

10066 - Epidemiological Aspects of Kawasaki Disease in Six Areas of China

Tuohong Zhang¹), MD, PhD; Hiroshi Yanagawa²), MD, Yosikazu Nakamura³), MD, MPH; Tomisaku Kawasaki⁴), MD

1)School of Public Health, Peking University, China; 2)Saitama Prefectural University, Japan;3)Department of Public Health, Jichi Medical School, Japan;4)Kawasaki Disease Research Center, Japan

Objective.

The objective of the study is to describe recent epidemiological patterns of Kawasaki disease in China and to make a comparison between China and Japan.

Methods.

There are 30 provinces in China so that the criteria for selection has been determined by Japanese-Chinese research group after consulted Chinese health related officials, which include regions(east, west, middle, south and north) and economic development situations. Totally there are 6 areas had been included into the research: Jiangsu(east), Shanxi(west), Beijing(middle), Guangdong(south), Harbin city and Dalian District(north).

The survey form and diagnostic guideline of Kawasaki disease that had been approved by the Kawasaki Disease Research Committee were sent to all pediatric departments of county hospitals and urban medical centers where pediatric beds existed in these areas. A retrospective survey was carried out and all of the hospitalized patients during a 5-years-period had been included into this research.

Results.

The total number of recorded cases during the 5-years-period was 2308. The incidence rate for per 100,000 children younger than 5 years of age was shown in table 1. The highest incidence rate was found in Beijing, the capital City of China, and the second was in Guangdong Province, where is the relative developed area. It was found that the annual incidence rates increased in all areas. The male:female ratio was from 1.7 to 2.2 . The peak of age at onset was 1 to 2 years old.

The disease occurred less frequently in autumn and early winter. The percentage of KD patients who developed cardiac sequelae varied between areas. The highest was 39.5% in Shannxi and the lowest was 6.1% in Harbin City. The difference might due to either the date of measurement or criteria for different complications.

1 patient was died in Guangdong and the fatality rate was 0.2%; 2 cases were died in Jiangsu and 3 died in Shannxi. No fatal cases were reported in the other areas.

Table 1 Incidence rate in selected areas

Province	No. Patients reported	Incidence Rate (100,000 under 5 ys.)	Male to female ratio
Jiangsu	505	1.85	1.7
Shannxi	375	2.34	1.9
Beijing	710	24.40	1.7
Guangdong	537	5.93	2.2
Harbin City	98	5.32	1.3
Dalian	83	--	1.8

Conclusion.

By comparison, the lowest incidence rate in China was almost the same as that in

Japan in 1969, with the highest incidence was similar to that in Japan in 1976.
Male:female ratio in China is from 1.7-2.2 with 1.3 in Japan. It might be due to the cultural influence to the parents to pay much more attention to their male children.

10094 - AIR POLLUTION, CEREBROVASCULAR DISEASES, ISCHAEMIC HEART DISEASES AND CONDUCTION DISORDERS.

Nelson Gouveia, Joya Correia, Gleice Conceição, Lourdes Martins, Clarice Freitas and Ademir Manerich

Departamento de Medicina Preventiva – Faculdade de Medicina da Universidade de São Paulo - Av. Dr. Arnaldo, 455 – São Paulo – 01246-903 – SP – Brazil

Background: Evidence indicates that air pollution adversely affects the health of exposed populations leading to a variety of health outcomes including increased cardiovascular (CV) morbidity and mortality. The potential mechanisms through which air pollution affects the cardiovascular system may involve blood coagulation abnormalities leading to ischaemic responses or alterations in the autonomic nervous system control leading to conduction disorders. However, subdivisions of CV causes are very difficult to investigate in observational studies of air pollution as the number of events per day are usually small, especially for mortality. We assessed the effects of air pollution on mortality and morbidity for different CV causes in São Paulo, Brazil. The huge population of São Paulo allowed the examination of specific causes of CV diseases.

Methods: Daily measurements of air pollutants, meteorological variables, mortality, and hospitalisations for the elderly were available for a 4-year period (1996-2000) and were analysed applying time series techniques. Final models used Generalised Additive Poisson regression adjusted for humidity, pressure, and smooth temporal factors. Deaths and hospitalisations due to all CV diseases (ICD-9 390-459), ischaemic heart disease (ICD-9 410,411,413), just acute myocardial infarction (ICD-9 410), cerebrovascular causes (ICD-9 430-436), and arrhythmia or conduction disorders (ICD-9 426,427) were examined.

Results: We found that levels of PM₁₀, SO₂ and CO were associated with mortality and hospitalisations for all CV diseases as well as with specific causes in single pollutant models. Effects for SO₂ and CO remained in multipollutant models. For a 10µg/m³ change in pollutants (1ppm for CO) we observed a 2-4% increase in hospitalisations and 2-3% increase in daily mortality for all CV diseases combined. Effects were higher for specific causes such as ischaemic heart diseases (4-9% increase in daily deaths), myocardial infarction (2.5-3.5% increase in deaths), and cerebrovascular causes (3-4%). Deaths from conduction disorders and arrhythmia although few also exhibited higher impact from air pollution (9% increase in deaths). Results for hospitalisations followed similar pattern.

Discussion: These results strengthen previous findings of acute effects of air pollution on CV diseases through two different mechanisms: altering the blood coagulability leading to ischaemic diseases and interfering with the autonomic function of the heart. As CV diseases are an important cause of morbidity and mortality in São Paulo accounting for a third of all deaths (with myocardial infarction alone accounting for 28% of CV deaths), a great impact in public health would be achieved if reducing urban levels of pollutants.

10170 - ARE DIABETICS MORE SUSCEPTIBLE TO CVD
HEALTH EFFECTS OF AIRBORNE PARTICLES?
RESULTS FROM FOUR CITIES.

A Zanobetti, J Schwartz. Harvard School of Public Health,
Boston, MA, USA.

Evidence exists that particulate air pollution exacerbates heart and lung disease, leading to increased morbidity and mortality. The populations susceptible to these exposures are still unclear. Recent work on potential mechanisms of action of PM₁₀ point to pathways also influenced by diabetes. We examined the effect modification by concurrent diagnosis of diabetes overall and by age group in a hierarchical model using 4 US cities. In the first stage Poisson regressions were fit in each city and within each strata of age and diabetes. In the second stage the estimated effect size for PM₁₀ within city and strata were regressed against stratification variables, allowing for a random effect. We used Medicare data for Chicago, IL, Detroit, MI, Pittsburgh, PA, and Seattle, WA, for the years 1988-1994. For each 10 $\mu\text{g}/\text{m}^3$ increase in PM₁₀, we found a 0.89% (95% CI 0.63%–1.14%) increase in young elderly without diabetes, a 1.60% (95% C.I.: 1.22-1.98) increase in young elderly diabetics, a 1.98% (95% C.I.: 1.58-2.39) increase in older diabetics and 1.27% increase (95% C.I.: 1.04-1.50) in older without diabetes.

We found that diabetics have double the risk of a PM₁₀ associated cardiovascular admission compared to non diabetics. We also found that person aged 75 and older had higher risk, and a suggestion of sub additivity between the two categories.

