outdoor ratios (I/O ratios) of ozone varied in a range from 0.9 to 1.1. I/O ratios observed in our studies were higher than that in other previous studies. From our studies, high failure rate and high I/O ratio observed in spring and autumn in Kaohsiung implied that indoor ozone exposure of children in classroom should be an important issue and need further studies of its health effect.

The concentration of ozone rose in the morning and the maximum value appeared between 11:00 to 12:00. We need to pay more attention on indoor ozone concentration in elementary schools in Kaohsiung. It may be a problem by using the data from air monitor station to estimate the exposure of children.

Table 1. Correlation between indoor ozone concentration and air quality station in spring.

	Background		Traffic		Industry	
	R	p-value	R	p-value	R	p-value
08:00	-0.033	0.39	0.87	0.002	0.88	0.003
09:00	0.85	0.004	1.00	<0.0001	0.50	0.253
10:00	0.82	0.007	0.83	0.005	0.74	0.04
11:00	0.80	0.010	0.88	0.002	0.89	0.01
12:00	0.91	0.002	0.95	<0.0001	0.83	0.01
13:00	1.00	<0.0001	1.00	<0.0001	0.81	0.64
14:00	0.96	<0.0001	0.88	0.002	0.64	0.09
15:00	0.80	0.010	0.88	0.002	0.76	0.03

Table 2. Correlation between indoor ozone concentration and air quality station in autumn.

	Background		Traffic		Industry	
	R	p-value	R	p-value	R	p-value
08:00	0.40	0.20	0.35	0.29	0.28	0.38
09:00	0.81	0.001	0.76	0.01	0.54	0.07
10:00	0.90	<0.001	0.86	<0.001	0.62	0.03
11:00	0.95	<0.001	0.92	<0.001	0.61	0.04
12:00	0.66	0.01	0.97	<0.001	0.18	0.58
13:00	0.76	0.001	0.89	<0.001	-0.06	0.85
14:00	0.98	<0.001	0.93	<0.001	0.28	0.40
15:00	0.96	<0.001	0.88	<0.001	-0.17	0.60

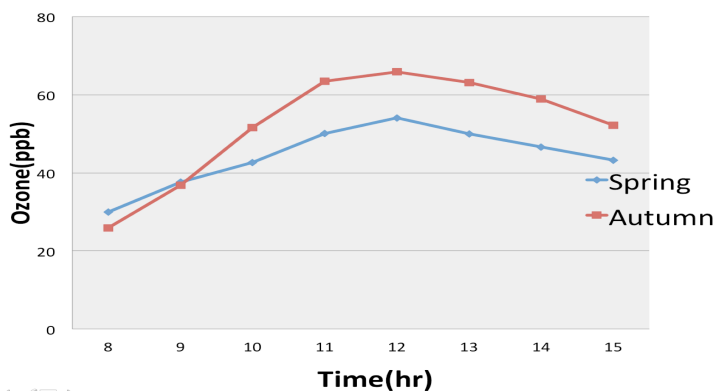


Fig1. The trend of the 8hr average indoor concentration of ozone