10071 - AN ANALYSIS OF CHILDHOOD ASTHMA NEAR NPL SITES IN UTAH

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The purpose of this study is to evaluate the spatial relationship between childhood asthma and NPL sites in Utah. The mapping of environmental hazards and the residences of hospitalized childhood asthma cases allow for the assessment of asthma hospitalization incidence in Utah and the spatial correlation to environmental hazards. Hospital admission/discharge data was obtained from 14 urban area hospitals for the years of 1990-1999. Case addresses at the time of hospital admission were geocoded using ArcView GIS. Annual incidence rates of children hospitalized for asthma were calculated for each census tract in each of the four counties for Utah children 0-14 years old derived from the 1990 and 2000 U.S. census data for Utah. The annual incidence of each census tract was then compared with annual incidence rate for the same population group for the remainder of the county as a proportional incidence ratio (PIR). The PIR was considered significant when the lower confidence limit was greater than one. The Local Moran's I and the Getis-Ord tests were used to detect clusters of disease that are less pronounced and spread over several adjacent census tracts. Any tracts that displayed significant clustering tendencies in all three statistical tests (PIR, Gedis-Ord, and Moran's I) were analyzed further to determine their relationship to NPL sites. The Lawson-Waller score test was used to assess the strength of association of a spatial pattern of asthma cases to a specified geographic location or focus, such as an NPL site. A Lawson-Waller Score with a lower 95% confidence limit above the expected value was considered a significant indicator of disease association to the focus. Any significant tracts within a one-mile radius of these NPL sites were then identified as having a possible relationship with the site. Significant clustering of asthma cases was identified in four census tracts. All four tracts are located in Salt Lake County and within a one-mile radius of one of three NPL sites. This data suggest a possible association of increased asthma rates in children and their proximity to NPL sites. Further study is needed to evaluate confounding factors, such as socioeconomic and climatologic influences. (This study is supported by Cooperative Agreement Number U50/ATU887580 from the Agency for Toxic Substances and Disease Registry)

10284 - Socioeconomic status, thoracic particulate matter and asthma hospitalization in Vancouver

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Objectives. To assess the association between thoracic particulate matter (PM_{10}) and asthma hospitalization among children and its difference related to socioeconomic status.
Methods. Study population were children 6-12 years of age living in Vancouver from 1995 through 1998. There were a total of 1,575 hospital admissions with asthma as a primary diagnosis. Exposures averaged over periods ranging from one to seven days were used to assess the effect of PM on asthma hospitalization in time-series analysis. Relative risk estimates of asthma hospitalization adjusted for daily weather conditions (maximum and minimum temperatures, and average relative humidity) were calculated for an incremented exposure of 8.15 $\mu g/m^3$ corresponding to the interquartile range in PM_{10}. Socioeconomic status (SES) was measured as an average household income in each enumeration area for average household size based on census data.
Results. Overall, PM_{10} averaged over 4- to 7-days was significantly associated with asthma hospitalization. The relative risk (RR) increased with increasing number of days of exposure (RR for 1 day: 1.05, 95% CI: 0.97, 1.14 ; RR for 7 days: 1.22: 95% CI: 1.06, 1.40). The effect of PM_{10} was significant in the low SES group, but not in the high SES group.

Table. Adjusted relative risk (95% confidence interval) for thoracic particulate matter related to asthma hospitalization

SES	4 days	5 days	6 days	7 days
Total	1.17(1.04,1.32)	1.18(1.05,1.34)	1.20(1.06,1.37)	1.22(1.06,1.40)
Low	1.17(1.00,1.36)	1.18(1.00,1.39)	1.20(1.01,1.43)	1.23(1.03,1.47)
High	1.18(0.99,1.40)	1.19(0.99,1.43)	1.20(0.99,1.47)	1.20(0.98,1.48)

Conclusions. The data suggest that PM_{10} has a significant impact on asthma hospitalization in low SES children even in a less polluted area.

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10332 - Parental atopy modifies the effect of early endotoxin exposure on sensitisation risk in infants

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Background: Endotoxin has well-known immunomodulatory as well as strong inflammatory properties. Whether endotoxin exposure in childhood may protect against atopy development is currently debated. Objective: To assess whether the effect of early endotoxin exposure on atopy development in infants differs according to infant's risk status due to parental atopy. Methods: In the ongoing birth cohort study LISA, endotoxin concentration in dust samples from mother's mattresses at infant's age of 3 months was analysed by the LAL method. Lifetime prevalences of atopic dermatitis and repeated wheeze were calculated from questionnaire data until the age of 2 years for 1942 children (79% of the initial cohort). Atopic sensitisation at age 2 was determined by measuring serum IgE specific to food and inhalant allergens (RAST-FEIA-CAP method) for 1553 children (64% of the initial cohort). Odds ratios for the association between endotoxin exposure (lowest quartile as reference) and outcomes were calculated by logistic regression, stratified by parental atopy and adjusted for gender, study region, breast feeding, siblings, parental education, and smoking during pregnancy. Results: In children at risk due to parental atopy, moderate to high endotoxin concentrations increased the odds for sensitisation exclusively to inhalant allergens compared to low endotoxin levels (OR for 2nd quartile ($_{Q2}$) 3.17 (95% CI 0.63-16.07), OR_{Q3} 4.80 (1.01-22.89), OR_{Q4} 4.69 (0.99-22.30)). Accordingly, high endotoxin exposure was associated with lifetime prevalence of repeated wheezing (OR_{Q4} 1.72 (1.13-2.62)). Additional adjustment for number of infections and dust levels of cat and mite allergens did not alter the effect estimates. In contrast, endotoxin levels were neither related to sensitisation to food allergens nor to lifetime prevalence of atopic dermatitis. Moreover, no association between endotoxin exposure and atopy was observed in children without parental atopy. Conclusion: Being at risk due to parental atopy modifies the effect of early exposure to endotoxin on sensitisation to inhalant allergens and repeated wheeze. Our data do not indicate a protective effect of endotoxin on atopy development until the age 2 years, but instead suggest an increase in risk for early atopic reactions only against inhalant allergens in children at risk. Thus, our results speak for a more differentiated analysis of endotoxin effects, which takes into account the time and dose of exposure, mode of uptake (oral versus inhaled) as well as susceptibility characteristics.