EPA grant R 82735301-1

10181 - Ultrafine particle exposures and heart rate variability

Kai-Zen Chuang¹, Guang-Ming Shiao², Jing-Shiang Hwang³, Chang-Chuan Chan^{*1}

¹Institute of Occupational Medicine and Industrial Hygiene, National Taiwan University, Rm. 1447, No. 1, 1st Sec., Jen-Ai Rd., Taipei, Taiwan, ² Chest Department, Taipei Veterans General Hospital, ³Institute of Statistical Science, Academia Sinica,

Objectives. To evaluate whether ultrafine particles will affect susceptible adult's heart rate variability (HRV) and blood pressures.

Methods. We conducted a panel study on 10 susceptible adults with either chronic obstructive pulmonary diseases (COPD) or obstructive sleep apnea syndromes (OSAS). We measured continuously each subject's 24-hour electrocardiographics by PacerCorder, blood pressures by DynaPulse, and ultrafine particle exposures (PM_{1.0}) by P-Trak twice. We used linear mixed-effects models to estimate the relationship between these subjects' particle exposures and their physiological response. The response variables were systolic blood pressure (SBP), heart rate (HR), time-domain measures of HRV, such as mean RR intervals (MRR), standard deviation of all normal-to-normal (NN) intervals (SDNN), square root of the mean of the sum of the squares of differences between adjacent NN intervals (RMSSD), standard deviation of differences between adjacent NN intervals (SDSD), and NN50 count divided by the total number of all NN intervals (pNN50), and frequency domain measures of HRV, such as low frequency (LF, 0.04-0.15 Hz), high frequency (HF, 0.15-0.40 Hz), and LF/HF ratio. Subject's age, body mass index (BMI), smoking, and temperature were controlled in the models..

Results. These subjects' ages were 42-79 years and BMIs were 20.6-33.8 kg/m². These subjects' PM_{1.0} exposures were 111-313,650 counts/cm³. We found no association between particle exposures and blood pressures. We found significant association between particle exposures and some HRV parameters of time and frequency domains. There were a decrease of 0.72% in SDNN (95% CI, -0.04% to -1.39%), and 0.98% in LF/HF (95% CI, -0.09% to -1.86%) for a concurrent increase in PM₁ of 10,000 counts/cm³ after adjusting for age, body mass index, smoking, and temperature. No time-lag effects were found in this study.

Conclusions. Our findings suggested that ultrafine particles might have short-term effects on susceptible adults via cardiac autonomic control mechanisms.

PRIMARY LEVEL COMMUNITY-BASED INTERVENTION ACTIVITIES FOR CORONARY HEART DISEASE (CHD) RISK FACTORS IN ONE PERIURBAN AREA, ANKARA, TURKEY

Sabahat Tezcan, MD¹, Rıza Sönmez, MD², Hakan Altıntaş, MD³, Banu Çakır, MD⁴

Abstract

In Turkey, there has been rapid change in lifestyle and health related behaviour towards increasing the risk of CHD. Smoking is very high among males (around 65 %) and rapidly increasing among females and adolescents, the starting age is decreasing over the years, about three-quarters of males are heavy smokers. Obesity is also an important health problem especially for females, about one third to half of females have BMI over 30. Hypertension and hypercholesterolemia is also prevalent, additionally regular control and compliance for these problems are lacking.

Objective: In one periurban area, namely Gülveren District of Ankara, having defined the prevalence of CHD risk factors it was aimed at implementing community-based intervention activities towards smoking, obesity and hypertension.

Materials and methods: Various target groups were selected to implement intervention activities. Ministerial province and local administrators, health personnel, school masters and teachers in order to discuss the health hazards of smoking and benefits of healthy nutrition. During these interactive discussions, strategies were decided and activities were started. Accordingly regular conferences, forums, pointing and essay writing contests were organised for students. At the local health centre and schools smoking rooms were assigned for separating smokers and non-smokers, health personnel and teachers were advised not to smoke in front of the patients and students respectively. For adults, basically home visits/meetings for females were carried out by dietician, public health nurse of local health centre and one member of the project team. For males, coffee houses were regularly visited. During these school, home and coffee house visits, educational material developed by the project team and ministry of health were used and pamphlets were distributed.

Results: Intervention activities continued about two years under the responsibility of project team, thereafter passed to the health personnel of local health centre. During this period, approximately 700 women attended about 70 home meetings which the duration of each was about an hour. With regard to school visits, there were three schools in the district, 14 visits were made, 25 teachers and 1050 students attended. For six coffee houses, 15 visits were held and more than 100 males attended.

Some gains obtained and some limitations were encountered during these intervention activities. Among the most important gains, increasing awareness of the administrators, health personnel and the community about risk factors of CVD. However, limitations were various; problems related to study area, lack of desired cooperation of local health centre staff, short duration of interventions, constraints in finding appropriate field of staff for temporary period and cultural values of the community.

¹ Prof. of Epidemiology in Hacettepe University, Medical Faculty, Department of Public Health, Director of Hacettepe University Institute of Population Studies

² Public Health Specialist in Ministry of Health

³ Assist. Prof., Hacettepe University, Medical Faculty, Department of Public Health

⁴ Hacettepe University, Medical Faculty, Department of Public Health

In conclusion, community-based intervention activities to decrease risk factors of CVD from childhood period are worth of life and shall be continued and extended to whole country in the near future, otherwise in coming decades the magnitude of this problem will be huge.

Key Words: Coronary Heart Disease, Risk factors, Turkey

10342 - Case-crossover analysis of the effects of hourly air pollution on ICD-detected cardiac arrhythmias

David Q. Rich¹, Joel Schwartz^{1,2}, Mark Link³, Heike Luttmann-Gibson¹,
Murray A. Mittleman^{1,4}, Richard L. Verrier^{1,4}, Diane Gold^{1,2}, Douglas W. Dockery^{1,2}

1. Harvard School of Public Health
2. Channing Laboratory, Harvard Medical School
3. New England Medical Center, Tufts University
4. Beth Israel Deaconess Medical Center, Harvard Medical School

