

**10001 - In utero and environmental tobacco smoke exposure:
A risk factor for allergic sensitization in childhood?**

Kulig M¹, Keil T¹, Lau S², Nickel R², Grüber C², Niggemann B², Willich S¹, Wahn U²

Charité Hospital, Humboldt University Berlin, Germany:

¹ Institute of Social Medicine, Epidemiology and Health Economics

² Department of Pediatric Pneumology and Immunology

Objective: There is only insufficient and conflicting evidence about the influence of intrauterine and postnatal tobacco exposure on the immune regulation such as allergic sensitization. Therefore, we investigated the effect of in utero (IUT) and environmental tobacco smoke (ETS) exposure on the development of allergic sensitization during the first 7 years of life.

Methods: In a prospective, multicentre birth cohort study in Germany (Multicentre Atopy Study [MAS] with n = 1314 newborns), outcome and exposure were annually assessed: IUT and ETS exposure by questioning of parents' smoking habit, and allergic sensitization by specific IgE measurement. Children were regarded as sensitized if specific IgE ≥ 0.35 kU/l (Pharmacia CAP) was detected to at least one of the tested allergens (milk, egg, soy bean, wheat, birch, grass, mite, cat, or dog). In addition to IUT exposure, 4 different ETS exposure categories were compared: 1. never, 2. irregularly by father only, 3. irregularly by mother +/- father, and 4. continuously by mother +/- father from birth to the respective year of age.

Results: At 7 years participation rate was 72%. Prevalence of allergic sensitization increased with age from 16% to 41% at 7 years. Since genetic predisposition is currently the most important risk factor for atopy we stratified our analysis by atopic family history. In children with at least one atopic parent, occurrence of allergic sensitization, total sum of specific IgE to the various tested allergens, and the total number of positive tests were significantly associated with IUT exposure and consistent passive ETS after birth ($p < 0.05$). In the multivariate longitudinal data analysis (using random effects models adjusting for education, duration of breast feeding, number and order of siblings, pets and allergen levels at home), IUT and motherly ETS exposure only slightly increased the risk of allergic sensitization (OR=1.8, 95% C.I.: 1.1-2.8). However, this effect was confined to the first 3 years of age whereas in older children no significant association between tobacco exposure and sensitization was found. Consistent risk factors of allergic sensitization throughout all age groups were positive atopic family history (OR=2.1, 95% C.I.: 1.5-2.9) and male sex (OR=1.5, 95% C.I.: 1.2-2.0).

In conclusion, during the first 3 years of life IUT and consistent ETS exposure have an adjuvant effect on the development of allergic sensitization. However, this effect is transient and restricted to children with a genetic predisposition for allergy.

10358 - Maternal smoking in pregnancy, fetal development, and childhood asthma

Jouni J.K. Jaakkola^{1,2} and Mika Gissler³

¹ Environmental Health Program, The Nordic School of Public Health, Göteborg, SWEDEN, ² Head, Environmental Epidemiology Unit, Department of Public Health, University of Helsinki, Helsinki, FINLAND, ³ National Research and Development Centre for Welfare and Health, Helsinki, FINLAND

Objective: We elaborated the relations between maternal smoking in pregnancy, fetal development, and the risk of asthma during the first 7 years of life in a cohort of Finnish children born in 1987.

Methods: We identified 58,841 singleton births from the nationwide birth registry and followed them through registries for 7 years. The Birth Registry information provided categorical information on the mother's smoking during pregnancy, categorized into: no smoking as a reference, low (<10 cigarettes per day) and high exposure (>10 cigarettes per day).

Results: In logistic regression, maternal smoking in pregnancy was a strong determinant of low birth weight (adjusted odds ratio = 2.23, 95% confidence interval=1.91-2.61 for high exposure), small-for-gestational age (3.74, 3.15-4.43), and preterm delivery (1.45, 1.26-1.68). Low birth weight (1.83, 1.50-2.24) and preterm delivery (1.64, 1.38-1.95) increased the risk of asthma, whereas small-for-gestational age (0.92, 0.66-1.30) did not. Maternal smoking increased the risk of asthma (1.23, 1.07-1.42 for low exposure, 1.35, 1.13-1.62 for high exposure). Adjustment for birth weight and gestational age reduced the effect estimates into 1.20 (1.04-1.38) and 1.31 (1.09-1.58) correspondingly.