10383 - Association of summer ozone levels with daily respiratory symptoms and bronchodilator use among children with asthma.

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Background: Exposure to ozone, particularly to the higher levels common in summer air pollution, is a potentially important environmental risk factor for respiratory symptoms in children with asthma. Daily diaries of respiratory symptoms and medication use and daily ozone levels were examined for children with asthma residing in Connecticut and Southern Massachusetts. Methods: Daily exposure to ozone from April 1 through August 31, 2001, was assessed using measurements of the peak, 8-hr rolling average (in ppb) averaged across 11 sites in Connecticut and 3 in Southern Massachusetts. Daily diaries of respiratory symptoms (including wheeze and persistent cough) and medication (including "maintenance" medications such as inhaled or systemic steroids, cromolyn, and leukotriene inhibitors and "rescue" medications such as bronchodilators) were collected for children enrolled in an on-going study of childhood asthma severity. The pool of study subjects were siblings of a birth cohort of 1002 infants. Study inclusion criteria were that at the time of enrollment: the child was < 12 yrs old; had physician diagnosed asthma; and had exhibited respiratory symptoms or used asthma medication within the previous 12 mo. A total of 260 children were enrolled for all or part of the 153 day sampling period. In order to address the potential confounding of maintenance medication use, children were divided into two groups: those who used any maintenance medication (N = 117) and those who did not (N = 143). Time series analyses, with a lag of 1 day and adjusted for maximum daily temperature, were used to evaluate the association between ozone concentration and prevalence of cough, wheeze, or bronchodilator use. Analyses were performed separately for each medication group and each outcome. Results: Mean ozone concentration (peak, 8-hr rolling average) during the sampling period was 60.4 ppb (SD=19.1 ppb, range: 28.4 - 127.4 ppb). On average, study participants were 8.6 yrs old (SD=2.2), male (65%), white (75%, 15% hispanic, 10% black), and were enrolled for 116 days (SD=43, range: 4 - 153 days). Mean daily prevalence of wheeze was 5.9 ± 8.7% for users of maintenance medication and 1.4 ± 3.7% for non-users; 7.8 ± 10.6% vs 2.4 ± 5.1% for cough; and 24.5 ± 31.1% vs 3.2 ± 11.1% for bronchodilator use ($p < 0.0001$ for each). Ozone was associated with increased bronchodilator use, but not respiratory symptoms, among maintenance medication users. Ozone was not associated with respiratory symptoms or bronchodilator use among non-users. Time series analysis, adjusted for maximum daily temperature, predicts that among users of maintenance medication a 50 ppb increase in daily ozone concentration would increase daily bronchodilator use by 2% ($p < 0.04$). Conclusion: These results suggest that children with severe asthma are particularly vulnerable to even moderate increases in the ozone levels in summer air pollution.

10482 - Evaluation of the shape of the exposure response relationship for rat allergen exposure

The shape of the exposure response relationship for sensitization to rat allergens has been studied in a cohort of more than 450 laboratory animal workers. The population has been studied and part of the cohort was followed for a two-year period. The medical evaluation involved skin prick testing to occupational and work related allergens, serology (IgG_4 and IgE against rats at baseline), respiratory questionnaire and spirometry. Exposure levels were characterized by more than 500 dust measurements and subsequent analysis for rat allergen content using an immuno-assay. These data were used for creation of a job exposure matrix that described average allergen concentrations by facility and tasks. Data were analyzed using logistic regression analysis and LOESS smoothers. The incidence of a positive skin prick tests (SPT ≥ 3mm) to rat urine or rat hair during 2-years of follow-up was 4.6 per 100 person years (30/658 py^{-1}). The incidence of work-related symptoms was 3.5 per 100 person years (25/714 py^{-1}). A high exposure to allergens (>4 $ngEQ/m^3$.hour/day) and atopy were strong predictors of rat sensitization. Most symptom-free but skin prick test positive laboratory animal workers developed symptoms within the two years of follow-up. Rat sensitization risk increased with increasing exposure and leveled off at the higher end of the exposure distribution as evaluated using smoothing techniques. This shape was observed in both a cross-sectional and a longitudinal analysis of the data, although the cross-sectional exposure sensitization relationship tended to a somewhat bell shaped curve. Presence of IgG4 antibodies was associated with exposure, atopy and rat sensitization. There were no indications that IgG4 antibodies at higher exposure levels were negatively associated with development of rat sensitization or work related symptoms in sensitized individuals, as has been suggested earlier for some allergens.