We assessed the association of community exposures to particulate air pollution with cardiac arrhythmias, detected by implanted cardioverter defibrillator (ICD) devices. ICD's monitor arrhythmias and can initiate therapy. Patients implanted with third generation ICD's at the New England Medical Center, between June 1995 and May 2000 (n=320), were included in the study and were followed until death, ICD explantation, or their last clinic visit before July 1, 2001. Patient characteristics including birth date, indications for ICD implantation, and cardiovascular history were abstracted from medical files. Complete ICD history was reviewed and information (date, time, ICD recorded zone, and ICD therapy) for each ICD-detected arrhythmia was recorded. Stored electrograms were analyzed by a cardiac electrophysiologist to characterize events. Hourly gaseous pollutant (NO₂, SO₂, CO, O₃) concentrations were measured by the Massachusetts Department of Environmental Protection at several monitoring sites throughout eastern Massachusetts, with the average from the sites used as each hours' pollutant level. Hourly PM_{2.5} was measured by the Harvard School of Public Health. Temperature and dewpoint were measured hourly by the National Weather Service at Logan Airport in Boston. NO₂, SO₂, CO, O₃, temperature, and dewpoint were available for the entire study period (April 1, 1995-July 1, 2001), while PM_{2.5} was not measured from January 19, 1997 to March 15, 1999. Of the 320 subjects in the study, 121 subjects had a total of 1718 recorded ICD events, of which 917 were separated by more than an hour. Hourly PM_{2.5} data were available for 582 events. We used a case-crossover study design with bi-directional symmetric control sampling (5, 6, 7, 8, and 9 days before and after the case event). Using conditional logistic regression models, adjusted for day of the week, temperature, and dewpoint, moderate increases in risk were associated with a 9.2 µg/m³ (interquartile range) increase in PM_{2.5} (OR=1.14; 95% CI = 1.02, 1.28) in the hour before the event. There were also moderate increases in risk associated with a 5 ppb increase in SO₂ concentration (OR=1.11; 95% CI = 1.00, 1.23) in the hour before the event, and a 20 ppb increase in O₃ concentration 5 hours before the event (OR=1.13; 95% CI = 0.92, 1.39). There did not appear to be increased risk associated with ambient levels of NO₂ or CO. Air pollution, particularly PM_{2.5}, was associated with an increased incidence of cardiac arrhythmias in this population of susceptibles. These data suggest an immediate cardiac response (within hours) to acute air pollution exposures. This study was funded by NIEHS grants ES-09825 and ES-00002, and HEI grant 98-14.

BLOOD PRESSURE ASSOCIATED WITH PM_{2.5} IN A CARDIAC REHABILITATION STUDY.

A Zanobetti¹, J Schwartz^{1,2}, D Sher², E Eagan-Bengston³, KA Gates³, Barr M, M Jacobson², D Gold^{1,2}. ¹Harvard School of Public Health, ²Channing Laboratory, ³Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA.

We investigated the associations between ambient PM_{2.5} and blood pressure (BP) at rest during repeated visits for cardiac rehabilitation in a population of 66 39- to 86 year old Boston residents with a history of myocardial infarction (MI), coronary artery bypass surgery or other coronary artery disease. Data were abstracted from records of 641 visits that occurred between 1999 and 2001. We applied a generalized additive model controlling for subject, body mass index, number of visits, hour of day, and weather variables. We found a positive association between resting diastolic blood pressure and PM_{2.5} averaged over the preceding 4 days with a 3.1% increase (95% C.I.: 0.71-5.52) for the difference between the 90th and 10th percentile of PM_{2.5}. This increased to 4.1% (95% C.I.: 1.5-6.6) for the mean of 5 days. We did not find any overall associations for the maximum blood pressure during exercise in all subjects, but we found effect modification in subject with resting heart rate ≥ 70 . For the 5 day average PM_{2.5} in persons with heart rate < 70 we found a 0.30% increase (C.I.: -3.95-4.56) for the difference between the 90th and 10th percentile of PM_{2.5}; while we found a 9.23% increase (C.I.: 3.31-15.15) in persons with heart rate ≥ 70 .

PM_{2.5} is associated with increasing resting BP in cardiac patients ongoing rehab. For those without adequate resting heart rate control PM_{2.5} is also associated with elevated max BP during exercise.

Program Project grant # 1P01ES09825-01 and EPA grant # 826780-01-0

10417 - Gaseous Criteria Pollutants Are Associated with Impaired Cardiac Autonomic Control
Duanping Liao, Yinkang Duan, Vernon M. Chinchilli, Sharon Xie. Pennsylvania State University College of Medicine, Hershey, PA

Several studies have examined the role of particulate matter (PM) pollution and impaired cardiac autonomic control (CAC) as a potential mechanism for the PM and cardiovascular mortality association. The associations between gaseous pollutants and CAC have not been reported. The authors examined the short-term effects of gaseous pollutants (O_3 , CO , NO_2 , and SO_2) and CAC in a population-based sample of 6784 males and females who participated in the fourth cohort examination of the Atherosclerosis Risk in Communities (ARIC) study. The exposures were calculated from the EPA's Aerometric Information Retrieval System (AIRS): O_3 as 8-hour average (10 am to 6 pm) of the hourly measures; CO , NO_2 , and SO_2 as 24-hour averages (12:00 am to 11:00 pm). These daily averages were used as the exposures one-day prior to the randomly allocated cohort examination date, during which supine, 5-minute R-R interval data were collected to estimate the following heart rate variability (HRV) indices as the conventional measures of CAC: high frequency (HF, 0.15-0.40 Hz) and low frequency (LF, 0.04-0.15 Hz) powers, standard deviation of normal R-R interval (SDNN), and average heart rate (HR). Following the convention, the logarithm-transformed HF (HF_{ln}) and LF (LF_{ln}) were used in the analysis. Multivariate linear regression was used to adjust for age, ethnicity-center, sex, smoking, body mass index, prevalent CHD, hypertension, and diabetes, and to obtain regression coefficient (β) and standard error (SE, in parentheses) of CAC indices per one standard deviation (SD) increase in each pollutant. The β (SE) per one SD increase of O_3 (0.016 ppm) was -0.069 (0.019) for HF_{ln} ; that of SO_2 (SD=0.004 ppm) was -0.122 (0.056), -0.532 (0.270), and 0.295 (0.130) respectively for LF_{ln} , SDNN, and HR; that of NO_2 (SD=0.008 ppm) was -0.042 (0.018), -0.035 (0.018), and -0.739 (0.324) respectively for HF_{ln} , LF_{ln} , and SDNN; and that of CO (SD=1ppm) was 0.918 (0.364) for HR. The p-values for testing $\beta=0$ were all < 0.05 for the above associations. These results suggest that higher levels of gaseous criteria pollutants, even below current EPA standards, have adverse health effects on cardiac autonomic control.

Keywords: Air pollution, criteria pollutants, cardiac autonomic control, population-based study.

Higher Ambient PM₁₀ is Associated with Impaired Cardiac Autonomic Control at the Population Level

Duanping Liao, Yinkang Duan, Vernon M. Chinchilli, Sharon Xie. Pennsylvania State University College of Medicine, Hershey, PA

Several studies have examined the role of particulate matter (PM) pollution and impaired cardiac autonomic control (CAC) as a potential mechanism for the PM and cardiovascular mortality association in selected populations. The authors examined the short-term effects of ambient PM₁₀ and CAC in a population-based sample of 4899 males and females who participated in the fourth cohort examination of the Atherosclerosis Risk in Communities (ARIC) study. The 24-hour average PM₁₀ concentrations one-day prior to the randomly allocated cohort examination date were calculated from the EPA's Aerometric Information Retrieval System (AIRS). During the cohort exam, supine, 5-minute R-R interval data were collected to estimate the following heart rate variability (HRV) indices as the conventional measures of CAC: high frequency (HF, 0.15-0.40 Hz) and low frequency (LF, 0.04-0.15 Hz) powers, and standard deviation of normal R-R interval (SDNN). Following the convention, logarithm-transformed HF (HF_{ln}) and LF (LF_{ln}) were used in the analysis. Multivariate linear regression was used to adjust for age, ethnicity-center, sex, heart rate, smoking, body mass index, prevalent CHD, hypertension, and diabetes. In the entire sample, the regression coefficient (β) and standard error (SE, in parentheses) of CAC indices per one standard deviation increase of PM₁₀ (11.5 $\mu\text{g}/\text{m}^3$) were -0.06 (0.018), -0.02 (0.018), and -1.03 (0.31) respectively for HF_{ln}, LF_{ln}, and SDNN. The p-values for testing $\beta=0$ were < 0.01 for HF_{ln} and SDNN, and p=0.20 for LF_{ln}. These associations were more pronounced in persons with hypertension (interactions between PM₁₀ and hypertension were all significant at p < 0.05). These results suggest that higher levels of ambient PM₁₀, even below the current EPA standard, have adverse health effects on cardiac autonomic control at the population level, especially among those with existing cardiovascular disease.

