

2C5) Comparison of Indoor Air Quality in Bars and a Night Club in Ulsan, Korea

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1. Introduction

Many indoors pollutants cause eye, nose, throat, and respiratory tract irritation(WHO, 2000). Recent studies reported that exposure to particulate matter(PM) can lead increase morbidity and mortality associated with respiratory symptoms, cardiovascular diseases, lung cancer(Brunekreef and Forsberg, 2005). Indoor particle sources include combustion devices, such as gas stoves and fire-places, and indoor activities, such as smoking, cooking, candle burning. The recent review of the World Health Organisation(WHO, 2004) pointed out that no lower threshold to indoor PM exposure exist and thus effects of PM exposure can be observed at very low concentrations.

The purpose of this study was to measure particle concentrations in bars and a night club in Ulsan, Korea.

2. Experimental

Particle concentrations were measured in the bars and night club on two weekend nights and two weekday nights. Indoor volume space of the sampling sites were 89m^3 and $9,000\text{m}^3$ of the bars and night club, respectively. Active sampling of indoor air was conducted for 3 hours during the main visiting hours. The sampling equipment was placed in the center of the room at a height of approximately 1m. Particle concentrations were measured over a four minute interval using a GT-331 particle counter, which records the mass of PM_1 , $\text{PM}_{2.5}$, PM_7 , PM_{10} , and total suspended particles(TSP). Air sampling was conducted a period of night time, 22:00 to 01:00. During all measurements, the approximate number of occupants in each place was recorded and the number of smoking occupants was counted.

3. Results and discussion

The highest $\text{PM}_{2.5}$ and PM_{10} concentrations were $167.3\mu\text{g}/\text{m}^3$ and $265.2\mu\text{g}/\text{m}^3$ in the night club, respectively. The highest $\text{PM}_{2.5}$ and PM_{10} were $100.3\mu\text{g}/\text{m}^3$ and $104.0\mu\text{g}/\text{m}^3$ in the bar, respectively. Figure 1 and 2 show the $\text{PM}_{2.5}$ concentrations observed in the bars and night club. Means concentration in the night club(46.2 and $108.4\mu\text{g}/\text{m}^3$ for $\text{PM}_{2.5}$ and PM_{10} , respectively) were higher than in the bar(16.1 and $26\mu\text{g}/\text{m}^3$ for $\text{PM}_{2.5}$ and PM_{10} , respectively).

The average $\text{PM}_{2.5}$ concentration in the night club during the measurement periods, 3hrs, was much exceeded the ambient annual standard value $15\mu\text{g}/\text{m}^3$ of $\text{PM}_{2.5}$ in the U.S. These results suggest that people in the night club may be exposed to significantly high concentration of $\text{PM}_{2.5}$ during then stay inside the club.

This high fine particle concentration in the night club might be due to the particles from smoking of the people while taking a rest in the seat and dancing(Fig. 3). Indoor PM concentrations in the night club and bar would be dependent upon indoor activities, volume occupancy, ventilation conditions, etc. Table 1 shows the occupancy and the number of smoking people during the sam-

pling period in the night club and bars.

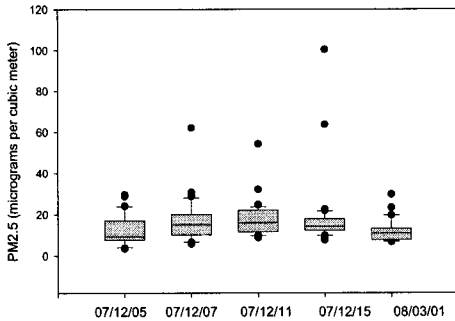


Fig. 1. PM_{2.5} concentrations in the bars.

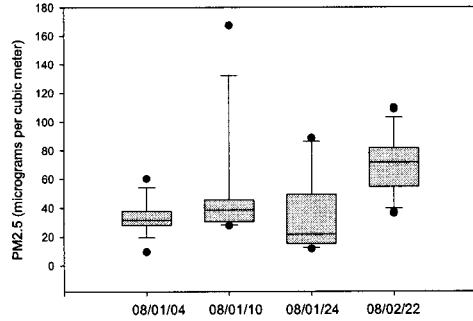


Fig. 2. PM_{2.5} concentrations in the night club.

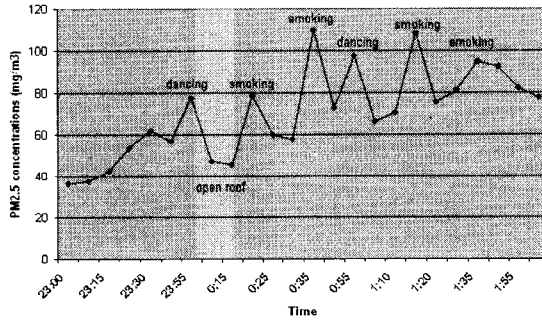


Fig. 3. PM_{2.5} concentrations during the sampling time in the night club(08/02/22).

Table 1. Approximate occupancy and the number of smoking people during the measurements.

	Date	Number of occupants	Number of cigarettes
Bar	2007/12/05	11	9
	2007/12/07	11	8
	2007/12/11	12	8
	2007/12/15	9	5
Night club	2008/01/04	400	60
	2008/01/10	350	55
	2008/01/24	400	60
	2008/02/22	500	75

References

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