10577 - Childhood Asthma Prevalence and Indoor Antigen Exposure

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Objective: We examined the association between asthma prevalence among children 1 - 17 years old and indoor antigen exposure as well as other potential risk factors in a nested case-control study from a large cross-sectional study in the City of Buffalo, New York conducted in 1996 – 1997.
Methods: The primary caretaker of each child was sent a self-administered questionnaire that included questions about asthma symptoms, socio-demographics, medical care access, lifestyle, time-activity patterns, smoking or passive smoking at home, having a pet, seeing rat or cockroach at home, and other characteristics of the home. As part of the case-control study, children underwent pulmonary function testing and skin allergen testing, which included dust mites, cat, dog, cockroach, and mouse. In addition, the levels of these antigens in indoor dust in the family room rug, children's mattress, and in the kitchen were measured in a random sample of the study homes. An asthma case was defined as having two or more self-reported asthma symptoms in the past year or a physician diagnosis of asthma with one or more asthma symptoms in the past year. The control group was defined as children who had never been diagnosed with asthma and had no asthma symptoms in past year.
Results: This study found increased risks of asthma prevalence for children who were sensitized to dust mite (OR=2.00, 90% Confidence Interval (CI)=1.14–3.49), cat (OR=2.02, 90% CI: 1.16–3.51), or dog antigens (OR=1.99, 90% CI: 1.16–3.42), after controlling for age, race, ethnicity, family history of asthma, and chemical odors outdoors. The results also showed positive associations between asthma prevalence and the presence of cat antigen in dust in either the family room (OR=2.69, 90% CI: 1.09–6.65) or mattress (OR=3.96, 90% CI; 1.48–10.59), after adjusting for gender, family history of asthma, chemical odors inside or outside, dampness in the home, and parental smoking. Children with both sensitization and environmental exposure to cat antigen had a higher risk of developing asthma (OR=7.08, 90% CI: 2.12–23.62) than those who were sensitized to cat antigen only (OR=2.31, 90% CI: 1.01–5.32).
Conclusion: This study suggests that sensitization to dust mite, cat, and dog antigens are important predictors of asthma. The increased risk of asthma associated with sensitization to cat antigen is further increased when there is also environmental exposure to cat antigen.

10580 - The association between residential distance from a highway or interstate and severity of asthma symptoms

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Background: Exposure to diesel and other forms of traffic exhaust is a potentially important environmental risk factor for the exacerbation of symptoms in asthmatics. Asthma severity and distance to the nearest highway was assessed for children residing in Connecticut. Methods: GIS techniques were used to determine the distance and bearing from place of residence to the nearest state or interstate highway for 814 children residing in Connecticut. Severity was assessed using the Childhood Asthma Severity Scale (CHAS). Logistic regression was used to evaluate the association between distance to nearest highway and asthma severity. Results: For those who were closest to a state highway (n=657) the mean distance was 0.40 mi. (SD=0.36, range=0-2.41), and for the interstate (n=148) the mean was 0.51 (SD=0.35, range = 0.02-1.78). The bearing to the nearest highway was uniformly distributed for the state highways but not the interstates in which the modes for bearing to the nearest highway was east or northwest. Distance to the nearest highway was categorized as 0.00-0.25, 0.25-0.50, 0.50-0.75, 0.75-1.00, and ≥1.00 miles. Using a linear logistic model, we treated distance as an ordinal variable and estimated trend based on the index for the distance category. Based on the trend among distance categories, we found an odds ratio for some asthma symptoms compared to no active symptoms of 2.80 (95% CI=1.15-7.49) for living less than 0.25 mile to the nearest state highway compared to more than one mile distance from a state highway. For an interstate highway the effect was 0.69 (95%CI=0.15-3.33). When the data for state highways were further stratified, we found an odds ratio of 2.11 (95% CI=0.55-10.04 when the residence was upwind from the highway and 3.34 (95% CI=1.06-12.35) when downwind. Similar analyses in which asthma symptoms were categorized as very mild, mild, moderate, and severe did not reveal an association with distance from a highway. Conclusion: These results suggest a possible association between distance from a state highway and some asthma symptoms. Further work is needed in order to refine the analysis by including data on traffic density on the nearest highway. The small number of subjects who were directly downwind from an interstate could reduce the power for finding an association with distance from an interstate in this study.

10713 - Reduced Th1 reactivity in cord blood is associated with the development of respiratory diseases and allergic sensitization during infancy

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Objectives. Recently we showed that reduced amounts of type 1 cytokine (IFN-gamma and TNF-alphą producing cord blood T cells are not only associated with family atopy history but also with environmental factors such as renovation activities and indoor chemical exposure during pregnancy. The aim of this study is to analyze whether altered cytokine production by cord blood T cells is associated with the development of respiratory symptoms and diseases and allergic manifestations during infancy.

Methods Within an ongoing birth cohort study (LISA: Life style – Immune system – Allergy) the cytokine production of PMA/ionomycin stimulated cord blood T cells was measured by intracellular cytokine staining. Children were followed up to the age of 2 years for the development of respiratory and atopic diseases. Specific IgE antibodies were measured by CAP-FEIA. Data of 99 children with complete information on cytokine production at birth, clinical outcome and total and specific IgE at 2 years were analyzed. Statistical analysis was performed using a regression model adjusted for gender, family atopy history, place of birth, smoking, socioeconomic status, elevated cord blood IgE, breast-feeding, and mite and cat allergen in dust.

Results The highest prevalence of allergic sensitization was found for the food allergen cow´s milk (5.1 %). Linked with the development of specific IgE against cow´s milk at the age of 2 years reduced amounts of type 1 cytokine (IFN-gamma and TNF-alphą producing cord blood T cells were found.

Significantly reduced TNF-alpha and in trend also IFN-gamma producing T cells at birth were associated with of respiratory infections during the first 6 months. Children with wheezing symptoms during the first two years of life (20.6 %) had significantly fewer TNF-alpha producing cord blood T cells, too. No association between skin manifestations (atopic dermatitis, itchy rash or urticaria) and cytokine production at birth was observed.

Conclusions IFN-gamma producing type 1 T cells downregulate IgE synthesis. Thus, reduced IFN-gamma production at birth may enhance the risk for the development of allergic sensitization. Moreover, type 1 T cells provide protective immune responses against viruses. Therefore, a reduced type 1 reactivity could raise the risk for the development of virus induced respiratory disorders. Since the observed association between reduced type 1 T cells at birth and allergic sensitization as well as respiratory disease during infancy was independent from atopic family history our findings may provide evidence for the impact of environmental factors on immune functions in early childhood.