Keywords: Air pollution, criteria pollutants, cardiac autonomic control, population-based study.

10441 - Effects of ultrafine and fine particulate air pollution on heart rate turbulence in subjects with coronary artery disease.

Timonen KL1,2, Vanninen E1, Tarkiainen T1, de Hartog J3, Heinrich J4, Hoek G3, Ibald-Mulli A4, Lanki T2, Peters A4, ten Brink H5, Tiittanen P2, Kreyling W6, Pekkanen J2.

1 Department of Clinical Physiology and Nuclear Medicine, Kuopio University Hospital and Kuopio University, Finland; 2 Unit of Environmental Epidemiology, National Public Health Institute, Kuopio, Finland; 3 Environmental and Occupational Health Unit, University of Utrecht, Utrecht, the Netherlands; 4 GSF-Institute of Epidemiology, Neuherberg, Germany; 5 The Netherlands Energy Research Foundation, Petten, the Netherlands; 6 GSF- Institute for Inhalation Biology, Neuherberg, Germany.

Previous studies have suggested an association between increased concentrations of particulate air pollution and cardiovascular morbidity and mortality. The absence of heart rate turbulence i.e. fluctuations of sinus-rhythm cycle length after a single ventricular premature beat, has been suggested to be a predictor of mortality after myocardial infarction. Therefore, we studied the association between heart rate turbulence and daily variation of particulate air pollution in a multicenter study 'ULTRA' in Amsterdam, the Netherlands, Erfurt, Germany, and Helsinki, Finland. Subjects (37 in Amsterdam, 47 in both Erfurt and Helsinki) with stable coronary artery disease were followed for 6 months with biweekly clinical visits. During the visits, ambulatory ECG was recorded during a standardized protocol. From a total of 1 394 ECG recordings, heart rate turbulence was determined by calculating turbulence onset and slope. Turbulence onset and slope could be determined for 105 (80%) subjects. The null hypotheses tested were that particulate air pollution is not associated with an increased turbulence onset and a decreased slope. A statistical model was built for each center separately. Turbulence onset and slope were analyzed as a continuous variable. The mean 24-h particle number concentration (NC, $1/\text{cm}^3$) of ultrafine particles (diameter 0.01 – 0.1 μm) was 17,300 in Amsterdam, 21,100 in Erfurt, and 17,000 in Helsinki, and of accumulation particles (diameter 0.1 – 1.0 μm) 2,100, 1,800 and

1,400, respectively. The corresponding values for PM_{2.5} were 20.0, 23.1 and 12.7 µg/m³. According to the preliminary analyses particulate air pollution was not associated with increased turbulence onset. In Helsinki, PM_{2.5} and NC of accumulation mode particles were significantly associated with a decreased turbulence slope. The effect estimate (se) was -4.74 (1.76) ms/RRI (lag 1) for a 10 µg/m³ change in PM_{2.5} and -4.56 (2.09) ms/RRI (lag 1) for a 1,000/cm³ change of NC of accumulation particles. Results for the same day and 2 days lagged exposure supported the association. No such associations were observed in Amsterdam and Erfurt. The present result supports the hypothesis that fine particulate air pollution can have harmful effects on the heart of subjects with coronary artery disease. In addition, the results are in accordance with the previous findings in the ULTRA study, in which especially in Helsinki fine particulate air pollution has been found to be associated with decreased heart rate variability, increased risk of ST-segment depressions, and increased epithelial barrier permeability in the lungs.

Daily values of sulfur dioxide and hospital admissions for cardiovascular diseases in Europe: results from the APHEA2 project

J Sunyer (1), F Ballester (2), A Le Tertre (3), R Atkinson (4), JG Ayres (5), F Forastiere (6), B Forsberg (7), JM Vonk (8), L Bisanti (9), JM Tenías (2), S Medina (3), J Schwartz (10), K Katsouyanni(11) on behalf of the APHEA2 project.

(1) Unitat de Recerca Respiratoria i Ambiental, Institut Municipal Investigació Mèdica (IMIM), Barcelona, Spain; (2) Escola Valenciana d'Estudis per a la Salut (EVES), Valencia, Spain; (3) Environmental Health Unit, National Institute of Public Health Surveillance, France; (4) Dept. of Public Health Sciences, St. George's Hospital Medical School, London, England; (5) Birmingham Heartlands Hospital, Bordesley Green East, Birmingham, England; (6) Department of Epidemiology, Health Authority Rome, Italy; (7) Dept. of Public Health and Clinical Medicine, Umea University, Umea, Sweden; (8) Faculty of Medical Sciences, Department of Epidemiology and Statistics, University of Groningen, Netherlands; (9) Department of Epidemiology; Local Health Authority; Milan, Italy; (10) Environmental Epidemiology Program, Dept. of Environmental Health, Harvard School of Public Health, Boston, USA; (11) Department of Hygiene and Epidemiology, Medical School, University of Athens, Greece.

e-mail: ballester_fer@gva.es

Objective: To assess the short-term effect of sulfur dioxide (SO₂) on hospital admissions for cardiovascular diseases within the framework of the APHEA2 (Air Pollution and Health: a European Approach). **Methods:** Daily mean hospital admissions for cardiovascular diseases, ischemic heart diseases, and stroke in seven European areas (the cities of Birmingham, London, Milan, Paris, Roma, and Stockholm, and The Netherlands) participating in the APHEA2 project, were measured. Data were also collected for air pollutant indicators as well as for relevant confounders and potential effect modifiers. For individual city analyses generalized additive models, extending Poisson autoregressive models allowing for overdispersion, were fitted. To provide a quantitative summary of results across the cities, we applied meta-analytic methods by obtaining a pooled regression coefficient. **Results:** All cardiovascular admissions and particularly ischemic heart diseases were significantly increased with an increase of daily SO₂ levels, but not stroke. After adjusting for PM₁₀, the association of SO₂ with ischemic heart diseases remain significant (i.e., an increase of 0.7%; 95% confidence interval = 0.1-1.3, per each increase in 10 µg/m³ of SO₂) among subjects younger than 65 years, but not among subjects older than 65. The only variable explaining heterogeneity was humidity, with a stronger effect in areas with less humidity. **Conclusions:** This study brings new evidence on the effects of urban air pollution on cardiac diseases in Europe, and suggests that SO₂ may play an effect by itself in ischemic cardiac event. From a Public Health perspective these results suggest that reduction in SO₂ levels in European cities could imply a reduction of admissions for ischemic heart diseases.