Conclusions: Maternal smoking in pregnancy, low birth weight and preterm delivery are independent determinants of the risk of asthma during the first 7 years of life.

10629 - Nicotine in House Dust from Homes with Infants: Relation to Smoking Behavior of Mother

Quintana, P.J.E.¹, Matt, G.E.², Novianti, N.¹, Gehman, C.^{1,2}, Floro, J.²

¹San Diego State University, Graduate School of Public Health, San Diego, CA, USA,

²San Diego State University, Department of Psychology, San Diego, CA, USA

Environmental tobacco smoke has not been widely investigated as a potential source of pollutants in house dust. Infants in homes where parents smoke may be exposed to ETS through dermal absorption, ingestion or re-suspension of house dust in addition to direct inhalation of ETS. This study measured nicotine as a marker for ETS in house dust samples collected by vacuum (HVS3 sampler) and also by wipe sampling of home surfaces using a method developed for this study. Subjects were mothers with infants 2 – 12 months who were recruited into three groups; Direct Exposure Group (DEG), where mothers smoked in the home, Indirect Exposure Group (IEG), where mothers smoked but not around the infant, and Non-Exposure Group (NEG), where mothers and other household members did not smoke. A total of 49 homes were visited 3 times over a period of a week, and vacuum and wipe sampling was performed in the living room as well as baby's sleeping room. A personal interview was also conducted and urine and hair samples collected from the infant. The total number of cigarettes smoked per week of the study was similar between the DEG and IEG groups (59.3 vs. 50.3 cig/week). Nicotine analysis in wipe and dust samples was performed by liquid extraction followed by GC-MS analysis, using commercially available isotopically labeled nicotine (methyl d₃-nicotine) as an internal standard. Nicotine levels in wipe samples were significantly higher in homes where the mother smoked around the baby than in homes where the mother smoked but did not smoke around the child. Nicotine levels were also significantly higher in the living areas than in the baby's sleeping areas. No nicotine was detected in wipe or dust samples from homes of non-smoking mothers (IEG group). For wipe samples from the living room, 79% of homes in the DEG group were above the detection level for nicotine as compared to 30% of the IEG group. For vacuum samples, 40% of the DEG dust samples were above the detection level as compared to 33% of the IEG group. Loading of surfaces was much higher in wipe samples than in vacuum dust samples (for living area, DEG group, means were 50.4 ug/m² vs. 0.10 ug/m² respectively). Our results indicate that the wipe method is preferable to the vacuum method for assessing nicotine in house dust, as wipe sampling is simpler and appears more sensitive; 100% of the houses with positive vacuum samples were also positive for wipe samples whereas only 56% of the wipe samples were also positive for vacuum samples. Our results indicate that wipe sampling of home surfaces for nicotine as a marker for ETS is feasible and simple, and that nicotine levels detected by wipe sampling are related to smoking behavior.

10699 - Passive Smoke Exposure In Restaurants and Nightclubs in Bangkok, 2001

Naowarut Charoenca¹, Nipapun Kungskulniti¹, Stephen Hamann², Prangchai Settachan³, Noppaseth Wansumrith³, Santi Hemsri³, Sorakom Santhana¹, Anurat Tanapanyanon¹

¹Faculty of Public Health, Mahidol University, Bangkok, Thailand

²Faculty of Medicine, Rangsit University, Bangkok, Thailand

³Armed Forces Research Institute of Medical Sciences (AFRIMS), Bangkok, Thailand

Purpose: To determine exposure levels of carbon monoxide and nicotine indicating occupational risk in nightclubs and restaurants with heavy smoking and designated smoking and no-smoking areas. Nicotine levels in smoking and no-smoking areas, where there is no physical separation, are also compared.

Population: Two nightclubs and restaurants where smoking is prevalent were monitored using an active CO recorder/data logger and passive nicotine sampler. Both personal samplers on employees and in fixed locations were used for nicotine monitoring.