Abstract # 10722

Immunomodulating processes and atopic diseases – role of indoor-VOC

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Problem
Air way symptomes and allergic manifestations may be influenced by indoor volatile organic compounds (VOC) exposure. Because the VOC are not allergens the mechanism of the process of influence has to be explained. Changes in the type1/type2-balance of T cell reactivity resulting in allergic sensitization are discussed as possible reasons. However, no real in vivo evidence for this hypothesis was found so far. Furthermore it should be known what kind of VOC leads to what kind of effect.

Methods
Within 2 cohort studies (LARS - Leipzig allergy risk children study, LISA - life style - immune system – allergy study) the effect of VOC on newborns and children during their first years of life has been studied.:

study	participants	number	birth year
LARS	newborns at risk for atopic diseases	475	1995/1996
LISA	newborns	976	1998

Additional to standardized questionnaire and clinical checkup also in a subgroup of children cytokine secretion profile of cord blood and peripheral T cells of 3 years old children were analyzed. The cytokines IL-4, interferon-γ, tumor necrosis factor-γ were measured using the method of intracellular cytokine staining. Indoor VOC exposure measurements run parallel at different times starting after birth in the infants´ bedrooms using passive sampling systems.

Results
LARS: The occurrence of IgE antibodies (specific or total) appeared to be positively related to exposure with alkanes (C6, C8-C10), aromates (toluene, o-, m-, p-xylene, ethylbenzene, 2, 3 and 4-ethyltoluene, naphthalene, chlorbenzene) and terpenes (pinene, carene). Moreover, specific IgE antibodies to food allergens (egg, cow´s milk) mainly were found. On the other hand, the same VOC (excluding 2,3 and 4-ethyltoluene and pinene) were associated with significant changes in T cell reactivity. A higher percentage of IL-4-producing type-2 cells or a reduction of interferon-γ and/or tumor necrosis factor-γ producing type1 cells was observed in correlation with VOC exposure. Furthermore, an association was found between sensitation to milk or egg at 3 and atopic eczema at 4 years (OR 30.1/7.5). In addition, the risk of atopic eczema was significantly increased in 4 years old children which were exposed to toluene, m+p-xylene, α-pinene, or tetrachloroethylene during the third year of life (adjusted OR between 6.6 and 25.6).
LISA: Maternal exposure to naphthalene and methylcyclopentane was associated with elevated percentages of IL-4+ type2 cells (OR 2.9/3.3), exposure to tetrachloroethylene with reduced IFN-γ+ type1 cells (OR 2.9) in newborns.

Conclusion
Our data suggest that maternal exposure to VOC, early exposure of the newborns and high exposure in the first years of life may have an influence on the immune status of the child (altered type1/type2 ratio). VOC exposure is associated with allergic sensitization possibly mediated by a type2-biased T cell reactivity. One consequence may be a higher prevalence of prodroma of atopic diseases.

Abstract # 10746

Effect of indoor chemical exposure on the development of allergies in infancy

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Problem

The „internal“ dose coming from external exposure is determined more by indoor than by outdoor conditions. Thats why it has to clear up what role plays indoor scenarios within the genesis of allergies. Mainly volatile organic compounds (VOC) associated with special indoor activities and allergens play a dominant role. The results are the basis for prevention.

Method

Based on preschool children‘s investigations (KIGA – Kindergartenchildren study, n=736, cross sectional study, main study time 1993-1995; LISS – Leipzig infection, allergy and air way diseases study with schoolstarters, n=2950, repeated cross sectional study, since 1997), a cohort study (LARS – Leipzig allergy risk children study, n=475, since 1995) was undertaken to assess whether indoor exposure will increase the prevalence of primary atopic manifestation (eczema infantum). The KIGA children have been selected arbitrary during the preschool time, the LISS children were all children of one school beginners cohort.
All newborns at risk for atopy were selected from one birth cohort (n=3540) for the LARS study. At risk means a classification for cord blood IgE, atopy anamnesis and preterm newborns (birth weight between 1500 and 2500g). These infants had a medical check-up at week 7 postpartum, at the age of one year and once yearly after that.
Twenty-six volatile organic compounds were measured in the infants bedrooms within the LARS and KIGA study. The logistic regression model was adjusted for different parameters like parental predisposition, smoking of the parents or smoking in presence of the pregnant woman or in the presence of the child, outdoor environment, living conditions.

Results

Indoor VOC concentrations were 10 times higher than outdoors and corresponded with specific indoor activities. Important activities with an influence on the load were painting and floor covering. The adjusted risk was increased for both air way diseases and eczema infantum. The VOC-dependent (including VOC associated activities) adjusted Odds Ratios (OR) for eczema infantum and atopic ekzema ranged from 1.4 (95% CI: 1.1 ... 1.7) to 6.4 (95% CI: 1.2 ... 34.4) depending on the study, the risk group and the time at which the VOC-related activities took place. In all cases an influence of VOC (or with VOC linked indoor activities) on allergic symptoms, diseases or first signs of a further development of allergic diseases was visible.

Conclusions

VOCs seem to play a role within the genesis of allergies. They may be trigger factors which act together with allergens. Further efforts are necessary to get information which kind of VOC are of importance. The LARS study and retrospective the other studies showed, that to prevent allergies, exposure to chemicals, such as VOCs, should possibly be avoided pre- as well as postnatally.