Acknowledgement: This work was supported by European Commission Environment and Climate 94-98 Programme, Contract number ENV4-CT97-0534.

AIR POLLUTION AND HOSPITAL ADMISSIONS FOR ISCHEMIC HEART DISEASES AMONG THE ELDERLY IN SEOUL, KOREA

JONG-TAE LEE¹, HO KIM², YONG-SUNG CHO¹, YUN-CHUL HONG³, HO-JANG KWON⁴, EUN-HEE HA⁵, YUN-SHIN KIM¹.

¹Institute of Environmental and Industrial Medicine, Hanyang University, Seoul, Korea; ²Department of Epidemiology and Biostatistics, School of Public Health and Institute of Public Health and Environmental Sciences, Seoul National University; ³Department of Preventive Medicine, College of Medicine, Inha University; ⁴Department of Preventive Medicine, College of Medicine, Dankook University; ⁵Department of Preventive Medicine, College of Medicine, Ewha Woman's University

Background: Most of recent interest in the association between air pollution and health has focused on respiratory disease. There is growing evidence, however, that air pollution may be associated with cardiovascular disease as well. Our previous work on the association of air pollution exposure with stroke mortality led to this study. This study was carried out for assessing the impact on cardiovascular diseases among the elderly of ambient air pollution.

Methods: We collected the data from the Korea Medical Insurance Corporation covering all hospitals for each admission of all residents in the nation and constructed daily counts of admissions for ischemic heart diseases (ICD-10 codes I20-I24). In this analysis, we included only patients older than 64 years of age who lived in Seoul during the study period (from December 1, 1997 to December 31, 1999). In Seoul, 27 monitoring stations that cover nearly all area of the city are providing the hourly levels of four gaseous air pollutants (sulfur dioxide, nitrogen dioxide, ozone and carbon monoxide) and of airborne particles less than or equal to 10 μm in aerodynamic diameter using standardized reference methods. We conducted time-series analysis of the counts by means of a generalized additive model with a log link and Poisson error allowing for over-dispersion. Autoregressive terms were also added in the model to remove the serial correlations of the residuals.

Results: The daily mean number of hospital admissions for ischemic heart diseases was 4.4 (standard deviation=2.6). Concentrations of ambient air pollutants were below the current recommendations for air quality in Korea. The daily levels of nitrogen dioxide were highly correlated with all other pollutants (correlation coefficient, $r > 0.7$), except ozone. The estimated relative risk of hospitalization associated with an interquartile range (IQR) was 1.05 (95% confidence interval (CI) = 1.01-1.10) for PM_{10} (IQR = 40.4 $\mu\text{g}/\text{m}^3$); 1.10 (95% CI = 1.05-1.15) for O_3 (IQR = 21.7 ppb); 1.08 (95% CI = 1.03-1.14) for NO_2 (IQR = 14.6 ppb); 1.90 (95% CI = 1.80-2.01) for CO (IQR = 1.0 ppm); and 0.95 (95% CI = 0.90-1.01) for SO_2 (IQR = 4.4 ppb).

Conclusion: Hospital admissions for ischemic heart diseases showed a significant association with daily

variations in ambient air pollutants. These findings on hospitalization for ischemic heart diseases may provide new insights into the possible pathologic mechanisms of air pollution effects and support a relationship between air pollution and cardiovascular diseases at sub-standard air quality levels commonly occurring in most countries.

ASSOCIATION BETWEEN TRAFFIC EXPOSURE AND RISK OF MYOCARDIAL INFARCTION

Regina Grazuleviciene^{1,2}, Ada Azaraviciene¹

¹Vytautas Magnus University; ²Institute of Cardiology, Kaunas, Lithuania

The objective of this study was to estimate the association between tobacco smoking habits and risk of first myocardial infarction among 25-64 years old men exposed to traffic exhaust.

We conducted a prospective case-control study, which involved all 25-64 year men who were Kaunas city residents and fall ill with first myocardial infarction in 1997-2000. In a hospital-based study 579 myocardial infarction cases were registered, 448 of these were interviewed during first hospitalization week. Totally 1777 of population controls frequency matched for age, were selected. Cases and controls were interviewed for their sociodemographic characteristics, smoking and environmental exposures. We used multiple logistic regression models to assess effect of tobacco smoking and motor exhaust effect on first myocardial infarction risk.

The analysis revealed that in population sample prevalence of smoking of 15c/d and more decrease with increasing age while percentage of ex-smokers increased. The prevalence of smoking among men with systolic blood pressure below 139/89 mmHg was 55.5 %, while among patients with hypertension (>160/100 mmHg) was 28.0%. After adjustment for age, blood pressure, socioeconomic status, body mass index, psychological status and traffic exposures, the OR for the smoking <15c/d was 2.96; 95% CI 2.11-4.15, OR for smoking >15c/d was 1.62; 95% CI 1.16-2.28 and OR for ex-smokers was 2.11; 95% CI 1.51-2.94. Smoking increased the effect of traffic exposure and after full adjustment OR associated with traffic exposure was 1.24; 95% CI 0.99-1.55.

Conclusion. The study results indicate that tobacco smoking contribute to increase of myocardial infarction risk and that its effect is synergistic with traffic exposures risk as well.

Cardiovascular risk profile in selected population group

Sevcikova L.; Stefanikova Z.; Jurkovicova J.; Sobotova L.; Aghova L.

Institute of Hygiene, Faculty of Medicine, Comenius University Bratislava, Slovak Republic

Objectives: The aim of the present study was to determine the presence of selected cardiovascular disease risk factors in Slovak university students and the changes in risk occurrence during the years 1992-2001.

Sample and Methods: A total of 2932 medical students (1101 men, 1831 women, mean age 22.38 ± 1.34 years) were examined in 10-year period (1992-2001). Anthropometric (BMI, WHR, body fat percentage), physical (BP) and biochemical (T-CH, LDL-CH, HDL-CH, TG) examinations as well as personal and family history, food intake, physical activity and energy balance were estimated. Statistical analysis was focussed on detection of intersexual and interannual differences of risk factors occurrence in students.

Results: The mean values of BMI, WHR, percentage of body fat, systolic and diastolic BP, total cholesterol, LDL-CH, HDL-CH, TG levels and atherogenic indexes both in men and women were in physiological range with no significant interannual differences. During the whole monitoring period the occurrence of cigarette smoking was higher in men than in women (21.6% vs. 12.2%, $p=0.025$), school stress was more frequent in women (42.5% vs. 31.3%, $p<0.001$) and it had an increasing trend (frequent stress situations stated 32.8% of students in 1992, and 50.2% in 2001, $p<0.001$). Positive family history occurrence also increased (31% in 1992; 45.3% in 2001, $p<0.001$), also the use of hormonal contraception had increasing trend in women (0.5% in 1992; 22.6% in 2001, $p<0.001$).