Methods: Primary collection of data was made using a CO monitor with an automatic data logger, later downloaded into a computer, and through nicotine analysis of static and personal samplers using HPLC (High Performance Liquid Chromatography) for analysis. One hundred and twenty-two samplers were collected for nicotine analysis and readings of CO levels were downloaded to characterize worker exposure levels.

Results: Highest CO and nicotine levels were in nightclubs (75 ppm CO and 144.4 micrograms/cubic meter mean nicotine) and restaurants with heavy smoking (20 ppm CO and 75.3 micrograms/cubic meter mean nicotine). Results from personal, employee samplers in nightclubs and restaurants with heavy smoking resulted in similar or slightly lower nicotine findings (148.8 and 65.8 micrograms/cubic meter mean nicotine, respectively). These levels are many times higher the exposure level projected to cause significant workplace risk, 6.7 micrograms/cubic meter, in risk models for working lifetime exposures in occupational settings. When comparing the concentrations of nicotine in smoking and no-smoking areas with no physical separation in two restaurants, there is no statistical difference. This indicates that nicotine, as well as other pollutants in cigarette smoke, is evenly dispersed throughout the restaurant.

Conclusion: Heavy smoking venues had very high CO and nicotine levels. These findings indicate that employees in these venues have significant occupational risk from passive smoke. A no-smoking area located in the same contiguous space as a smoking area did not prevent exposure to pollutants from cigarette smoke.

Implications: High exposure to passive smoke results in increased risk for lung and sinus cancer and heart and vascular disease. Regulatory measures to restrict smoking with public education programs are necessary to reduce this significant risk to worker health.

Keywords: passive smoke, second hand smoke, restaurant, nightclub, carbon monoxide (CO), nicotine, workplace, exposure

10871 - Environmental Tobacco Smoke from Smoking Conventional and Electrically Heated Cigarettes

R.W. Lau, D.J. Hirnikel and H.J. Roethig

Philip Morris USA, Richmond, VA, USA

As a measure of environmental tobacco smoke, respirable suspended particulate (RSP), carbon monoxide (CO) and total volatile organic compound (TVOC) concentrations in air were measured in a ventilated room during the smoking of conventional cigarettes and electrically heated cigarettes by adult human subjects. For each type of cigarette tested, 20 cigarettes were consumed during the course of about 45 minutes. Real time particle monitor and multi-gas analyzer were used to record data before, during and after the smoking period. Compared to conventional cigarettes, concentrations of RSP and CO during the smoking of electrically heated cigarettes were both reduced to the order of $\geq 90\%$. TVOC levels measured for the conventional cigarettes were just above the level of quantification of the instrument, but were not quantifiable when the electrically heated cigarettes were smoked or when no smoking took place.

10877 - Environmental Tobacco Smoke Exposure Measurement Quality and its Impact on Estimated Breast Cancer Risks

*KC. Johnson, S Pan. (Centre for Chronic Disease Prevention and Control, Health Canada, Ottawa ON K1A 0L2)

Spousal exposure has been the central measure of passive smoking in most epidemiologic studies examining its relationship to cancer risk. For lung cancer this has resulted in conservative measures of risk in most instances. Here, we examine the impact on the risk of breast cancer in lifelong non-smoking women exposed to passive smoking and in women who have smoked compared to women never regularly exposed to tobacco smoke. We located and summarized results from 10 published breast cancer studies that collected information on passive smoking and met basic study quality criteria. Analyses focused on the sensitivity of risk estimates to the quality of the passive smoking exposure assessment. Estimated summary passive smoking risk among women who had never smoked was 1.61 (95% CI 1.26-2.05) for all 10 studies. Risk estimates, however, were heterogeneous. For studies with incomplete coverage of major sources of lifetime passive exposure, the summary risk was 1.17 (95% confidence interval (CI), 0.85-1.60); when major sources of passive exposure were collected the risk estimate was 1.73 (95% CI 1.34-2.21). The passive smoking risk estimate for premenopausal never smokers (7 studies) was 2.45 (95% CI 1.89-3.17). The summary estimate for women who had smoked was 1.68 (95% CI 1.22-2.32) when compared to women never regularly exposed to tobacco smoke. Summary risk estimates were again heterogeneous with incomplete passive exposure assessment, active smoking risk was estimated at 1.17 (95% CI 0.85-1.60); with more complete exposure assessment, 2.14 (95% CI 1.56-2.92). More studies of passive and active smoking and breast cancer are needed that quantify the major lifetime sources of passive smoking and explore the biological mechanisms that might explain the similarity of the passive and active risk.