10758 - Air pollution and respiratory drug use in the city of Como, Italy, 1995 to 1997

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Study Objective and Setting: Particulate air pollution has a known negative effect on human respiratory health, often studied with hospital admissions, emergency room access, or mortality as health indicators. We evaluate respiratory drug dispensing data as health indicator for the effects of total suspended particles (TSP) air pollution in the city of Como(84,713 inhabitants).
Design: Weekly count of individual patients with respiratory drug dispensed (Cases) and weekly dispensed daily defined doses (DDD) of drugs were crossed with weekly air mean concentrations of TSP using Poisson regression model adjusting for long time trends, seasonal variations, calendar variations due to holidays, and weather.
Main Result: A summary of data is shown in the Table

Table Summary of data, by year, city of Como, 84,713 inhabitants.

Year	Cases	DDD	DDD/case	DDD/1000 inhabitants	Cases % of population
1995	4,805	309,254	64.4	9.9	5.6
1996	4,901	362,056	73.9	11.6	5.7
1997	5,712	368,715	64.6	11.8	6.7

Relative risks (RR) were expressed for a variation from 10th to 90th percentile of TSP (29 to 92 μg/m^3). Weekly aggregation was used considering the complexity of drug dispensing data and potential biases of daily aggregation. For weekly mean concentrations of TSP, RR = 1.082 (95% Confidence interval (CI) 1.002 to 1.169) for Cases and RR =1.137 (95% CI 1.044 to 1.238) for DDD.
Conclusion: Our study concludes that both Cases and DDD of dispensed respiratory drugs could be useful for epidemiological surveillance of air pollutant health effects. Further investigation may allow routinely health and economics considerations, producing a new stimulating tool for health policy makers.

10803 - Endotoxin in Household Dust is Associated with Resident, Housing, and Demographic Characteristics.

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Rationale: Evidence suggests that exposure to endotoxin in homes is associated with exacerbation of asthma and viral respiratory tract infections. The National Survey of Endotoxin in Housing was launched as a population based, multi-stage area probability study designed to characterize exposures contributing to asthma. Levels of endotoxin, a proinflammatory constituent of housedust, were measured in settled dust collected from a representative sample of U.S. households; and associations with housing, geographic, demographic, socioeconomic factors, and health status were determined. **Methods:** A total of 4300 vacuumed dust samples was collected from five rooms in each of 831 homes representing the national distribution of housing types, geographical regions, and socioeconomic groups. Extensive health, demographic and housing data were collected by questionnaire and observation forms. Endotoxin concentrations were determined from dust extracts using the kinetic chromogenic *Limulus* amebocyte lysate assay performed at multiple dilutions. **Results and Conclusions:** Within our sample source types (e.g. bedroom floor) there were consistent differences observed by region of the country (Midwest and West > Northeast and South). Analyses of a randomly selected subset of dust samples from bedroom floor (n= 376), bedding (n= 248), living room floor (n= 313), living room upholstery (n= 124), and kitchen floor (n=376) revealed highest levels of endotoxin in kitchen and living room floor samples, compared to significantly lower values in bedding and upholstered furniture. Multivariate statistical analyses based on survey questionnaires, observation forms, and bedroom dust samples data demonstrated that higher endotoxin levels were significantly associated with homes from western region of the U.S., households that included children, households with annual income below $30,000, homes with cockroaches infestation evidence, mildew and food debris observed, households with residents - smokers, and homes having residents experiencing asthma past year. NIEHS P30 ES05605, NIEHS DIR, HUD/OHHLHC

10874 - Wheeze risk associated with animal production among farmers in the Agricultural Health Study: Interactions with atopy, asthma, and smoking

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Animal production involves daily contact with many potential allergens and sensitizers. The respiratory impact of these exposures may differ among potentially sensitive populations. Using the Agricultural Health Study, a large cohort of certified pesticide applicators enrolled between 1994 and 1997, in Iowa and North Carolina, we evaluated the odds of wheeze associated with aspects of animal production including animals raised, direct contact with animals, working in animal confinement areas, grinding feed, and handling of grains, and assessed interactions among potentially sensitive subgroups (atopics, asthmatics, smokers). We used logistic regression models controlling for age, state, smoking, and history of asthma or atopy to evaluate odds of wheeze in the past year among the 20,468 farmers who provided complete information on all covariates. Individuals who reported raising animals involving direct contact had the highest odds ratios (OR) for wheeze (OR_{dairy} =1.3, 95% confidence interval (CI) = 1.1, 1.5; $OR_{poultry}$=1.4, 95% CI=1.1, 1.6; OR_{eggs}=1.7, 95% CI=1.3,2.3). We observed a significant dose response both for the number of chickens and the number of livestock on the farm at one time. The odds of wheeze associated with poultry production was significantly greater among individuals with atopy than among those without atopy. Asthmatic participants who reported milking cows on a daily basis were more likely to wheeze than were non-asthmatic subjects with the same exposure. Interaction with smoking status (never, past, and current) showed that past smokers had the highest odds of wheeze followed by non-smokers, and then current smokers for dairy, poultry and eggs. This was most pronounced for raising eggs; the OR_{eggs} was 2.9 (95% CI = 1.8,4.6) for past smokers, 1.5 (95% CI =1.0,2.2), for never smokers, and 0.8 (95% CI = 0.4, 1.2) for current smokers. These findings are consistent with increased risk of wheeze due to animal handling and suggest that certain subgroups may respond differently to exposure. Since Agricultural Health Study participants were farming prior to enrollment, it is possible that those most sensitive to animals were no longer exposed at the time they enrolled in the study.