In the 90-ties the nutrition of students has been changed considerably (meat consumption decreased by 19%, milk by 24%, fruits by 15%; cereal products consumption increased by 32%) preserving the typical intersexual consumption differences. Higher energy, protein (especially animal protein), fat, cholesterol and salt intake in men and some vitamins and minerals deficiency together with adequate energy intake in women were observed. Energy balance in men was 1.12 MJ, in women 0.6 MJ. Positive energy balance in men is also due to decrease of sport activities in the last years.

Conclusion: Excessive intake of risky nutrients and protective nutrients deficiency in food, low level of physical activity, smoking and stress load were observed in our group of university students. During the years 1992-2001 positive as well as negative trends in life style risk factors occurrence were recorded in students. Dynamic changes in life style and nutrition of inhabitants which are the part of social and economic transformation in Slovakia could significantly affect the cardiovascular risk profile development in the Slovak population.

Abstract # 10718

EFFECTS OF AMBIENT AIR POLLUTION ON DAILY MORTALITY IN A COHORT OF PATIENTS WITH STROKE IN SEOUL, KOREA

Ho-Jang Kwon¹, Yun-Chul Hong², Jong-Tae Lee³, Ho Kim⁴, Soo-Hun Cho⁵

¹Department of Preventive Medicine, Dankook University College of Medicine, Cheonan, Korea

²Department of Occupational and Environmental Medicine, Inha University College of Medicine, Incheon, Korea

³Institute of Environmental and Industrial Medicine, Hanyang University, Seoul, Korea

⁴Department of Epidemiology and Biostatistics, School of Public Health and Institute of Public Health and Environmental Science, Seoul National University, Seoul, Korea

⁵Department of Preventive Medicine, Seoul National University College of Medicine, Seoul, Korea

Background: Many studies have shown that the elevated risk of death associated with short-term increases in air pollution is primarily due to cardiovascular mortality. However, the relation between stroke and air pollution has not been adequately studied. This study was planned to test the hypothesis that patients with stroke are susceptible to harmful effects of air pollution.

Method: The authors investigated the association between air pollution and daily mortality of patients with stroke among residents of Seoul, Korea. To construct a cohort of stroke patients, all admissions with a primary discharge diagnosis of stroke (ICD-10 code, I61-I63) in Seoul were selected from the medical insurance file for the period 1994 through 1996. We tracked each patient from the first day of admission to the last day of 2000, and the vital status was ascertained by linking records with the mortality database. We used a case-crossover study design. For each subject, 1 case period was matched to 2 control periods exactly 1 week apart before and after the date of death. Weather variables such as temperature, relative humidity, and barometric pressure on the same day were included in the model. We used the daily mean levels for each pollutant from the same day as exposure measures.

Results: The odds ratios and 95% confidence intervals (CIs) for an interquartile range (IQR) increase of particulate matter less than 10 μm in diameter (IQR=41.2 $\mu\text{g}/\text{m}^3$), carbon monoxide (IQR=0.57 ppm), nitrogen dioxide (IQR=15.0 ppb), sulfur dioxide (IQR=8.4 ppb), and ozone (IQR=20.7 ppb) were 1.085 (95% CI = 1.013-1.161), 1.081 (95% CI = 0.997-1.171), 1.069 (95% CI = 0.982-1.163), 1.044 (95% CI = 0.957-1.138),

and 1.058 (95% CI = 0.978-1.144), respectively.

Conclusion: We found that daily variation in ambient air pollution was associated with the increased risk of death in the stroke patients. This finding suggests that short-term effect of air pollution on mortality involve cerebrovascular system.

10839 - Heart Rate Variability (HRV) changes associated with ambient air pollution in two sensitive cohorts living in Atlanta, GA.

*Amanda Wheeler¹, Joel Schwartz¹, Antonella Zanobetti¹, Diane Gold², Helen Suh¹

¹Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115,

²Channing Laboratory, Brigham & Women's Hospital, 181 Longwood Avenue, Boston, MA 02115

Recent research conducted in Boston¹, Utah Valley² and Baltimore³ have shown significant associations between ambient particle exposures and decreased heart rate variability (HRV). To examine further the short term effects of exposure to particulate matter on HRV, an exposure and cardiovascular health study was conducted in Atlanta, GA during Fall 1999 and Spring 2000.

HRV for each participant was measured for seven consecutive monitoring days during each season following the same 35-minute protocol as in the Boston HRV study.¹ Thirty one individuals were included in the study, 19 of the participants had moderate to severe physician diagnosed chronic obstructive pulmonary disease, 12 of the participants were 3-12 months post-MI.

A hierarchical model was fit in which the effect of PM_{2.5} on SDNN in each participant was allowed to vary about the population mean slope. These random slopes were assumed to vary with the participant characteristics. The second stage model examined lung function, baseline heart rate, blood pressure and medicine use as explanatory factors of the heterogeneity in response. The hierarchical model was fit using the lme function in Splus in a single stage.

We found that the effect of PM_{2.5} on HRV was modified by lung function. For participants with FEV₁ more than 60% of predicted, PM_{2.5} was associated with reduced SDNN (-5.2%, 95%CI: -10.3 – -0.03 per 10µg/m³). As lung function decreases, the association between PM_{2.5} and SDNN rose, where for participants with FEV₁ below 60% of predicted, the effect was reversed (7.5%, 95%CI 2.44 – 12.53 per 10µg/m³).

References:

1. Gold, D.R., Litonjua, A., Schwartz, J., Lovett, E., Larson, A., Nearing, B., Allen, G.A., Verrier, M., Cherry, R. & Verrier, R. 2000 'Ambient Pollution and Heart Rate Variability' *Circulation*, 101:1267-1273
2. Pope C.A., Verrier R.L., Lovett E.G., Larson A.C., Raizenne M.E., Kanner R.E., Schwartz J., Villegas G.M., Gold D.R. & Dockery D.W. 1999 'Heart Rate Variability Associated with Particulate Air Pollution' *American Heart Journal*, 138, 5 pt 1, 890-899
3. Creason J., Neas L., Walsh D., Williams R., Sheldon L., Liao D. & Shy C. 2001 'Particulate Matter and Heart Rate Variability among Elderly Retirees: The Baltimore 1998 PM Study' *Journal of Exposure Analysis and Environmental Epidemiology*, 11(2) 116 – 122.

RISK ASSESSMENTS FOR CARDIOVASCULAR DISTURBANCES TO MINERS EXPOSED TO VIBRATION

L.D.Tamaian, Md.Ph.D.

Prophylactic Medicine Center, Cluj-Napoca, Romania

Objectives

We intended to clarify the effect of vibration professional exposure on cardiovascular system of miners.

Methods

374 miners, working in an ore mining area, were investigated to evaluate the prevalence of ischemic heart disease, the high blood pressure and parodontitis. They were assigned to three groups: 174 subjects exposed to vibration, with signs of Raynaud's phenomenon, (group A), 100 with similar exposure, without Raynaud's phenomenon (group B), and the other 100, who were not exposed, representing the control group (C). The three groups were similar from the standpoint of age, years of working, smoking habits, and hereditary risk factors for ischemic heart disease. Raynaud's phenomenon was evaluated on basis of history, physical examination, skin thermometry and cold test. There were performed electrocardiograph tracing, blood pressure, gum thermometry and cardiovascular functional tests.

