EDITORIAL

Traffic Air Pollution - Is it Safe to be a Traffic Policeman or Professional Driver?

In the present issue of the APJCP there are two papers on air pollution, one focusing on change in CYP1A1 inducing potential of airborne particulate extracts (Kiyohara et al., 2005) and the other reporting estimated risk of lung cancer for Thai traffic police exposed to traffic benzene vapor (Wiwanitkit et al., 2005). Environmental diesel emissions have been shown to contribute to the incidence of lung cancer and have been classified as probably carcinogenic to humans (IARC monograph, 1988). Thus occupational factors, including exposure to vehicle exhaust, seem to play an important part in the development of lung cancer among drivers in Scandinavia (Hansen et al., 1998; Gustavsson et al., 2000) and data from China suggest that traffic exhaust gas is a likely cause of p53 gene mutations and lung neoplasms in traffic policemen (Zhu et al., 2003). Bladder cancer may also be significantly associated with diesel or traffic fumes (Risch et al., 1988) and motor traffic emissions could furthermore be involved in the etiology of childhood leukemia (Crosignani et al., 2004).

Given the potential risk of increased tumor development it is of obvious importance that the physiological effects of different constituents of air-borne pollution be determined and parameters be chosen for effective monitoring to identify high risk individuals who might particularly benefit from cancer screening.

Bangkok traffic police are exposed to high levels of automobile-derived particulate air pollution and demonstrate an increased prevalence of respiratory symptoms (Tamura et al., 2003), including obstructive changes in the peripheral airways (Karita et al., 2001) and frequent coughing or phlegm, although this may be also related to smoking (Karita et al., 2004). Furthermore, allergic sensitisation in exposed traffic police compared with non-exposed police has been reported, albeit without statistical significance (Jinsart et al., 2002). Hemosiderin-laden macrophages have been shown to be slightly but significantly elevated in traffic policemen and related to both smoking and time of exposure to air pollution (Giovagnoli et al., 1999). In traffic police of Hyderabad city, India, plasma levels of lipid peroxides are documented to be high, while concentrations of nitric oxide and levels of various antioxidants in RBC lysates such as catalase, superoxide dismutase and glutathione peroxidase were found to be low (Suresh et al., 2000). From a comparison of policemen in Brussels and foresters in the countryside, serum pneumoproteins and especially serum Clara cell protein (CC16) could be useful in the detection of chronic effects of urban air pollutants on the respiratory epithelium of populations particularly at risk (Berthoin et al., 2004). Thus there are a number of functional parameters directly linked to the lungs which might be applied for monitoring (see Table 1).

On evidence of liver damage among asymptomatic members of a Municipal Police Force pointing to chemical agents present in urban air in big cities causing damage to the liver, it has been argued that periodic hepatic screening with tests for serum levels of liver enzymes could also be useful (Tomao et al., 2002).

Occupational exposure to urban air pollutants may furthermore lead to significant induction of cytogenetic damage in peripheral lymphocytes of traffic policemen and taxi drivers (Burgaz et al., 2002). Analysis of frequencies of sister chromatid exchange (SCE) revealed a significantly greater number of SCE/cell in traffic policemen in Madras as against a matched control population (Chandrasekaran et al., 1996), and similar findings have been documented in Italy, here limited to non-smokers (Bolognesi et al., 1997a). On the other hand exposure to moderate air pollution levels does not appear to result in a detectable increase of genetic damage in blood cells (Carere et al., 2002) or levels of micronuclei in peripheral white blood cells (Bolognesi et al., 1997b). This does not rule out possible adverse effects, but strongly suggests that in urban residents life-style related factors, such as tobacco smoking, provide the prevailing contribution to individual genotoxic burden (Carere et al.,

Table. Parameters for Asssessment of Exposure to Traffic-Associated Pollutants

Site	Parameter
Lung	Coughing, phlegm
	Hemosiderin-laden macrophages
Blood	Plasma lipid peroxides
	RBC catalase/superoxide dismutase
	Markers of hepatotoxicity
	AST, ALT, gamma-GT, AP
	Serum pneumoproteins like CC16
	Cytogenetic damage in lymphocytes
	Sister Chromatid Exchange
	Micronuclei
Urine	1-Hydroxypyrene for PAH exposure
	Trans, trans muconic acid for benzene

2002). In a study in Budapest, Hungary, it was concluded that cancer-related risk due to polycyclic aromatic hydrocarbons (PAH) in the case of policemen on street duty and road builders does not exceed significantly that of workers not exposed occupationally to PAHs in the ambient air, but that smoking is a decisive factor (Szaniszlo and Ungvary, 2001). Thus smoking is an obvious confounding factor which needs to be taken into account.