10903 - PREVALENCE OF ASTHMA IN PRIMARY SCHOOL STUDENTS IN A REGION POLLUTED BY YATAĞAN COAL FIRED POWER PLANT

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The most common method used all over the world in order to determine the prevalence of school age asthma is the administration of ISAAC (international study of asthma and allergy in childhood) form. Facilitating international collaboration by establishing a standardized methodology and easy application are the most important advantages of this method. Yatağan power plant is composed of three units each of which is of 210 MW power. Shaft heights are 120 meter. Coal that is used as a fuel contains sulphur with a ratio of 4%. The establishment continued to operate without a desulphurisation unit from the year it started (1984) until 2001.
The aim of this study was to determine the asthma prevalence in primary school students (ages 6-14 years) who live in central parts and villages of the administrative district Yatağan by means of the method of ISAAC.
MATERIALS AND METHODS: All of the students, who enrolled in central and village schools, were included in the study. According to Yatağan National Education Directorate data, 5680 students are enrolled in primary education school. 3029 (53.3%) students are enrolled in schools located in the central part of the city, 2651 (46.7%) in schools in the central part of the village. The study performed December 2001. A questionnaire was composed of items on personal qualities, educational statuses, personal habits hobbies of the parents' characteristics of the residence, household size, annual income, atopy history, presence of pet. Explaining the ISAAC form to the teacher, parents are asked to fill out the forms. Chi Square and logistic regression tests were used for comparisons. p value is considered as 0.05.

RESULTS: 14.9% of cases had wheezing.12.9% of cases was physician-diagnosed asthma. Proportion of students who had at least 1 wheezing attack was 28.1%. 20.4% of them 4-12 times and 11.3% of them had attacks more than 12 times. Proportion of waking with nocturnal wheezing is 38.5%, having a severe wheezing that limits the speech is 38.5%, having wheezing after or during exercise 8.2%. Both in students have wheezing and students diagnosed as asthma, between 6-10 years, asthma frequency was found significantly high in boys, living in a house with small number of rooms, houses that do not get sunlight and have moisture and passive smoking and having atopy history in the individual or family. Logistic regression test revealed the same results.
CONCLUSION: In regard to the other studies with the same method in our country, wheezing frequency is found to be similar. Nevertheless physician-diagnosed asthma was quite high. These results show that wheezing frequency increases with local air pollution. This, which is the first study in this risky region, is very important to observe the changes through years.

10929 - Factors influencing Ni(II)sulfat sensitivity in 6 year old children - a population based study in different regions of Germany

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The objective of the study was to determine factors influencing Ni(II)sulfat sensitivity (Ni-s) in children regarding exposure due to environmental pollution as well as inheritable, ethnical and life-style factors.
In a cross sectional study in West-, East and South-Germany 1384 preschool children (mean age: 6.3y +- 0.4) were investigated in the year 2000. A subgroup of 604 pairs - preschool child and mother - has been randomly selected. With consideration of questionnaire and dermatological examination life-style factors and allergic/atopic findings were determined. Ni-s was assessed by a ready to use test in children (TRUE test®, Pharmacia Hillerod Denmark). Ni-concentration in morning urine samples were measured using ET-AAS. Sensitivity to airborne and food related allergen has been quantified by means of Prick testing and determination of allergen-specific IgE in the serum of children and mothers (RAST).
Altogether 17.5% of the children were sensitized to Ni(II)sulfat. 43.6% were sensitized to at least 1 of 24 test substances included in the patch-test Panel. Girls show more frequently (21,6%) and more strongly reactions, as well as children from parents with higher educational level. In the girls (68% with piercing) the age at being ear pierced (3.3 +- 1.7 years) do not show significant effect on sensitivity. Children with brighter skin type are more frequently and more strongly concerned. Children with features of atopic symptoms (at least 1 RAST positive, Diagnosis of eczema) are more frequently concerned compared to children without these features. Even more prominent is the relation of Ni-s with the familial predisposition for atopic symptoms (at least 1 RAST, diagnosis of eczema in the mother). Children vaccinated in the past are more rarely and more weakly concerned. Children with the specification "Tonsillitis during the last 12 months" are more rarely and more weakly concerned. Cooking with gas and unfavorable heating (single-storey heating system/single-storey heating system with wood/coal/oil) is associated with Ni-s. No effect was found for passive smoking. Internal Ni-exposure, based on urine concentration and categorization in Ni-polluted and non-polluted study regions is associated with Ni-sensitization. No association was found with Ni-concentration and daily consumed tap water. Results of multiple regression analysis will be presented in detail.
Conclusion: Determining factors of influence on the Ni-Sensitivity in 6 year old children differ substantially from the factors of influence on Ni-Contact dermatitis in adults. Environmental and inheritable Influence seem to play the major role, lifestyle factors are less relevant in this age group.
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Abstract # 10938

Temporal Patterns in South Carolina Emergency Department Asthma Admissions

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Many environmental factors that affect asthma vary temporally. To narrow the field of environmental processes under investigation in a larger project, this study investigated temporal patterns in South Carolina hospital emergency department admissions for asthma during 1997-2000. Approximate annual totals demonstrate the dramatic increase in admissions during these four years: 26,000 for 1997, 29,000 for 1998, and 36,000 for 1999 and for 2000. South Carolina's population, about 3.8 million, did not show a similar pattern of increase. Females represented about 57% of admissions. Whites (68%) and blacks (30%) compose the vast majority of the South Carolina population, therefore the analyses for this study included only those racial groups. Blacks (55% of admissions) and children under age 15 (40% of admissions and about 21% of the population) were disproportionately represented. Annual trends in asthma emergency department admissions were determined, and relationships among admission rates, season, race, gender and age group were examined. Kernel smoothing was used to clarify underlying annual patterns. Monthly rates were calculated and plotted by age group, gender, and race. Poisson regressions and negative binomial regressions were performed to examine whether admission rates were related to race, gender, age group, season or year. Plots indicated asthma admission rates increased each year from 1997 to 1999 with a slight decrease in 2000. Rates were notably higher in black females and males, and generally rates for females appear to be higher than those for males of the same racial group (Graph 1). Annual rate patterns were similar among both races and genders, demonstrating cyclical seasonal variation with dips during summer and peaks during late fall/early winter. As group age increased, asthma admission rates decreased (Graph 2). Seasonal variations appeared to decrease with age and were markedly greater for children under age ten. Log linear models indicated statistically significant relationships between asthma admission rates and gender, race, age group, season and year of admission. Rates for children under five were approximately four times greater than those among persons aged 45 and older adjusting for season, race and gender. Rates among blacks were more than double those of whites controlling for age group, gender and season. Rates increased significantly from 1997 adjusting for age group, gender, race and season. Seasonal effects appeared to differ by age group and year, with greater differences for younger age groups and earlier years. This study revealed age, gender, racial and temporal differences in South Carolina asthma emergency department admissions from 1997-2000. As part of a larger intervention study, further research and analyses are underway to explore reasons for these differences.

