

# A day at the European Respiratory Society Congress: passive smoking influences both outdoor and indoor air quality

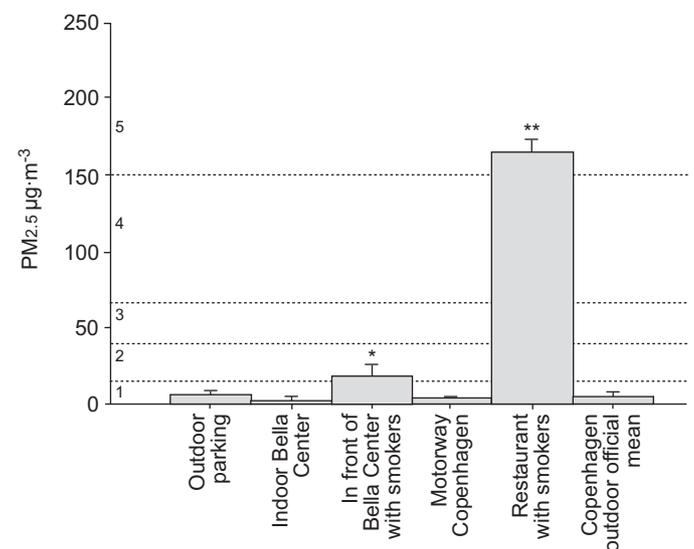
To the Editors:

Outdoor and indoor air quality is a well known determinant of human health [1]. Environmental tobacco smoke (ETS) is a recognised risk factor for respiratory diseases [2] and the most important source of indoor particulate matter (PM) pollution [3]. In recent years, several countries have issued smoking policy rules to protect nonsmoking people from ETS with a good compliance [4]. This year, the European Respiratory Society (ERS) Congress was held in Copenhagen (Denmark), a country where, like many others, comprehensive anti-smoking rules are not yet fully endorsed [5]. In fact, although smoking has been restricted in state-owned governmental premises since 1988, the legislation doesn't apply to the hospitality industry or to workplaces in the private sector. The ERS has made the case of passive smoking one of utmost importance for respiratory prevention [6]. Congress participants were advised to refrain from smoking both inside and in front of the Copenhagen Congress venue at the Bella Center, which was indicated by signs stating the following: "Tobacco is the major cause of lung disease. Please refrain from smoking in and in front of the Congress venue, including meeting rooms, the exhibition, poster areas, restrooms, restaurants and bars." The ERS Congress represented a good opportunity for air quality measurement and comparisons in relation to ETS pollution. PM<sub>2.5</sub>, as a representative marker of outdoor pollution [1] and as a surrogate of ETS [7], was measured in different places in the city, in the proximity of the Bella Center and inside the Bella Center, and compared with official 24-h urban backgrounds.

PM<sub>2.5</sub> measurements were carried out on the third day of the Congress (September 17, 2005) from the morning to late in the evening with time-tabled records of the place of measurements. We measured PM concentrations sequentially in the Congress car parking place (open space), inside the Bella Center, outdoors in front of the Bella Center with smokers under a roof (18 smokers during a measurement time of 35 min), along the motorway to the city centre, and inside a Copenhagen restaurant where smoking was allowed. Official outdoor PM<sub>2.5</sub> values for the same day were taken for comparison from an urban background location in Copenhagen (H.C. Ørsted Institute) belonging to the Danish Air Quality Monitoring Programme [8].

PM<sub>2.5</sub> measurements were carried out by means of model AEROCET 531 (Metone Instruments Inc., Grants Pass, OR, USA), a hand-held laser-operated monitor of particle size and mass concentration with a 2-min sampling time. The instrument had been pre-calibrated using a reference gravimetric system. The weather was cloudy and with a light breeze, with the temperature ranging 17–27°C and the relative humidity 44–74%. For each site, a minimum of eight consecutive measurements for a total of 16 min were taken. US-EPA air quality index (AQI) was chosen as a reference [9]. The official outdoor PM<sub>2.5</sub> values at the urban background location were measured with TEOM technology (Tapered-Element Oscillating Microbalance; Rupprecht & Patashnick Co. Inc., Albany, NY, USA).

Mean ± SEM PM<sub>2.5</sub> records are reported in figure 1. With reference to time-sequence of measurements, PM<sub>2.5</sub> complied



**FIGURE 1.** Comparison of particulate matter (PM<sub>2.5</sub>) concentrations at different sites during the third day of the European Respiratory Society Copenhagen Congress, 2005. ....: air quality index break-points, which correspond to the following. 5: very unhealthy; 4: unhealthy; 3: unhealthy for sensitive groups; 2: moderate; 1: good. \*: p<0.05 as compared with outdoor, indoor, motorway and official mean; \*\*: p<0.001 as compared with outdoor, indoor, motorway and official mean.

with good AQI according to US-EPA ( $<12.5 \mu\text{g}\cdot\text{m}^{-3}$ ) in the car parking area and inside the Bella Center, with a level of  $6.0\pm 1.7$  and  $3.0\pm 0.9 \mu\text{g}\cdot\text{m}^{-3}$ , respectively. Peak values were  $12.5 \mu\text{g}\cdot\text{m}^{-3}$  and  $12.0 \mu\text{g}\cdot\text{m}^{-3}$ , respectively. However, outside in front of the Bella Center with smokers, mean PM<sub>2.5</sub> was  $17.8\pm 7.5 \mu\text{g}\cdot\text{m}^{-3}$  with a peak of  $98.9 \mu\text{g}\cdot\text{m}^{-3}$  ( $p<0.03$ , as compared with inside the venue), which is a step down in AQI. PM<sub>2.5</sub> along the motorway was only  $4.6\pm 0.7 \mu\text{g}\cdot\text{m}^{-3}$  with a peak value of  $8.7 \mu\text{g}\cdot\text{m}^{-3}$ . Inside the restaurant, high concentrations of PM<sub>2.5</sub> were found ( $165.1\pm 8.5 \mu\text{g}\cdot\text{m}^{-3}$ ) with a peak value of  $372.2 \mu\text{g}\cdot\text{m}^{-3}$ , with a "very unhealthy" AQI. Official outdoor PM<sub>2.5</sub> mean  $\pm$  SEM recorded in the town for the time interval of all the measurements was  $5.7\pm 0.4 \mu\text{g}\cdot\text{m}^{-3}$ . Overall, mean values observed with smokers in front of the Bella Center and inside the restaurant were significantly higher than the outdoor parking place, indoor Bella Center, motorway and Copenhagen outdoor official data ( $p<0.05$  and  $p<0.001$ , respectively).

Indoor and outdoor air quality monitoring through an entire day showed that in a country where outdoor air quality is generally good, as in Denmark, the presence of ETS worsens both indoor and outdoor PM concentrations. In the restaurant with smokers we observed very high PM<sub>2.5</sub> levels, with an AQI classified as "very unhealthy", as reported by previous studies [7]. PM also reached significant values outdoors where smokers gathered to smoke, confirming previous field surveys at outdoor patios [10]. By appreciating this issue, ERS organisers advised participants not to smoke in front of the Congress venue, a suggestion that also implies coherence with doctor's role model, an issue that still deserves attention.

Understanding the importance of indoor *versus* outdoor pollution and the issue of environmental tobacco smoke as both an indoor and outdoor pollutant can contribute to a better knowledge of environmental tobacco smoke exposure risk.

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