Urinary parameters like trans, trans muconic acid (ttMA)e, accepted as a useful monitoring tool for benzene exposure and found to be much higher in Bangkok traffic police than in controls (Wiwanitkit et al., 2003) may be employed. Similarly the urinary concentration of 1-hydroxypyrene has found application for assessment of exposure to particulate PAH pollution (Merlo et al., 1998).

In addition to determination of the most appropriate parameters for test purposes, it is clearly necessary to select the groups at highest risk for future research. While most research has been conducted with police officers these may be less at risk than bus, motorbike taxi or three-wheeled vehicle drivers. Traffic police officers now generally wear simple facemasks, which have been shown to protect against particle-associated PAHs (Ruchirawa et al., 2002). Furthermore, revolving duties within police forces means that years of exposure may be limited. This might not be the case for professional drivers, on the other hand, who are also less likely to wear face masks.

Smoking was mentioned above as a confounding factor for traffic pollution associated physiological changes and clearly must also be taken into consideration in estimation of effects on cancer development. Another influence which may warrant attention is energy from radar units, given the report that police may have increased incidences of testicular and melanoma skin cancer, anatomical sites which might be exposed (Finkelstein, 1998). However, overall results of a synopsis of cohort studies on biological effects on human health due to radiofrequency/microwave exposure were inconsistent and complicated by measurement difficulties (Breckenkamp et al., 2003).

While lung cancer screening is not currently recommended for the general population in most countries of the world, identification of high risk groups who might benefit from sputum tests, for example (McWilliams and Lam, 2005), is necessary and the data for potential adverse effects of traffic pollution would indicate that more attention needs to be devoted to this area in the major cities of Asia, with their slow-flowing traffic, exposed populations and economic constraints on strict emission controls.

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References

Berthoin K, Broeckaert F, Robin M, et al (2004). Serum pneumoproteins and biomarkers of exposure to urban air pollution: a cross-sectional comparison of policemen and foresters. *Biomarkers*, **9**, 341-52.

Bolognesi C, Gallerani E, Bonatti S, et al (1997a). Sister chromatid exchange induction in peripheral blood lymphocytes of traffic police workers. *Mutat Res*, **394**, 37-44.

Bolognesi C, Merlo F, Rabboni R, Valerio F, Abbondandolo A (1997b). Cytogenetic biomonitoring in traffic police workers: micronucleus test in peripheral blood lymphocytes. *Environ Mol Mutagen*, **30**, 396-402.

Breckenkamp J, Berg G, Blettner M (2003). Biological effects on human health due to radiofrequency/microwave exposure: a synopsis of cohort studies. *Radiat Environ Biophys*, **42**, 141-54.

Burgaz S, Demircigil GC, Karahalil B, Karakaya AE (2002). Chromosomal damage in peripheral blood lymphocytes of traffic policemen and taxi drivers exposed to urban air pollution. *Chemosphere*. **47**, 57-64.

Carere A, Andreoli C, Galati R, et al (2002). Biomonitoring of exposure to urban air pollutants: analysis of sister chromatid exchanges and DNA lesions in peripheral lymphocytes of traffic policemen. *Mutat Res*, **518**, 215-24.

Chandrasekaran R, Samy PL, Murthy PB (1996). Increased sister chromatid exchange (SCE) frequencies in lymphocytes from traffic policemen exposed to automobile exhaust pollution. *Hum Exp Toxicol*, **15**, 301-4.

Crosignani P, Tittarelli A, Borgini A, et al (2004). Childhood leukemia and road traffic: A population-based case-control study. *Int J Cancer*, **108**, 596-9.

Finkelstein MM (1998). Cancer incidence among Ontario police officers. *Am J Ind Med*, **34**, 157-62.