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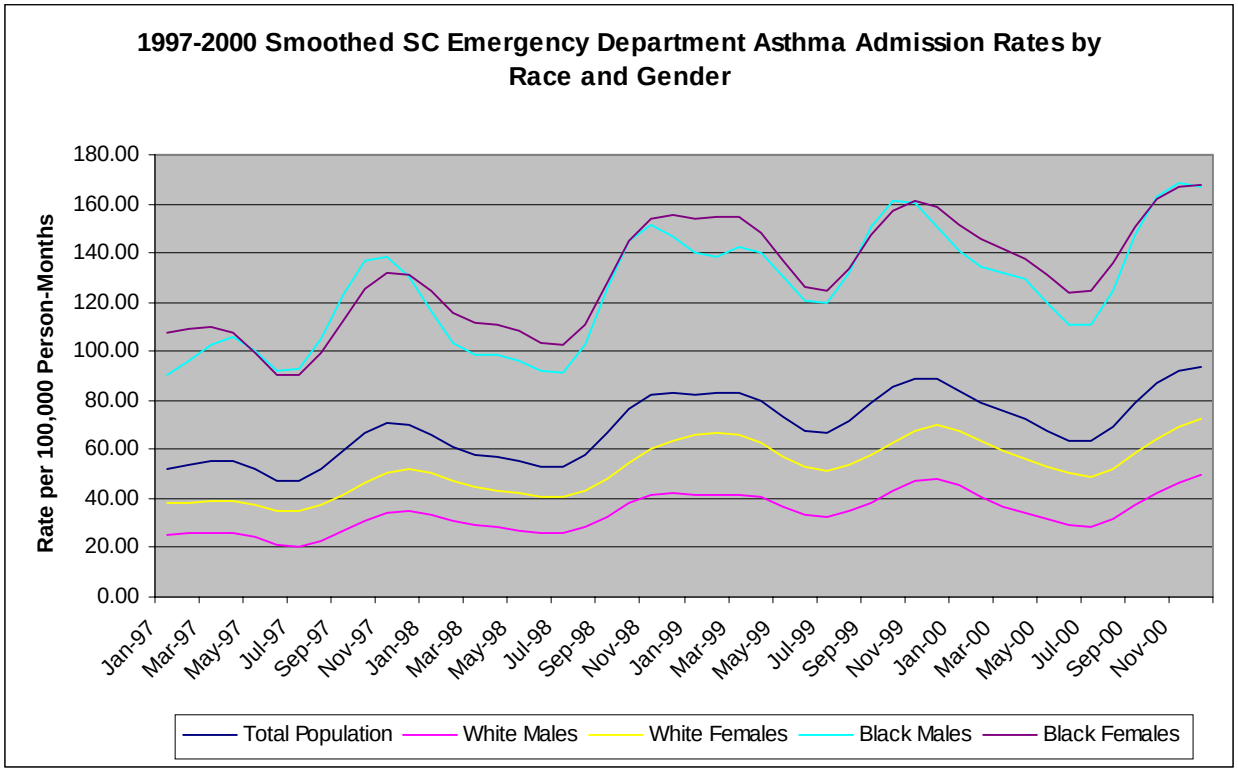
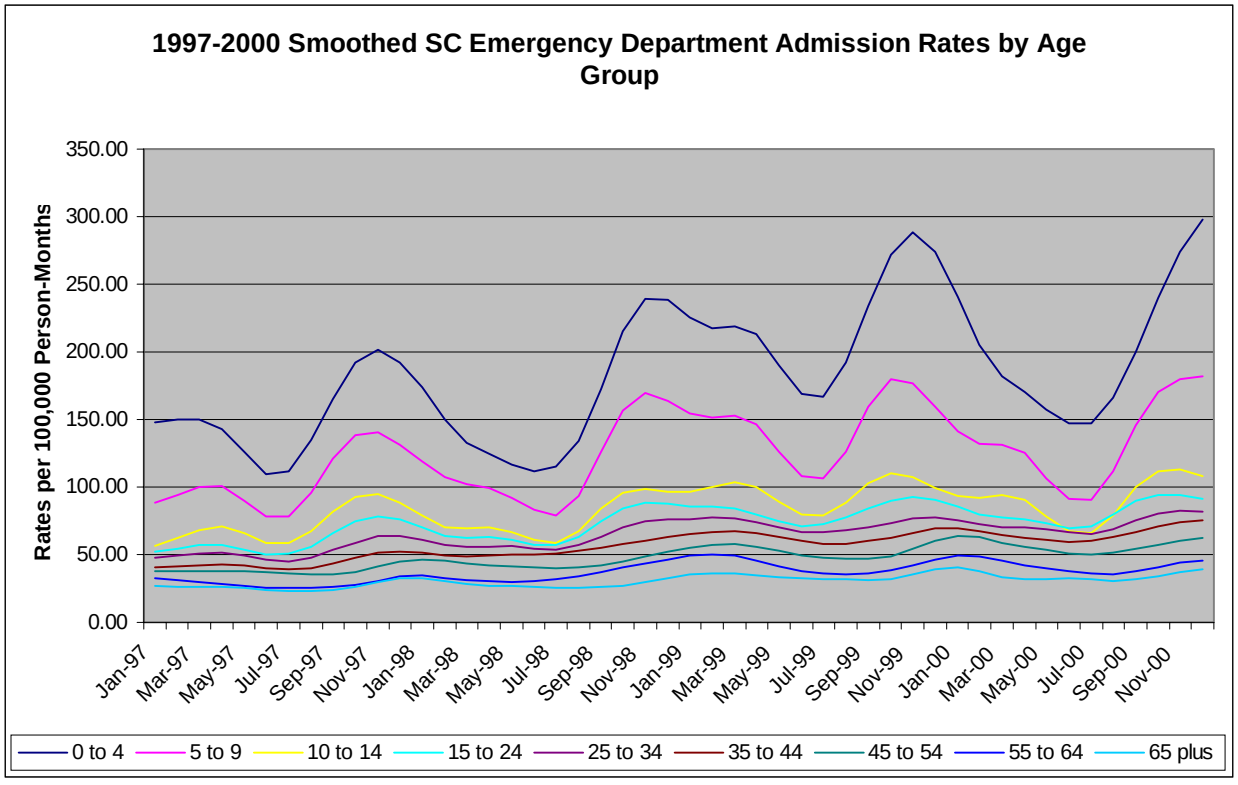
Graph 1.