Results

The relationship expressed as prevalence was examined by the χ^2 test and the differences between means by the student's t-test. There was a statistic significance between the groups A, B and C respectively, concerning the HTA: p (A-C)=0,001; p (B-C)=0,00069; EKG modifications: p(A-C)=0,00021; p(B-C)=0,009; cardiovascular functional test: p (A-C)= $1,7 \times 10^{-5}$; p (B-C)=0,00088.

Conclusions

The results of this study suggest that there is a relation between exposure to vibration and cardiovascular disturbances.

10856 - Daily air pollution effects on cardiac arrhythmias in patients with implanted cardioverter defibrillators

Heike Luttmann-Gibson¹, Diane R. Gold^{1,2}, Mark Link³, Murray A. Mittleman^{1,4}, David Q. Rich¹, Joel Schwartz^{1,2}, Richard L. Verrier^{1,4}, Douglas W. Dockery^{1,2}

¹Department of Environmental Health, Harvard School of Public Health, Boston, MA

²Channing Laboratory, Harvard Medical School, Boston, MA

³New England Medical Center, Tufts University School of Medicine, Boston, MA

⁴Beth Israel Deaconess Medical Center, Boston, MA

Implanted cardioverter defibrillators (ICD) monitor for cardiac arrhythmias and can initiate a therapeutic intervention. These devices also provide a record of the dates and times of the arrhythmias and electrograms of these events. We examined the effects of air pollution on 257 cardiac patients with ICD devices among a cohort of patients followed at the New England Medical Center in Boston between September 1995 and March 2001. Fine particle and gaseous air pollutant and meteorological data were available on an hourly basis. Date and time of detected arrhythmias, electrograms, and therapeutic interventions were downloaded during the patients' regular follow-up visits at intervals, on average every 3 months. Arrhythmias were categorized into ventricular and supraventricular events by review of electrograms. Subject-specific episodes were defined as one or more ICD detected arrhythmias on a given day, separately for ventricular and supraventricular events. A total of 104 patients with mean follow-up of 2 years had 383 ventricular and 87 supraventricular episode-days. Risk of ventricular and supraventricular arrhythmias associated with air pollution was estimated with logistic regression, adjusting for season, temperature, relative humidity, and day of the week. Increased risks of supraventricular arrhythmias were associated with an increase in 24 hour mean PM_{2.5} air pollution of 8.2 µg/m³ (interquartile range) on the same day (OR=1.48, 95% CI: [1.01,2.18]) and on the previous day (OR=1.62, [1.10,2.39]) and with an increase in CO of 0.2 ppm on the same day (OR=1.23, [0.96,1.57]) and on the previous day (OR=1.30, [1.03,1.65]). The Odds Ratios for ventricular arrhythmias were estimated as OR=1.07 [0.91,1.26] for PM_{2.5} on the same day, OR=1.03 [0.99,1.22] for PM_{2.5} on the previous day, OR=0.97 [0.86,1.10] for CO on the same day, and OR=0.99 [0.87,1.12]) for CO on the previous day. No significant associations were found between SO₂, NO₂, O₃ and cardiac arrhythmias. These effects are comparable in magnitude to previously reported associations of ICD detected arrhythmias with particulate air pollution. These results suggest that air pollution episodes may trigger cardiac arrhythmias in these particularly susceptible populations. While these ICD devices are specifically designed to monitor and treat ventricular arrhythmias (not supraventricular tachycardias), these results also suggest that air pollution may trigger supraventricular arrhythmias. This study was funded by the Health Effects Institute (98-14), and the National Institute of Environmental Health Sciences (ES-00002 and ES-09825).

PREVALENCE OF CARDIOVASCULAR DISEASE RISK FACTORS IN ONE PERIURBAN SETTLEMENT OF ANKARA, TURKEY

Sabahat Tezcan¹, Hakan Altıntaş², Rıza Sönmez³, Bahar Doğan⁴, Banu Çakır⁵, Ahmet Akıncı⁶, Lale Tokgözoğlu⁷, Oliver Razum⁸

Abstract

Over the last 50 years, important social-demographic and economic changes are occurring in Turkey. Among these, rapid migration from rural to urban areas, industrialisation, decrease in mortality, particularly childhood mortality increase in life expectancy, decline in fertility and change in lifestyle and health related behaviour of the community. These changes lead to increase in risk factors for cardiovascular disease (CVD) among adults in Turkey. Though death registrations are not complete, only 20 percent of deaths were due to CVD in 1960s, it increased to about 50 percent in late nineties.

The basic objective of this study was to determine the extent of CVD risk factors in the community of one periurban district of Ankara and to assess the need for primary level preventive activities directed to major risk factors namely smoking, hypertension and nutrition.

Materials and methods: This cross-sectional study was carried out in Gülveren District of Ankara that is mainly a slum area and where mostly low and middle socioeconomic level people live (total population 23 000). A random sample of 2400 (1200 male and 1200 female) individuals between 25-64 years of age were selected from the records of local health centre. Of these 1672 (736 male- 63.3 %; 936 female-78.0 %) were interweaved, 1252 were physically examined and 1145 bloods were analysed.

Results: Prevalence (%) of risk factors related to CVD was found as follows:

<u>Risk factors</u>	<u>Male</u>	<u>Female</u>
Hypertension	12.4	21.5
Smoking	68. ²	23.7
High cholesterol	17.9	21. ²
Low HDL	6.7	26.3
High LDL	54.1	50.2
High blood glucose	7.8	6.8
High BMI	13.7	46.5

The prevalence of ischemic findings at ECG was 11.2 %. As the number of risk factors per individual increased, the risk of having CHD became also higher. Based on these findings, community-based primary prevention activities were started and details will be presented in the separate paper.

In conclusion, the prevalence of CVD risk factors were found to be high in the study area where mostly families of low socio-economic level and migrants from rural areas were

¹ Prof. of Epidemiology in Hacettepe University, Medical Faculty, Department of Public Health; Director of Hacettepe University Institute of Population Studies

² Assist. Prof., Hacettepe University, Medical Faculty, Department of Public Health

³ Public Health Specialist in Ministry of Health

⁴ Assoc. Prof., Hacettepe University, Medical Faculty, Department of Public Health

⁵ Epidemiologist, Hacettepe University, Medical Faculty, Department of Public Health

⁶ Giessen University, Department of Internal Medicine

⁷ Prof., Hacettepe University, Medical Faculty, Department of Cardiology

⁸ Heidelberg University, Department of Tropical Hygiene and Public Health

residing. Particularly, smoking among males, hypertension, hypercholesterolemia (low HDL) and high body mass index were prevalent among females. In the beginning of new century, unhealthy life style and behaviours have been becoming widespread in Turkey and though some efforts started, weight and nationwide extensive intervention activities directed to primary prevention of these risk factors shall be immediately started.