10914 - Passive and Active Smoking and Adult Glioma

Johnson KC, Hu J, Pan S, Fincham S, Mao Y, and The Canadian Cancer Registries Epidemiology Research Group

Risk factors for adult brain cancer are poorly understood. We conducted a case-control study to investigate the relationship between passive smoking and adult brain cancer. The analysis included 308 male and 199 female patients with newly diagnosed primary glioma and 1,178 frequency-matched population control subjects who provided a lifetime residential and occupational passive smoking history. Regular passive smoke exposure at home or at work was associated with increased risk of glioma in never-smoking women (risk factor adjusted odds ratio 2.39 (95% confidence interval (CI) 1.1-5.2) but not among never-smoking men (OR 1.10 (95% CI 0.6-2.0). The adjusted OR for those who had actively smoked compared with those who were never actively or passively exposed was 1.82 (95% CI 0.8-3.9) for women and 0.80 for men (95% CI 0.5-1.5). Among never smoking women there was a dose-response relationship with total years of residential and occupational passive exposure (two-sided test for linear trend $P=0.01$). Adjusted OR's for 1-23, 24-45 and ≥ 46 years of passive exposure were 1.85 (95% CI 0.8-4.4), 2.35 (95% CI 1.0-5.7) and 3.27 (95% CI 1.2-8.8). Dose-response relationships were not evident for active smoking among women. Passive and active smoking may be associated with increased glioma risk in women.

11026 - Passive Smoking in Nonsmoking Sections of 71 Indiana Restaurants

S. Katharine Hammond and Charles Perrino
University of California, Berkeley

Restaurants are one of the important public places where nonsmokers may be exposed to second hand smoke (SHS). In response to nonsmokers' concerns about this exposure, a variety of smoking restrictions have been introduced in restaurants across the USA in the past two decades, the most common of which is to establish smoking and nonsmoking sections. However, the efficacy of such segregation is in some dispute. At the request of Smoke Free Indiana we conducted a study of the passive smoking that children might experience while seated in the nonsmoking section of family restaurants. Volunteers from the local and state sections of Smoke Free Indiana visited family restaurants during the dinner hour and requested a seat in the nonsmoking section. A standardized data collection sheet was used to record information on the restaurant and its occupants. Nicotine was collected on glass fiber filters treated with an aqueous solution of sodium bisulfate and glycerin with air drawn at 150 ml/min through quiet, lightweight air sampling pumps for one to two hours. The filter was extracted with aqueous 5% ethanol solution, the pH adjusted, and nicotine was concentrated into heptane and analyzed with GC/NPD. The analytical detection limit for airborne nicotine in these samples was 0.07 ug/m^3 . Personal samples of SHS exposure were collected from 71 restaurants in 26 cities in Indiana. The restaurants ranged in size from 50 seats to 400 seats, with a median value of 160 seats. The average number of smokers observed during sampling ranged from 0 to 22, with a mean of 3.5 and a median of 2; an average of one or fewer smokers was reported at 23 of the restaurants, but at 18 restaurants 5 or more smokers were observed, on average. Nicotine concentrations during the dinner hour ranged from 0.016 to 26.7 ug/m^3 , with a median of 2.2 and a mean of $3.7 \pm 5.1 \text{ ug/m}^3$. Special ventilation, which was used by 22% of the restaurants, reduced the variability but not the average concentration. In 15 of the restaurants the smoking sections were in a separate room, in 5 restaurants there was a full partition between the sections, and in 33 restaurants there were partial partitions. Neither special efforts to add ventilation nor any of the methods used to separate smokers from nonsmokers were effective in eliminating second hand smoke in the nonsmoking sections; the concentrations remained higher than the weekly average concentrations found in the homes of smokers. These results have important public health significance because family restaurants were targeted, and children are particularly susceptible to the adverse health effects of passive smoking.