Graph2.



11072 - OCCUPATIONAL SEAFOOD ALLERGY AND ASTHMA IN SOUTH AFRICA

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Background: The spectrum of occupational allergy and asthma prevalence associated with indigenous bony fish species has not been previously investigated in South Africa. The seafood industry employs over 28,000 mainly seasonal women workers involved mainly in bony fish processing. Aerosolisation of seafood or cooking fluid during processing is an important risk factor for allergic sensitization and development of asthma symptoms. The aim of this study was to test the association between airborne exposure to fish aerosols and allergic symptoms, allergic sensitisation, bronchial hyper-responsiveness and asthma among workers processing saltwater bony fish. **Methods:** A cross-sectional study was conducted on 594 currently employed workers in two fish processing plants working in fish canning and fishmeal processing. Workers were interviewed about allergic symptoms and occupational histories using a modified version of the European Community Respiratory Health Survey (ECRHS) questionnaire. Skin prick tests were conducted using extracts of common airborne allergens and fresh fish processed at the plant. Lung function spirometry, including methacholine challenge tests were conducted using a bellows volume-time spirometers according to ATS guidelines. Environmental exposure was measured using full shift 8-hour TWA area samples using air-sampling pumps. **Results**: Environmental sampling revealed higher mean airborne particulate concentrations of 2.68 mg/m^3 in the cannery compared to 0.27 mg/m^3 in the fishmeal department. The mean allergen concentrations in canning were much higher (pilchard: 0.53 µg/m^3, anchovy: 2.12 µg/m^3) than fishmeal production (pilchard: 0.09µg/m^3, anchovy: 0.58µg/m^3). The prevalence of atopy (ascertained by skin prick tests) was 38%. Common work-related symptoms reported were rhino-conjunctivitis (27%), asthma symptoms: chest tightness or wheezing (16%) and skin symptoms (14%). Nine percent of workers were sensitised to one or more of the fish species processed or to the fish parasite *Anisakis pegreffi*, with 1 % being sensitised to both fish and parasite allergens. Furthermore, 32% of workers demonstrated bronchial hyperresponsiveness ($PC_{20} \leq 8$ mg/ml), with 4% among these also showing sensitisation to fish processed at the plant (fulfilling our criteria for occupational asthma). The prevalence of seafood-associated rhino-conjunctivitis was much higher than protein-contact dermatitis (2%). A dose response relationship was demonstrated between high (canning), medium (fishmeal) and low (clerical, labelling, workshop) allergen exposure category workers and the presence of work-related asthma, rhinoconjunctivitis and skin symptoms. **Conclusion:** Workers involved in bony fish processing can develop allergic symptoms and asthma due to inhalation of aerosols generated during high-risk exposure activities such as canning and fishmeal production. The prevalence of occupational asthma

associated with indigenous bony fish is similar to reported prevalence of 2-8% in other studies.

Abstract # 11107

Using data mining techniques to identify volatile organic compounds associated with asthma attack

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Background: It is estimated that asthma is affecting more than 17 million people in the United States. However the role for a group of important air pollutants, volatile organic compounds (VOCs), in asthma remains inconclusive. The purpose of this study is to use data mining technology to explore the differences in patterns of volatile organic compounds (VOCs) found in breath samples collected from asthma patients at baseline and onset of asthma attacks. **Method:** A longitudinal study of 24 asthmatic children was conducted and breath samples were collected during a follow-up period of 76 days. Samples were analyzed using gas chromatograph/mass spectrometry. Cluster analysis was performed to identify potential useful peaks in chromatograms. Efforts were then made to examine whether a combination of these peaks can be used to identify asthma status (i.e.attack vs baseline). Principal component analysis and other pattern recognition techniques were applied to the data to identify clustering among the compounds and the correlation of their presence and intensity to the onset of the asthma attacks. **Results:** Interesting clusters of VOC compounds were discovered as potential triggers of asthma attacks. A group of compounds that might be used for potential chemical markers of the asthma attack were also identified. **Significance:** Chromatograms are routinely generated in analytical chemistry labs yet this rich information resource has long been overlooked in heath research community. Our results indicate that mining has great potential in analytical chemistry as well health researches.

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