Key Words: Cardiovascular Disease, Prevalence, Turkey

BIOLOGICAL INDICATORS OF STRESS IN LORRY DRIVERS

BERGOMI M, VIVOLI R, ROVESTI S, MALAGOLI C, PECONE LF, VIVOLI G. Department of Hygiene, University of Modena and Reggio Emilia, Via Campi 287, 41100 Modena, Italy

Objectives - In professional drivers, cardiovascular diseases are the most common causes of illness and early retirement. To elucidate the extent of stress reaction during driving we have designed a study to assess neuroendocrine and metabolic responses induced in heavy-vehicle drivers by mental and physical stressors.

Methods - The study was carried out on lorry drivers engaged in long-distance work. The drivers recruited for the survey were submitted to the following measures: personality traits (Big Five Questionnaire, State-Trait Anxiety Inventory), biochemical markers of stress (catecholamine and cortisol in urine) and biochemical modulators of platelet function (thromboxane and prostaglandin in urine). Drivers were studied both before and at the end of shift-work, taking into account road, traffic and weather conditions.

Results - Catecholamine and cortisol levels were significantly higher at the end of shift-work compared to values measured before departure. Thromboxane levels have shown a notable increase at the end of the shift-work compared to levels measured before, while no difference was observed for prostaglandin. A significant relationship between noradrenaline and thromboxane was observed before departure, but not at the end of shift-work.

Conclusions – The marked activation of neuroendocrine system demonstrates that the long-term driving of a lorry represents a psychophysical stress. The finding of higher levels of thromboxane measured at the end of shift-work suggests that this pattern might be related to stressful conditions linked to drive. Since this marker of vascular function play an important role in the vasoconstriction and platelet aggregation, the increase of thromboxane might be proposed as a predictive factor of cardiovascular risk.

Personal, indoor and outdoor PM_{2.5} and its elemental composition associated with heart rate variability.

de Hartog JJ¹, Lanki T², Janssen N¹, Hoek G¹, Pekkanen J², Timonen K², Tarkiainen T³, A Peters⁴, Brunekreef B¹.

¹*IRAS, Utrecht University, the Netherlands;*

²*National Public Health Institute, Kuopio, Finland;*

³*Kuopio University Hospital, Finland;*

⁴*GSF-National Research Center for Environment and Health, Neuherberg, Germany*

From clinical studies is known that decreased heart rate variability (HRV) is a predictor for mortality in subjects with prior myocardial infarction. This might give the explanation for the observed cardiac mortality during high air pollution days, since it has been hypothesized that ambient air pollution is able to modify the autonomic nervous control of cardiac rhythm. Within the framework of the ULTRA study, heart rate variability was measured in 84 elderly subjects with pre-existing coronary heart disease in Amsterdam and Helsinki during the winter 1998/1999. Every biweekly visit, ambulatory ECG was recorded during a standardized protocol including a paced breathing period and an exercise test. Both time domain (like standard deviation of the normal beat to beat interval (SDNN)) and frequency domain (like high frequency (HF) power (0.15 to 0.4 Hz)) measures of HRV were obtained.

Indoor ($N_{\text{amsterdam}}=413 / N_{\text{helsinki}}=504$) and personal PM_{2.5} ($N_{\text{amsterdam}}=335 / N_{\text{helsinki}}=329$) were measured on the day preceding the clinical visit. Daily outdoor air pollution ($N_{\text{amsterdam}}=429 / N_{\text{helsinki}}=513$) was measured on a fixed site. Absorbance was determined for all the collected dust samples. Furthermore, elemental composition of all outdoor samples and part of the indoor and personal samples was determined.

In Amsterdam and Helsinki the 24h median(max) PM_{2.5} outdoor concentration was 16.9(82.2) and 10.6(39.8) [$\mu\text{g}/\text{m}^3$] with an absorption coefficient of 15(55) and 19(78) [$*10^{-6}$], respectively. Indoor 24h median PM_{2.5} concentrations were 14.9 [$\mu\text{g}/\text{m}^3$] in Amsterdam and 10.2 [$\mu\text{g}/\text{m}^3$] in Helsinki. Fixed effect linear regression adjusted for subject, trend, temperature, relative humidity, ambient pressure and weekday of the visit was used to assess the relationship between air pollution and HRV.

Outdoor PM_{2.5}, reflectance and elemental composition were not associated with decreased SDNN in both centers. However, there was some suggestion of an effect on the HF component of HRV in the higher lags of PM_{2.5} but not in the lower lags, and some elements (iron, sulfur, potassium, copper) were stronger related to HF. Indoor and personal exposure to PM_{2.5}, absorbance and elemental composition were not associated with HF, which is consistent with the observations in outdoor as no lags were available for these exposure variables. The results suggest that the response to outdoor PM_{2.5} may be affected by the elemental composition of the ambient PM_{2.5}.

11120 - HEALTH EFFECTS OF AIR POLLUTION ON PATIENTS WITH ISCHEMIC CARDIOPATHY IN MEXICO CITY

Horacio Riojas Rodríguez

José Antonio Escamilla Cejudo

Jesús Antonio González Hermosillo¹ Leonora Rojas Bracho

Mayte Vallejo Allende¹

BACKGROUND. Epidemiological studies have shown high mortality rates on elders with cardiopulmonary diseases related with high particulate matters and carbon monoxide concentrations in Mexico City. (Borja; Escamilla, 2000). Atmospheric pollutants has been postulated as a triggers of myocardial infraction. Heart rate variability (HRV) has been used as early indicator of myocardial dysfunction. Mexico City is one of the more polluted cities in the world.

OBJECTIVE: To asses the role of personal exposure to air pollutants on the risk of acute cardiac events in Mexico City residents with cardiac ischemia; specifically the purpose was to asses the relative contribution of respirable particles (pm2.5) and carbon monoxide (CO) to produce heart rate variability modifications and eventually ischemic signs or cardiac arrhythmia in susceptible patients. Another aim is To develop a personal exposure model for pm2.5 an CO in susceptible adult subjects

METHODS.

STUDY DESIGN.

A Follow-up study was carried out with 30 patients with ischemic cardiopathy. The design of the study is a Case-crossover defining a case period when the HRV's parameter are under "normal" values. Normal values were used for the square root of the mean of the sum of the square differences between adjacent normal to normal intervals in the electrocardiograph trace .(RMSSD) in the time domain measurements. Pm2.5 and CO concentration were measured in five minutes periods using personal monitors during ten hours as well as holter monitoring for the analysis of HRV

RESULTS

Preliminary results show that the mean pm 2.5 concentration was 64 (1-551) $\mu\text{g}/\text{m}^3$ and mean of CO was 3.45 (1.45-12.25) ppm. The mean of pm2.5 when Rmssd was less than 15.1 was 40 $\mu\text{g}/\text{m}^3$ and 24 $\mu\text{g}/\text{m}^3$ when Rmssd was more than 15 being this difference statically significant. The following statistical analysis will show if this differences persist after adjusting for other variables and if they are consistent when we perform the frequency domain analysis of HRV.