Giovagnoli MR, Alderisio M, Cenci M, Nofroni I, Vecchione A (1999). Carbon and hemosiderin-laden macrophages in sputum of traffic policeman exposed to air pollution. *Arch Environ Health*, **54**, 284-90.

Gustavsson P, Jakobsson R, Nyberg F, et al (2000). Occupational exposure and lung cancer risk: a population-based case-referent study in Sweden. *Am J Epidemiol*, **152**, 32-40.

Hansen J, Raaschou-Nielsen O, Olsen JH (1998). Increased risk of lung cancer among different types of professional drivers in Denmark. *Occup Environ Med*, **55**, 115-8.

IARC (1988). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 46, Diesel and Gasoline Engine Exhausts and Some Nitroarenes, Lyon.

Jinsart W, Tamura K, Loetkamonwit S, et al (2002). Roadside particulate air pollution in Bangkok. *J Air Waste Manag Assoc*, **52**, 1102-10.

Karita K, Yano E, Tamura K, Jinsart W (2004). Effects of working and residential location areas on air pollution related respiratory symptoms in policemen and their wives in Bangkok, Thailand. *Eur J Public Health*, **14**, 24-6.

Karita K, Yano E, Jinsart W, Boudoung D, Tamura K (2001). Respiratory symptoms and pulmonary function among traffic police in Bangkok, Thailand. *Arch Environ Health*, **56**, 467-70.

Kiyohara C, Sakai S, Akutagawa T, Matsumoto Y (2005). CYP1A1 inducing potential of airborne particulate extracts collected during a 25-year period (1975-2000). *Asian Pacific J Cancer Prev*, **6,** 153-8.

McWilliams A, Lam S (2005). Lung cancer screening. *Curr Opin*

Pulm Med, **11**, 272-7.
Merlo F, Andreassen A, Weston A, et al (1998). Urinary excretion of 1-hydroxypyrene as a marker for exposure to urban air levels of polycyclic aromatic hydrocarbons. *Cancer Epidemiol Biomarkers Prev*, 7, 147-55.
Proietti L, Mastruzzo C, Palermo F, et al (2005). Prevalence of respiratory symptoms, reduction in lung function and allergic sensitization in a group of traffic police officers exposed to urban pollution. *Med Lav*, **96**, 24-32. [Article in Italian]
Risch HA, Burch JD, Miller AB, et al (1988). Occupational factors and the incidence of cancer of the bladder in Canada. *Br J Ind Med*, **45**, 361-7.
Ruchirawa M, Mahidol C, Tangjarukij C, et al (2002). Exposure to genotoxins present in ambient air in Bangkok, Thailand--particle associated polycyclic aromatic hydrocarbons and biomarkers. *Sci Total Environ*, **287**, 121-32.
Suresh Y, Sailaja Devi MM, Manjari V, Das UN (2000). Oxidant stress, antioxidants and nitric oxide in traffic police of Hyderabad, India. *Environ Pollut*, **109**, 321-5.
Szaniszlo J, Ungvary G (2001). Polycyclic aromatic hydrocarbon exposure and burden of outdoor workers in Budapest. *J Toxicol Environ Health A*, **62**, 297-306.
Tamura K, Jinsart W, Yano E, Karita K, Boudoung D (2003). Particulate air pollution and chronic respiratory symptoms among traffic policemen in Bangkok. *Arch Environ Health*, **58**, 201-7.
Tomao E, Baccolo TP, Sacchi L, DE Sio S, Tomei F (2002). Harm to the liver among employees of the Municipal Police Force. *Int J Environ Health Res*, **12**, 145-51.
Wiwanitkit V, Suwansaksri J, Soogarun S (2003). A note on urine trans, trans muconic acid level among a sample of Thai police: implication for an occupational health issue. *Yale J Biol Med*, **76**, 103-8.
Wiwanitkit V, Suwansaksri J, Soogarun S (2005). Cancer risk for Thai traffic police exposed to traffic benzene vapor. *Asian Pacific J Cancer Prev*, **6**, 219-20.
Zhu WC, Chen Q, Chu XW, et al (2003). Study on serum p53 protein in cops in Guangzhou city. *Zhonghua Liu Xing Bing Xue Za Zhi*, **24**, 872-4 [Article in Chinese]